सत्यमेव जयते

स्वच्छ भारत
एक कदम स्वच्छता की ओर

CPWD
HANDBOOK OF
HORTICULTURE

Central Public Works Department

Ministry of Housing and Urban Affairs

Zaitoon (Olea europea)

सत्यमेव जयते

स्वच्छ भारत
एक कदम स्वच्छता की ओर

CPWD
HANDBOOK OF
HORTICULTURE

CENTRAL PUBLIC WORKS DEPARTMENT
Ministry of Housing and Urban Affairs

Hon’ble Prime Minister planting Rudraksh Tree in the Parliment House

Hon’ble Minister and his wife visiting Bonsai stall during CPWD flower show

हरदीप एस पुरी
HARDEEP S PURI

आवासन और शहरी कार्य राज्य मंत्री (स्वतंत्र प्रभार)
नागर विमानन राज्य मंत्री (स्वतंत्र प्रभार)
वाणिज्य एवं उद्योग राज्य मंत्री
भारत सरकार
Minister of State (I/C), Housing & Urban Affairs
Minister of State (I/C), Civil Aviation
Minister of State, Commerce & Industry
Government of India

MESSAGE

It gives me immense pleasure to note that "CPWD Handbook of Horticulture" is being published by the Central Public Works Department on the occasion of 166th CPWD Day on 12 July 2020.

Green areas are the lungs for the planet Earth. Man survives only if the surrounding natural habitat is green and vibrant. Any grievous assault on nature puts our very survival as a human race in peril. We can all contribute in our own ways in keeping the earth green. In urban areas, tree lined avenues and parks supplement the ecosystem and add to the aesthetics.

I hope this book will be beneficial for the professionals and amateurs in the field of horticulture and ornamental gardening.

I congratulate Shri Vinit Kumar Jayaswal, Director General, CPWD and his team for publishing this handbook of Horticulture.

(Hardeep S Puri)

New Delhi
07 July 2020

Office:- Room No. 104-C, Nirman Bhawan, New Delhi-110011; Phone: 011-23061166, 23061162, 23062089 (Fax)

दुर्गा शंकर मिश्र
सचिव
Durga Shanker Mishra
Secretary

भारत सरकार
आवासन और शहरी कार्य मंत्रालय
निर्माण भवन, नई दिल्ली–110011
Government of India
Ministry of Housing and Urban Affairs
Nirman Bhawan, New Delhi-110011

MESSAGE

Congratulations to Central Public Works Department for publishing 'CPWD Handbook of Horticulture' on the occasion of its 166th Foundation Day. This Handbook deals with various aspects of horticulture, landscaping and ornamental gardening. Green areas are not only important for environmental conservation, micro climate regulations, bio-aesthetics, but also for stress busting effects.

I am confident that this Handbook will increase awareness amongst horticulturists, professionals, garden amateurs, practicing engineers and architects.

I applaud the efforts of Shri Vinit Kumar Jayaswal, Director General, CPWD and his team in publishing this very useful Handbook.

(Durga Shanker Mishra)

New Delhi
7 July, 2020

Office Address: Room No. 122 'C' Wing, Nirman Bhawan, New Delhi-110011
Tel.: 011-23062377, 23061179; Fax: 011-23061459; Email: secyurban@nic.in
Website: www.mohua.gov.in

Vinit Kumar Jayaswal
Director General

सत्यमेव जयते

भारत सरकार
Government of India

केन्द्रीय लोक निर्माण विभाग
निर्माण भवन, नई दिल्ली-110011
Central Public Works Department
Nirman Bhawan, New Delhi-110011
Tel : 23062556/1317, Fax : 23061884
E-mail : cpwd_dgw@nic.in

MESSAGE

It gives me immense pleasure to note that CPWD Handbook of Horticulture is being published by the Horticulture Wing of Central Public Works Department on the occasion of 166th CPWD Day on 12 July, 2020.

Landscaping and horticulture are essential elements for healthy living and create pleasant eco-friendly surroundings. Trees, shrubs, foliage, flowering plants and green spaces trigger happy emotions with feelings of togetherness with nature. This ultimately improves work performance.

I hope this CPWD Handbook of Horticulture which contains various aspects of Horticulture will be beneficial to professionals, garden amateurs, garden lovers and public at large to update their knowledge in the field of landscaping, horticulture and ornamental gardening.

I appreciate the sincere efforts of Dr P. K. Tripathi, Deputy Director General, Horticulture and his team of officers and staff for bringing out this book and I wish it a great success.

(V K Jayaswal)

New Delhi
July, 2020

सत्यमेव जयते

भारत सरकार
Government of India
अपर महानिदेशक (प्रौ.)
Additional Director General (Tech)
केन्द्रीय लोक निर्माण विभाग
Central Public Works Department
द्वितीय तल, कमरा संख्या 203–ए, ए–विंग निर्माण भवन, नई दिल्ली–110011.
Second Floor, Room No. 203-A, A Wing, Nirman Bhawan
New Delhi-110011, Phone : 23063389, Fax : 23061608
E-mail : adgtd@nic.in

CPWD

Message

I am happy to note that CPWD Handbook of Horticulture is being published by the Horticulture Wing of Central Public Works Department on the occasion of 166th CPWD Day on 12 July 2020.

Horticulture, landscaping and garden design is the foundation of any great landscape .The garden can incorporate both natural and man made materials. Plants are considered one of the most cost effective agents for remedying negative views of an area, thereby adding to its aesthetic value and significantly improving the visual amenity, economic and social conditions of the city.

Indoor air pollution is now considered by many experts to be one of the major threats to health. During pollution alerts, people are generally advised to stay indoors. Now a days Indoor plants are advised for air purification and absorption of obnoxious gases emitted through household gadgets.

I appreciate the sincere efforts of Dr P.K.Tripathi, Deputy Director General Horticulture and his team of officers and staff for bringing out this book and I wish it a great success.

(Anant Kumar)

New Delhi
July, 2020

डॉ. प्रसून कुमार त्रिपाठी
उप महानिदेशक (उद्यान)
Dr. Prasun Kumar Tripathi
Dy. Director General (Hort.)
Phone : 23061293, 23061943
Fax : 23061297
E-mail : ddghorticulture@gmail.com
delddghort.cpwd@nic.in

सत्यमेव जयते

केन्द्रीय लोक निर्माण विभाग
उप महानिदेशक (उद्यान)
कमरा न. 235, ए-विंग
निर्माण भवन, नई दिल्ली-110011
Central Public Works Department
Dy. Director General (Hort.)
Room No. - 235, A-Wing
Nirman Bhawan, New Delhi-110011

FOREWORD

In CPWD, Horticulture deals with planting of ornamental plants in a such a way that it creates picturesque effect. The concept of landscape and horticulture is being implemented by way of using different kind of garden features that it must conform to the place and the purpose.

The importance of a tree can be attributed that a mature leafy tree produces as much oxygen in a season as ten people inhale in a year. A single mature tree can absorb carbon dioxide at a rate of 48 pounds per year and release enough oxygen back in to the atmosphere to support two human beings. On average, one tree produces nearly 260 pounds of oxygen each year. Two mature trees can provide enough oxygen for a family of four.

This book contains 30 chapters on different aspects of horticulture and ornamental gardening ranging over various fields of horticulture. I understand this book would be ready reference and beneficial for the professionals and garden amateurs through know how, discussions, experiences for refreshing and updating latest technology and methodology in the field of Horticulture and ornamental gardening.

I express my sincere gratitude and thanks to Sh. V. K. Jayaswal, Director General, CPWD for entrusting me this work.

I also express my sincere thanks to Sh. Anant Kumar, A.D.G.(Tech/Works) for guiding me during this work.

I take this opportunity to thank Sh. Yoginder Singh,Sh. Ram Singh Meena, Sh. R. Selvam, Sh. Ram Kumar Malik, Deputy Directors (Hort.). Sh. Ashwani Kumar Deshwal, Sh. Sudhir Kumar, Dr. S. K. Singh, Dr. Deepti Saxena, Sh. R. S. Chauhan, Dinesh Kumar Tyagi, Sh. B. B. Sharma, Sh. Y. K. Gaur, Assistant Directors (Hort.), for providing necessary data's and pictures during the writing of this book, andSh. Amrit Singh Shokeen, Sh. Rahul Shukla and Sh. Dilip Kanojiya for typing this manuscript neatly.

New Delhi
July, 2020

(Dr. P. K. Tripathi)
Deputy Director General (Hort.)

CONTENTS

	INTRODUCTION	1
	HISTORY	2
1.	HORTICULTURE AND THE LANDSCAPE	3
2.	GREEN WALL / VERTICAL GARDEN	15
3.	MODULAR LANDSCAPING SOLUTIONS	17
4.	HYDROPONICS	23
5.	HOME GARDEN FEATURES	26
6.	ROOF GARDENS	31
7.	PLANT PHYSILOGY	32
8.	TREES	33
9.	PALMS	59
10.	SHRUBS	67
11.	HEDGES & EDGES	82
12.	GROUND COVERS	87
13.	CLIMBERS	89
14.	ROSES	94
15.	LAWNS	113
16.	CHRYSANTHEMUM	117
17.	RARE TREES IN CPWD LOCATIONS	121
18.	MIRACLE FRUIT	146
19.	DETAILS OF CPWD PARKS	149
20.	COLLECTION OF SPECIMEN BONSAI PLANTS AT GOVERNMENT SUNDER NURSERY, CPWD, NIZAMUDDIN, NEW DELHI	162
21.	DECORATION AT DIFFERENT SAMADHIES	168
22.	DISPLAY OF FLORAL TABLEAU DURING REPUBLIC DAY CELEBRATIONS, PREPARATION OF FLORAL TABLEAU	190
23.	WINTER SEASONAL FLOWERS	211
24.	SUMMER AND RAINY SEASON FLOWERS	237
25.	FLOWER BEDS	242
26.	POTTED PLANTS	245
27.	CACTUS & SUCCULENTS	248
28.	ESSENTAL ELEMENTS AND THEIR SOURCES	260
29.	IMPORTANT FERTILIZERS	262
30.	MEDICINAL PLANTS	266

INTRODUCTION

The Horticulture Unit of CPWD was established way back on 1st April, 1912 under the able guidance of Shri R.H.Loke, Horticulture Superintendent. Since then the unit has evolved into a large wing, pioneer in execution of all kinds of horticulture & Landscape works. The major functions of the wing are as follows:

- Development & Maintenance of open spaces and parks
- Development of different types of gardens
- Raising of trees
- Development and Maintenance of Landscape and Horticulture works in Residences of Hon'ble Vice President, Prime Minister, Ministers, Members of Parliament, Judges of Supreme Court & High Court etc.
- Development and Maintenance of Landscape and Horticulture works in the Samadhi complexes of National Leaders spread in about 200 acres area. The Rajghat and other Samadhi complexes are not only visited by International dignitaries and leaders but also International and local tourists.
- Development and Maintenance of Landscape and Horticulture works in Central Government office complexes and residential areas

Besides above, Horticulture wing is also involved in enhancing and conserving the green areas, aesthetic improvement of the gardens and preparation of green manure using green waste in localized areas, thereby maintaining and conserving an eco-friendly environment. The nurseries maintained by this wing of CPWD are well known for maintaining large collection of indigenous plants, seasonal, perennial, foliage, exotic, herbal and aromatic plants. Horticulture wing is maintaining two major nurseries i.e. Government Sunder Nursery and Government Mehrauli Nursery in New Delhi.

Hon'ble Prime Minister planting Kadamba Tree

HISTORY

The Horticulture Wing of CPWD was established on 1st April, 1912 with a very small unit headed by Shri R.H. Loke (British origin), as Horticulture Superintendent. It was pioneer in the field of horticulture and famous for indigenous plants and collection of all kind of seasonal, perennial, foliage, exotic, herbal and aromatic plants. Horticulture Unit is maintaining two major nurseries viz., Govt. sunder Nursery and Govt. Mehruali Nursery.

Govt. Sunder nursery was inaugurated in February, 1949, presently spreaded in 20 acres land (approx.) at Nizamuddin, New Delhi. The nursery is bordered by Humayun's Tomb to the South and the National Zoological Park to the North.

Govt. Mehruali Nursery is located in Shaheed Jeet Singh Marg, (in front of NCERT Gate No.2), Katwarai Sarai New Delhi. Mehruali nursery is presently spread over in 33 Acre area (approx.) and is also having a collection of foliage's plant, perennials, seasonal plants, palms, cactus, Bougnvellia, money plants, roses, etc.

CHAPTER - 1

HORTICULTURE AND THE LANDSCAPE

The CPWD , comprises of Civil, Electrical, Architecture and Horticulture wings, finds its relation with the Built Infrastructure. The people of the world are slowly realizing the damage that has been done to our environment. The success of development and maintenance of landscaping features can be judged by the quality of relationship between the building, the site ,landscaping features and its surroundings .The natural resources which are useful in the landscaping should be environmentally sustainable and function efficiently and economically in the long run. Man`s greed for quick economic gains has led to imbalance of this planet thereby threatening to the very survival of mankind in the not very distant future. In our metro cities we are already experiencing the effects of soil, water, air and noise pollution which has already crossed the threshold of human tolerance and has manifested itself in the deterioration of all life forms. In this bleak scenario there is still a ray of hope if people in general are awake and realize that the solution for correcting our mistakes lies in our understanding of nature as a holistic phenomenon and take course of action intelligently and diligently.

In CPWD, Horticulture deals with planting of ornamental plants in such a way that it creates a picturesque effect .Landscaping gardening can be defined as the decoration of a tract of land with plants and other garden materials so as to produce a picturesque and naturalistic effects in a limited space. Landscape gardening can also be defined as the beautification of a tract of land having a house or other object of interest on it. It is a done with a view to create a natural scene by the planting of lawn, ground covers, shrubs ,hedges and trees. The arrangement and final establishment of the garden features must be done in a such a way that it gives an effect of a natural landscape soothing to the heart. It must act in such a way that it helps in improving of the total living environment for the people. The concept of landscape and horticulture by way of using different kind of garden features must conform to the place and the purpose for which it is built example. Selection of plants in a Samadhi and in a recreational park are totally different to one another. Care must be taken to define the relationship between various colours of the plants, flowers, building or other objects present at the site.

Landscape Concept and Garden Design :

Garden and garden features should be compatible to each other and meet the characteristics of the garden, because it is an extension of house and an enclosure for pleasure. It is essential to understand the site characteristic and its potential for development and conceptualize the scheme for specific purpose and design accordingly. Most of us love to be with nature and are often disappointed with the limited space available around the house, which makes us think that these little spaces do not accommodate beautiful gardens. Landscaping is making of pictures with plant materials and hence its principles are same as those of art. Followings are the points which needs to taken care during the landscape concept and garden design.

Rhythm: Repetition of same object at equidistance is called rhythm. It can be created through the shapes, progression of size or a continuous line movement, rhythm creates movement to the eye. In gardens generally trees of single species of equal height and shape are planted to create this effect. In Mogul gardens, fountains and water canals have also been extensively used to create such effects Now-a-days other objects like lights are also used to

Whether you're planning to "borrow ideas," or coming up with your customized landscape design, you need to know the basic principles of landscape design. Understanding these landscape design principles will increase your creativity while at the same time help you generate new ideas. A great landscape design lies in the eyes of the artist, and these basic principles of landscape design will not only boost your creativity, but also ensure that the elements in your design have balance and harmony.

Basic Principles of Landscape Design:

1. Unity

Unity in landscaping is the repetition and consistency of a design. Repetition is used to bring about unity in your design by repeating like elements which include plants and decor in the landscape. Consistency is used to create unity by fitting different elements of a landscape together to create a common unit or theme.

2. Balance

Balance is simply a sense of equality. There are two types of balance in design symmetrical and asymmetrical balance. In symmetrical balance, two sides of the landscape are identical while in asymmetrical balance, the landscape composition is balanced using different elements and objects which have almost similar imaginary weight.

3. Contrast and harmony

Contrast helps highlight certain elements in your design, while harmony helps elements in a landscape composition look unified. Contrasting elements draw the viewer's attention when they're placed next to each other. Contrast and harmony are achieved by the comparison of any elements of art or using complementary colors side by side.

4. Color

Color gives your landscape design the dimension of real life. Warm colors (e.g. red and orange) seem to advance towards you, making an object seem closer. While cool colors like blues and greens seem to move away from you. Blues and greens are used to create perspective.

5. Transition

Transition is simply a gradual change. Transition in a landscape design is illustrated by gradually varying the plant size or the color intensity. Transition can also be applied to texture, foliage shape and size of different elements.

6. Line

Line is the mother of all elements in landscape design. Lines are used almost everywhere including creating beds, entryways, walkways, texture and perspective. Lines are also used to give an illusion of depth and distance.

7. Proportion

Proportion refers to the size of an element in relation to the other. Among the principles of landscape design, this is the most obvious one but still needs a little planning and thought. One must ensure that all the elements in a landscape design have proper proportions.

8. Repetition

Repetition is directly related to unity. It's good to have several elements and forms in

a garden, but repeating the same elements gives your design various expressions. Too many objects that are not related can make your design look unplanned and cluttered. Also, don't overuse an element since over using an element can make your design feel boring, uninteresting, and monotonous.

In Conclusion

With these basic principles of landscape design designing a landscape can be a nice way of unleashing your creativity. Utilizing, colors, contrast, and lines all can help influence the design of your landscape.

Important Things to Consider When Planning Your Landscape Design:

Whether you are interested in completely redesigning your landscape or simply making a few changes there are some important factors to consider before you start planting. While many people head straight to their local gardening supply store to browse the selections, creating a plan beforehand will help you chose plants that will best fit your needs and thrive in your landscape.

It's easy to go out and be tempted into buying plants that look beautiful at the garden store, only to get them home and realize they are wrong for your landscape. These tips will help you develop a plan and put you on the road to creating a beautiful, cohesive, and thriving landscape.

Know your Garden :

Think about your regional climate, the topography of your site, and your soil type when planning your landscape.

Keep in mind that the specific conditions of your garden are likely to create a microclimate based on the amount and length of sun and shade exposure the area receives. Microclimates are usually broken into one of four categories: full sun, partial shade, shade, or deep shade; take note of your landscape's microclimate when selecting plants for your landscape.

The topography of your site is important to consider as well as you plan; take note of how water drains in your landscape. The best landscape design will promote water movement away from your home towards other areas of your garden.

Who will be using your Garden :

Think about who will be using your garden and how they will use it. Will children be using your garden? Do you have pets? Are you hoping to use your garden for outdoor entertaining? Remember you can create different spaces for different uses in your landscape using strategic plantings and hardscapes. Walkways can be used to move people from one area to another.

Since you will be using and maintaining your garden (or hiring someone to maintain it) consider what your maintenance style and

budget are. Be as realistic as you can. How much time will you truly have to put into your landscape? Or if you won't have the time will you have the money to pay someone else to put in the time? How much do you have to invest in your landscape? Determining the answer to these questions will help to ensure the success of your landscape for years to come.

Think about themes of your garden:

A theme can unify your landscape and help guide your plant and material selections. Themes can be as simple as using consistent shapes or forms throughout your garden or as complex as creating a relaxation garden or an Oriental garden. When deciding on a theme for your garden, a good place to start is looking at the architecture of your home. Try to complement the lines and style of your home's architecture in your garden; after all, your garden is an extension of your home.

Themes can help guide how you place and select plants, decorations, hardscapes, and structures. Are you someone who wants lots of neat, geometric shapes and structures in your landscape? Do you want softer lines and a more natural feel to your space? Do you want a landscape to include only specific colors? Questions like these will help you choose a unified theme for your garden.

Create and link spaces :

In order to get the most out of your garden, think of it as another room, or rooms, in your home. Just as a home has well defined and carefully planned rooms, so should your landscape; using your materials wisely allows you can create different "rooms" in your landscape. Don't forget to think about how you'll link your spaces. How will people move from one area of your garden to another? Create openings to encourage exploration in your garden and keep people moving throughout the landscape.

Make your plants work for you :

Early in your planning you should determine how your plants will function in your landscape. Plants can be used in a number of ways, they can provide you with fresh and delicious fruits and vegetables, beautiful scenery, lovely aromas, and much more. Plants can be used as barriers to define areas within your landscape as well as identify where your landscape ends. You can use plants to create physical barriers in your landscape by blocking both views and access to an area. If you want to keep your views open, but maintain some barriers, low growing plants can be used to create implied barriers, blocking access but not the view.

Correctly placed plants can also be used to alter your landscape site conditions. Temperature, light levels, and wind are greatly affected by the trees and plants in a landscape. The noises in your landscape can be affected by what you put into the design, such as water features or bird houses, as well as any physical barriers that keep your garden insulated from noises beyond your landscape.

Structure your plantings :

Consider your various visual planes when selecting plants. Starting from the area above you, think about the overhead plane, this might include archways and trees.

Moving on to the vertical plane, consider how closely spaced or far apart plants will be, how plants will be layered or staggered (generally larger plants are used behind smaller plants), as well as the individual and massed heights and widths of your plants.

Don't forget about the ground plane (including how smaller plants will be grouped

and arranged as well as groundcovers and hardscapes).

Repeating similar shapes and structures in your garden will give you a unified view throughout your space.

Highlight important points :

Using unique plants, distinct structures, or garden ornaments allows you to highlight a particular area of your landscape. Contrasting shapes, textures, sizes, and colors will help to capture attention and direct it to a specific area.

Pay attention to detail :

Plants, hardscapes, and garden ornaments all have their own visual details, from various forms and shapes to an array of colors and textures. By thinking about how these visual details can be used to complement and contrast each other, you can create a cohesive and captivating landscape.

Don't just think about visuals; taking into consideration the scents of the plants you select for your landscape can enhance the experience you create for those in your garden. Think about when flowers will be blooming and fragrant, as well as what scents will complement each other in the landscape.

Think about the future :

More specifically, take into account how the passage of time will affect your landscape plants. When selecting plants, make sure you consider the plant's growth rate, maintenance needs, and its eventual mature size. Make sure you provide your plants with enough room to reach their mature size. Keep in mind though, that mature size is typically based on optimal growing conditions, your landscape's specific conditions may cause a plant to grow larger or smaller.

Protect your resources:

By choosing resource-efficient plants, consciously managing water, and choosing environmentally sound hardscapes, you can help protect and preserve your environment.

Before removing plants from your landscape, determine whether these plants truly need to be removed, or if they could be relocated to another area of your yard. When selecting new plants, look for resource-efficient plants, ones that will require less water, fertilizers, and pesticides.

When planning the changes to your landscape, consider installing a rainwater catchment system which will provide you with an environmentally sustainable source of irrigation water. With careful planning such a system can even be incorporated as an aesthetic design element.

Using environmentally friendly hardscapes, non-toxic preservatives, stains, paints, and cleaners is another way you can protect your natural resources. Also, consider reusing construction materials; before demolition starts consider what materials you might be able to reuse, repurpose, or incorporate into your new lands

GARDEN STYLES

The Orangerie in the Gardens of Versailles with the Pièce d'Eau des Suissesin the background (French formal garden)

Stourhead (1741-80) (English garden)

Jardin del Generalife de Granada (Spanish garden)

Reflection of the Bagh-e Narenjestan (orange garden) and the Khaneh Ghavam (Ghavam house) at Shiraz, Iran (Persian garden)

Mughal gardens at Taj Mahal, Agra, India

Nishat Bagh, terrace garden at Srinagar, India (Mughal Gardens)

The Yuyuan Garden in Shanghai, China (created in 1559) shows all the elements of a classical Chinese garden

Ryoan-ji (late 15th century) in Kyoto, Japan, the most famous example of a Zenrock garden

Royal Botanic Gardens, Kew, London

Labyrinth maze of Bravaux, Durbuy, Belgium

Parc de Bagatelle, a rose garden in Paris

Roof garden on the top deck of a multi-storey car park at Hyderabad

GARDEN FEATURES

GARDEN PAVING

GARDEN GATES

GARDEN ARCHES

GARDEN FURNITURES

GARDEN SCULPTURES

GARDEN GAZEBOS

GARDEN BRIDGES

GARDEN FEATURES

GARDEN FOUNTAIN

GARDEN WATER FALLS

GARDEN WATER BODY

GARDEN ILLUMINATION

GARDEN CHILDREN PLAY AREA

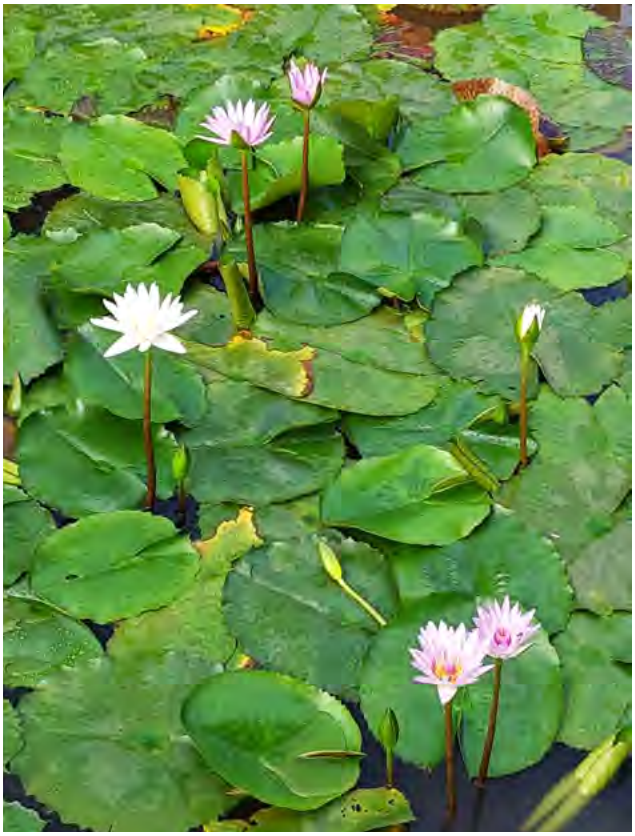
GARDEN POP-UPS SPRINKLERS

GARDEN KNOTS

President Estate Garden

Landscaping Ideas

Landscaping Ideas



Landscaping Ideas

CHAPTER - 2

GREEN WALL / VERTICAL GARDEN

Green wall/Vertical Garden is the new concept of gardening particularly suitable for cities, as they allow good use of available vertical surface areas. With nationwide emphasis on being environment friendly and conserving resources beautiful creations like a Green Wall are bound to become common place in most commercial and residential buildings. A Green Wall, also known as living wall, bio wall or a vertical garden, is a living plant based exterior or interior wall to buildings or homes which may be free standing structures or part of the building. They are more frequently composed of climbing plants, but there are other options that some designers have incorporated in which the plants are grown in specially made support structure and growth media such as soil. The benefits of a Green Wall go far beyond aesthetics. A Green Wall is a natural insulation that helps to maintain and regulate the temperature within a building. It has been observed that the exterior of a wall with a Green Wall is 10 degrees cooler than an exposed wall. With the rising costs and shortage of energy, this feature reduces consumption of energy for heating or cooling in a multiple occupancy building. Living walls used on the interior of a building can also help to maintain humidity levels as well as assist in the air filtration, which can be a problem for some commercial buildings because they are located in crowded parts of the city. According to the EPA (Environmental Protection Agency), USA, poor indoor air quality is ranked fourth on a list of 31 of the worst environmental threats that the average worker faces each day. Another benefit of Green Wall is that they can be a means of water reuse. The Plants may purify slightly polluted water by breaking down the nutrients and filtering into the water system. They also have the ability to absorb noise and reduce noise pollution inside the building while increasing the property value of a building. The living wall could also function for urban gardening or for its beauty. In vertical gardens, various types of modular panels can be used along with geotextiles fabrics, growing media, irrigation systems, and plants.

Commonly seen types of vertical gardens

Ideally the selected plants are planted into the modules or pots and are allowed to settle and grow over a period, before installation on site. Watering can be done manually or through irrigation systems which can be installed along with living wall structure. These living wall structures can be fixed directly to existing walls or can be fixed on to a MS framework in case of free standing living walls.

Green wall: This type consists of plastic modules which have a geotextile fabric bag which is filled with growing media and rooted plants are inserted into slits made into the bag placed inside the module. The modules can be fixed to walls directly or on a framework.

Bio wall: This type consists of plastic frames and plastic pots. Plants can be planted directly into the pots. The pots can be easily inserted into the frames, which are fixed to walls directly or on a framework.

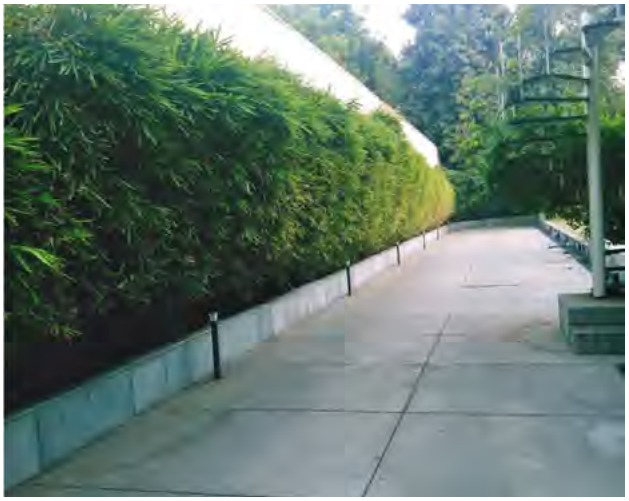
Living wall: This type consists of felt fabric fixed on a support, which in turn is fixed to

the wall. Plants can be planted directly into slits made to this fabric.

Benefits:

1. Aesthetics.

Green walls combine the works of art by nature in different ways as there are numerous varieties of plants that can be used in different combinations.



2. Indoor Air Quality

It is well established that plants can purify air. Along with indoor potted plants, green walls go a long way in improving indoor air quality.

3. Health and Wellness.

Living in urban environments, we are surrounded by concrete, traffic, noise and pollution. It has a profound impact on our physical and mental wellness. Greenery softens this hard environment, acting as a tonic to ease stress and fatigue.

CHAPTER - 3

MODULAR LANDSCAPING SOLUTIONS

Landscape Horticulture around the country has been evolving with new trends and we need to keep in pace with the developments of the International world of green practices in order to keep up with the influx of Landscape developments in this country.

People have practiced landscaping for centuries. As far back as the ancient civilizations, humans were manipulating the land for both aesthetic and practical reasons. The addition of plants, changes to the existing terrain and the construction of structures are all part of landscaping. Today landscaping refers to the planning, laying out and construction of gardens that enhance the appearance and create useable space for outdoor activities around a home.

A high proportion of the population and economic activities are at risk from climate change are in urban areas, and a high proportion of global greenhouse gas emissions are generated by urban-based activities and residents. Suspended Particulate Matter (SPM) is the main problem of urban air pollution in India, caused mainly due to fast growing population of automobiles and poor traffic control, congested roads as well as factories in the peri urban areas. The most watched pollutants include particulate matter (PM), Nitrogen dioxide (NO2), Sulphur dioxide (SO2) and Carbon dioxide (CO2), that are continuously degrading the ambient air quality in major cities in India.

With the growth of urbanization the cities are converted in to concrete jungles day by day and consequently reducing the greenery, rise to global warming, here the need is to bring about greenery in the every little available area along with its beautification.

Landscaping products which can bring about greenery vertically as well as horizontally as per your need and available spaces as all of them are modular system. Followings are the some key Features & General Informations about Various Landscaping Products.

DRAIN MAT

Sheet Drains for single side drainage applications are prefabricated products that consist of a solid, formed, three dimensional core covered with a geotextile Sheet Drains for single side drainage applications are prefabricated products that consist of a solid, formed, three dimensional core covered with a geotextile filter fabric bonded to the dimple side of the core. The filter fabric is securely bonded to prevent soil intrusion into the core flow channel while allowing water to freely enter the drainage core. Sheet drains solid cores allow water entry from one side and are typically used to collect and re-direct water from a structure or site. Sheet drains are designed for use in both vertical and horizontal drainage applications.

HONEYCOMB GRASS PAVER

Each Honeycomb Grass paver Unit made with a High-density recycled and UV rays-stale polythene (PE-HD), Weighing 1 kg.

and available in green or black colour. The Load bearing capacity is 200 tons/m^2 & Dimensions of the unit is 500mm x 430mm x 45mm.

- Instant lawn effect with minimal labour.
- Makes maintenance operations, including lawn moving very easy.
- Mobility to your lawn patch. Takes ample foot traffic.
- Eliminates heavy ground and soil preparation.
- Water logging is eliminated with the special studs provided below the trays.
- The unique interlocking trays allow replacement of damaged lawn instantly with matured turf.

GREEN WALL

Each Green wall Unit made with a UV rays-stable RC Polypropylene (PP), Weighing <3.5kg. and available in green or black colour. The load bearing capacity is 150 kgs /module & Dimensions of the unit is 500mmx125mm.

- Modular Planting System
- Very Little framework Required
- Self Supporting & Strong Structure
- Easy for Creative Planting Design & Easy Maintenance
- Quick Construction & Plant Installation
- Both Vertical & Horizontal Expansion possible
- Each Plant can be Accessed & Maintained Individually.

BIO WALL

"BIOWALL" it's a kind of Green wall made from the shown product. Where we can create most beautiful Green wall using our choice of plants, herbs etc.

As Highlighted above one of the main feature of BIOWALL is its flexibility in the sense of giving it a shape.

It gives freedom of having green wall in the required shape like Round, Half Circle, Square, Angular and Curve in addition to normal horizontal and vertical.Each Bio wall Unit is made with a UV rays-stable RC Polypropylene (PP), made in black colour, Dimesions of the unit is 450mm x 150mm x125mm.

Available in box containing 4 frames + 12 pots and it covers area of 3 Sq.Ft.

DRAIN CELLS

Drain cell Unit is made with 100% recycled Polypropylene available in black colour. Can take compressive load of > 100t/m^2 Above 1200 KN having Discharge Capacity of 350 lit./min @1% Gradient Available in Dimension of: 610mm x 410mm x 30mm, 450mm x 450mm x 30mm & 450mm x 450mm x 20mm.

GEO TEXTILES

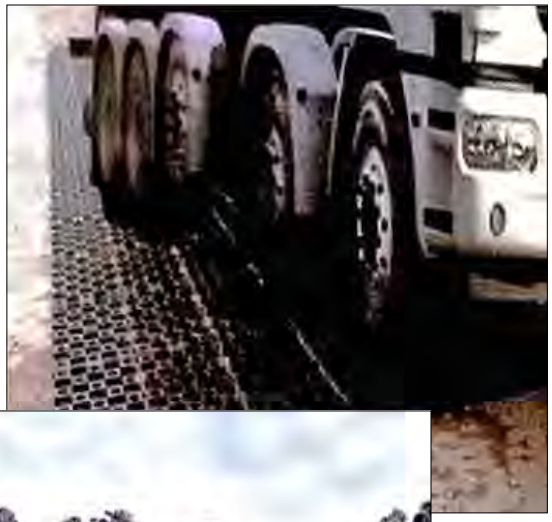
Geotextiles are permeable fabrics which, when used in association with soil, have the ability to separate, filter, reinforce, protects or drains. Typically made from polypropylene. Geotextile forms an integral part of drain cell system.

Available mainly in Gray, Black and White Colours in diff. GSM.

ROAD SURFACE CELL

Basic Structure and Specifications are same as Multi Grow wall.

The Cells can be used in any situation where low to medium & heavy use parking surfaces, access roads for mining sites and driveways are required.



MULTI GROW WALL

Each Multi Grow wall Unit is made with a High-density recycled and UV rays-stable polythene (PE-HD), Weighing <1kg. and available in black colour, The Load bearing capacity is 200 tons/m^2 & Dimensions of the unit is 480mm x 260mm x 51mm.

- Modular Planting System & Easy Maintenance
- Easy for Creative planting Design
- Quick Construction & Plant Installation
- Both Vertical & Horizontal Expansion possible

ARTIFICIAL SPORTS SURFACE

With the modular landscaping solutions, it has been successfully completed sports grounds related projects for various surfaces for sports centres and gymnasiums.

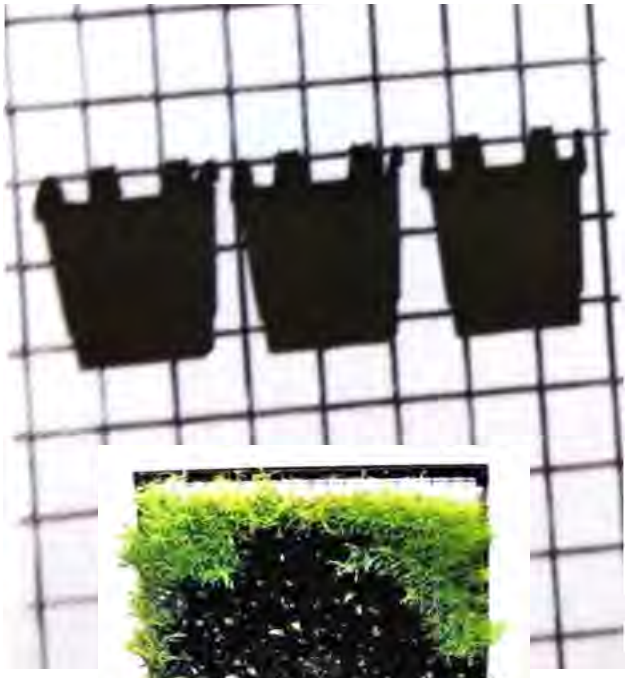
- Sports surfaces for sports centres and gymnasiums.
- Artificial grass for both elite football and lower divisions/training pitches
- Sports and gymnastics mats
- Surfaces for Cricket, Volley Ball, Badminton
- Synthetic surfaces for tennis and multisport (outdoor) Skating etc.

EASSY WALL

A New Concept in Greenwall

Easy Hook Module system is one of the latest in many Green wall/ bio wall products introduced by the Modular Landscaping Solutions.

Just like other products, we can incorporate drip irrigation system in the Green wall made with help of Hook Easy module. With this facility we required less external irrigation elements and thus gives us enhanced irrigation efficiency and reduced cost, water flows smoothly throughout the system maintains the green wall evenly.



TECHNICAL SPECIFICATION OF THE MODULE:

Height: 130 mm Base : 90 x55 mm Top : 115 x 125 mm

New Modular Design: Better design gives elegant look to the green wall

- Simple Method: Easy to build method.

Eco Friendly: Made with UV stabilized recycled polypropylene material

- Instant Wall: We can create an instant wall by placing pre grown plants in the pots.
- Drainage Holes: Holes at the bottom allows excess water to flow next level.

BIOWALL ULTRA

USED AS KITCHEN GARDEN SYSTEM

How it works: it consists of two trays kept one over the other, with lower one providing the water to the upper tray where the plantations are done, the lower tray comes with a water level meter which helps to adjust the water level required in the lower tray.

Where it can be placed:

- A corner of Kitchen
- Balcony or Verandah
- On the Terrace Area
- Backyard
- Window Cut outs.

CHAPTER - 4

HYDROPONICS

Hydroponics has, popularly, been defined as methods of growing plants without soil. The soilless culture defined as biotechnology technique that makes use of natural plant growth phenomena in obtaining better results from plants using inorganic or organic nutrients and standard agronomic practices. The fact is that soilless culture technology is a form of eco-technology that realizes the efficiency and profit from crop plants while maintaining harmony between human activities and the environment.

Thus, hydroponics and organic hydroponics are environment friendly technologies suitable for growing all kind of plants using balanced nutrients in a scientific way. This soilless culture technology not only supplements but also compliments the normal soil condition. It is a clean and scientific eco technology – a smart way to grow the plants.

Hydroponics is highly productive and yield superior quality crop produce round the year, irrespective of the soil and climatic conditions. Organic farming is as good as hydroponic farming albeit low and slow productivity.

Soilless Culture Techniques:

A soilless culture technique refers to the methods of applying nutrient solution to the roots in an efficient way. There are ten techniques in soilless culture.

1. Static Aerated Technique (SAT):

Plants are grown in a depth of static nutrient solution which is aerated either by providing air space in the root zone or by pumping air in to nutrient solution in the tank. In organics, a simple pot or bag of organic medium is used. This is sometimes referred to as a “Passive Technique”. Ideally suited for learning the basics of hydroponics or organics and for doing R&D work. Never use this technique for regular growing of plants hydroponically (especially in the tropics) as mosquitoes might breed.

2. Ebb and Flow Technique (EFT):

Plants are grown as a SAT, but the nutrient solution is drained off 3-4 times a day to permit the roots to breathe. This technique is sometimes called ”Flood & Drain Technique”(in aggregate culture).In organics plants are grown in organic medium and only plain water is used for flooding. Good for home gardens and commercial nurseries. Almost any type of plants can be grown.

3. Deep Flow Technique (DFT):

A depth of nutrient solution (4-6 cm) is circulated around the roots either by gravity or by using a pump. As the nutrient solution circulates, it absorbs oxygen from the atmosphere. This technique is also referred to as ”Dynamic Root” Floatation Technique” and as “Raceways Hydroponics”. Ideal for leafy vegetables and all shallow rooted plants. In organics, fish tank water or any liquid organic nutrient source is used.

4. Aerated Flow Technique (AFT):

This is modified version of DFT. Here, the nutrient solution is profusely aerated by special mechanism. Oxygen level of 10-12 ppm is maintained in the nutrient solution.

The Japanese “Kyowa Hyponica System” and “Styrofoam Float System” adopt AFT, Excellent for growing both leafy and fruit vegetables and certain ornamentals. In organics, fish tank water or any liquid organic source is wood.

5. Nutrient Film Technique (NFT):

A thin film of nutrient solution is always in contact with the roots. While the nutrient solution is circulated, the root surface is exposed to the air.This helps the roots to breathe. Numerous modified versions featuring slant /plane feeding, hypertonic feeding, etc. are available. Very good for producing fruit and leafy vegetables. This technique works well both in temperate and tropical regions of the world. In organics, fish tank water or any liquid organic nutrient source is used.

6. Gravel Flow Technique (GFT):

Plants are grown in inert inorganic or organic substrates and the nutrient solution is fed to the roots from beneath the roots. A film of nutrient solution is circulated beneath the substrate .This technique is usually practiced with sand, granite or perlite or other porous substrates which permit free flow of nutrient solution beneath. Commonly practiced in the USA, South Africa, Australia and India for growing lettuces and other kinds of plants. The Bengal System Adopts this technique. In organics, fish tank water or any liquid organic nutrient source is used.

7. Sub-Irrigation Technique (SIT):

Plants are grown in inert inorganic or organic substances and nutrient solution is fed to the roots from beneath the roots through seepage tubes. Though this method of feeding has been practiced in soil cultivation, it has been refined in hydroponics. Nutrients are fed through capillary action of the growing medium or wicks or any similar water absorbing material that links a pipe or tray containing the nutrient solution to the media surrounding the roots.

8. Drip Irrigation Technique (DIT) :

Like SIT, plants are grown in inert inorganic or organic substrates, and the nutrient solution is fed close to the roots 6-7 times a day in drops or trickles. This technique is called a’’ Drip Fertigation Technique”. This technique is also referred to as “Surface Watering Technique” if hand watering or flooding is practiced instead of drippers. Deserts in the Middle - East are exporting crop produce because of this technique. Also suitable for the plantation, orchard and landscaping industries.

9. Root Mist Technique (RMT):

A mist of nutrient solution is sprayed every 4-5 minutes on to the roots of the plants that hang frame in a rooting chamber. Hydroponic system that are designed using the technique is popularly known as “aeroponics. Good for initiating rooting of cuttings and also for extracting(“milking”) phytochemicals from the roots for medicinal purposes. Also good for growing any type of plants. Selection of nozzles to adjust the droplet size might promote more fine root hairs which in turn might influence nutrient absorption. In organics, fish tank water or any liquid organic nutrient source is used.

10. Fog Feed Technique (FFT):

This is similar to RMT but the droplet size is so very minute (like a cloud) that the nutrient solution can hardly moisten our hand. This technique has yet to be perfected. Good for plants having aerial roots with spongy water absorbing tissues like “valamen”. e.g orchids, anthuriums, etc. In organics, fish tank water or any liquid organic nutrient source is used.

CHAPTER - 5

HOME GARDEN FEATURES

Gardens have been established next to homes since time immemorial. The most important characteristics of home gardens are their location adjacent to homes, close association with family activities and a wide diversity of plant species to meet family needs.

Home gardens are divided based on their features, broadly into:

1. Front garden or aesthetic garden: This is the visual area between the gate of the campus and entry point to the main building. Focus is laid on aesthetic components such as lawns, flower beds, shrubs, trees, edges, hedges, creepers on arches, pergolas, walls, fountains, waterfalls etc. This part of the garden enhances the value of the building, refreshes the mind after hard work outside and makes life more enjoyable both for owners and visitors.

2. Indoor Garden: This is mostly a container garden in any part of the house like verandah, balconies, living room, kitchen, bedrooms and bathrooms etc. There is scope to showcase the entire house as a garden and allow one to be close to nature. It is easy to maintain and enjoy an indoor garden especially foliage plants. Potted plants can be placed on pot stands, window-sills, on the floor in pot trays or in corners or can be hanged on specially made hooks.

3. Back yard or Kitchen Garden: This is mainly used for growing fruits and vegetables for personal use and also to have some lawn area for a family sit out. Functional value is of prime concern.

4. Roof Garden: A rooftop garden is when you build a garden on the roof of a building which is usually done in urban areas. It is an easy way to have a garden experience without needing the land to create the garden. The plants are usually grown in pots or planters especially constructed for the purpose. Flowers & vegetables grown in pots on the roof top provide coolness to the building and also help in creating a habitat for birds. Light pots and pot media are preferred. Water proofing the roof floor is very important. Lawns can also be raised with light soil media and by providing proper drainage.

HOME GARDEN COMPONENTS

This can be broadly divided into soft and hard landscape components. Soft landscape components consist of various types of plants and hard landscape components comprise of civil works including metallic structures such as arches pergolas etc.

(A) Softscape Garden Components:

i. **Trees:** Trees are grown for shade, cooling effect, screening, reducing dust, sound and air pollution. Based on available space, medium or small canopy trees can be grown. Trees can be evergreen and deciduous, based on their leaf shedding character or they can be flowering and non flowering foliage trees.

ii. **Palms:** Palms require very small ground space for growth. They can either have clear, round, upright trunk with a majestic ever green crown or clustering habit. Their root system does not require large surface area or depth in the ground. They are elegant to look at and well known for

their symmetrical growth which makes an avenue look beautiful. They remain evergreen and do not litter the ground with leaves. Therefore, palms are more suitable and ideal for narrow passages and narrow strips of land, boundaries and near the building.

iii. **Shrubs:** Shrubs can be classified as flowering and non flowering. Flowering shrubs need full sun light, and foliage shrubs can grow well under partial sunlight and shade. Location has to be decided based on the height and canopy of the shrubs. Pruning of shrubs helps to get bushy growth.

iv. **Climbers:** Climbers are plants which require support to grow. They can be trained on arches, pergolas, walls, trees and on pandals. Climbers can be used for screening even in narrow spaces, over grills and wire meshes.

v. **Flower beds :** Seasonal and perennial flower beds can be laid in various shapes and sizes. Flowers in all colours of the rainbow are available. Some species are specific to winter; summer or rainy season and some can be grown throughout the year.

vi. **Ground Covers:** These are used to cover the soil surface as an alternative to lawns for avoiding dust and to and to add colour through flowers or foliage. They also check soil erosion.

vii. **Hedges and edges:** Hedges are used for providing privacy, concealing unwanted and ugly locations or as a back ground to lawns, flower beds etc... Edges are used as demarcating lines to lawns, flower beds, pathways etc. and low height is maintained with regular pruning with shears.

viii. **Roses :** Many people consider a garden incomplete without rose plants. These are grown for attractive and scented blooms, in beds or as standards and climbers.

ix. **Potted plants:** Potted plants are displayed both indoors and outdoors, as groups or in singles, on plane areas or steps, on ground or pot stands. Hanging pots are also used extensively. Pots in a group give a very good effect.

x. **Lawns:** Lawns are areas planted with various types of grasses. They are a major component in any garden. They can be planted in turf form and also as grass slips. The following varieties are available either in carpet or loose form- Korean, Mexican, Fescue, Calcutta doob, Bermuda, Paspalum and St.Augustine.

xi. **Rockery:** A rockery is a retaining or protection structure that consists of stacked rocks without mortar, concrete or steel reinforcement. The rocks are stacked in an “interlocking” pattern, and rely on the weight, size, shape, and interface friction of the rock elements to provide overall stability. Selected plants are grown to give an effect of a rocky terrain. Plants best suited to rockeries are those which grow slow and low and are happy in dry areas. These plants usually prefer well-drained soil and less water.

xii. **Special garden features:** Special features include Bonsai, Topiary, tray gardens, bottle gardens and specimen plants etc. that are used especially to create an aesthetic effect in a garden.

(B) Hardscape Garden Components :

i. **Arches:** These are used at entry points to the house or a lawn and are covered with creepers. Arches are of different shapes and sizes and can be made of iron pipes/ flat rods, wood, cement bars etc.

ii. **Pergolas:** Pergolas are umbrella shaped iron or wooden structures covered with

creepers to provide shade over sit-outs and also for elegance.

iii. **Statues:** These can be art statues or memorials.

iv. **Pathways, steps, curbs, benches etc:** Functional elements introduced in a garden which are very much essential and practical.

v. **Water features:** Ponds, flow channels, waterfalls, fountains, sprinklers and swimming pools are essential water features which can be used in a garden to provide a feeling of peace, calmness and beauty.

vi. **Tools and Implements for Watering, Drainage and Lighting Systems:** These are the basic needs for any garden. Tools and implements like a pruning Shear, Rake, watering can, drip systems etc. can be used. Nowadays, to showcase a garden, a variety of lighting systems can be designed.

Hydrangea Flowers

Kalanchoe

CHAPTER - 6

ROOF GARDENS

Tips for Roof Garden:

1. Suitable for people living in apartments or buildings without much open area around the house.
2. Ensure the structural strength of the building, before embarking on the project.
3. Provide water proofing to roof top before under taking any construction of planter boxes with the required water proofing material. Use drain cells and geo textile fabric for improving the drainage for lawns, flower beds and planters, before filling with red soil and manure.
4. Try and use materials which are light weight like plastic pots and trays, aluminum pots, fiber glass planters and earthen pots. This helps in reduction of dead load on the terrace.
5. Use of light weight material like peat or sphagnum moss, coco peat, vermi-compost etc. in the soil mixture will help in reduction of weight.
6. For plant propping, provide light supporting structure.
7. Keep the plant growth under check by regular pruning.
8. For shade loving plants provide shade net.
9. Use limited quantity of water daily. Care should be taken to avoid water stagnation.
10. With proper planning, care and precaution, a full-fledged roof garden can be developed and maintained with many Garden features.

CHAPTER - 7

PLANT PHYSIOLOGY

Fundamentals of Plant Physiology and Soil Moisture:

i. **Photosynthesis:** Photosynthesis is the process of converting light energy to chemical energy and storing it in the bonds of sugar. Plants need only light energy, Carbon-di-oxide and water to make sugar while releasing oxygen. The process of photosynthesis takes place in the chloroplasts using the green pigment chlorophyll. This is essential for survival of life on earth.

ii. **Osmosis:** The process of absorption of dilute plant nutrients through the roots is osmosis. If the nutrient solution around the absorbing roots is more concentrated than that of plant sap, then such solutions suck plant sap and the plant dies, this process is called as reverse Osmosis.

iii. **Transpiration:** The process of evaporation of moisture from the plant through leaves is transpiration. This depends on the surface area of the leaf, atmospheric temperature, humidity and wind speeds. If the rate of evaporation is more than absorption of moisture from the soil through roots, the plant wilts and dies.

iv. **Respiration:** Plants respire through leaves and roots. Periodical loosening of soil near the root zone helps in better aeration and respiration of the plant and it helps in maintaining plant vigour.

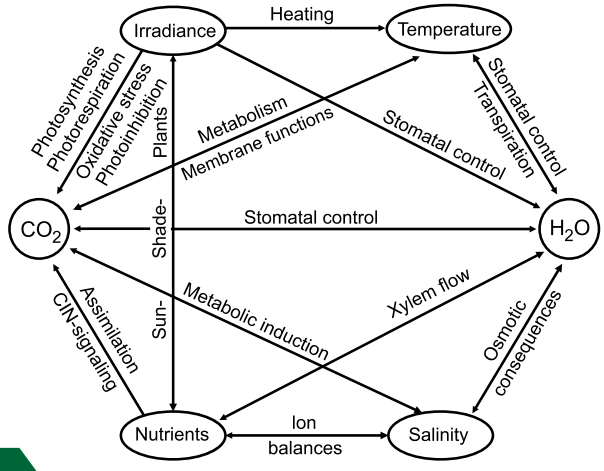
Factors Responsible For Better Plant Growth:

1. **Light:** Plants need light for photosynthesis and growth. Intensity and duration of light needed by a plant differs from species to species. Poor light results in pale leaves or loss of colour. If proper distribution of light is not available on all sides of the plant, pots need to be rotated regularly. Bright artificial light can substitute natural light.

2. **Humidity:** 40-60% RH is ideal for plant growth. It is very low during summer months. Low humidity leads to tip burn in leaves. Protect the plants from dry winds during summer. To increase humidity, spray fine mist on foliage, sponge the leaves with water or place pots on moist sand, cover the soil around the plant with sphagnum moss/wet paper.

3. **Temperature:** Ideal temperature for indoor plants varies from 15-300 C for different species. Plants prefer uniform temperatures, which can be achieved with good aeration by keeping the doors or at least windows open.

4. **Soil moisture:** Indoor plants need lesser water than outdoor plants. Succulent and thorny plants need water less frequently. Soil in small pots dries quickly than in larger pots. Clay pots need water more frequently than plastic or ceramic pots. For retention of water in the pots loosen top soil, apply mulches, and add charcoal, brick crumbs, and coco peat and water absorbents. Do not over water the plants as this may create anaerobic conditions for the root system.



CHAPTER - 8

TREES

For us a tree means flowers, fruits and shade. For a person in a village it means fuel wood, timber, fodder and lots more. For children it is a wonderful place to climb on to and watch animals in action. For elders it is a religious symbol and a pharmacy at home. For some people it is a leaf shedding machine that fills the yard with leaf litter. In urban areas, they are of immense value as they are the only source of greenery amidst the concrete jungle, adding beauty to the city surroundings with their lush foliage, colorful flowers and beautiful shapes. Beside the aesthetic value, they help in controlling pollution, regulating temperature and as wind breakers. Trees are dominant elements of a garden and contribute substantially to the garden atmosphere. They are available in many shapes, sizes, foliage and blooms. The selection of trees depend on the architecture of the building, the purpose for which they are plantedwhether a single plant as a focus of attention, or a cluster of plants for mass effect, the position available, whether in shade, semi-shade or open sunshine, waterside, rock areas etc.,

Tree are grown for shade, cooling effect, screening, reducing dust, sound and air pollution. Based on available space, large or small canopy trees can be grown. Trees can be classified as evergreen (which do not shed leaves) and deciduous (which shed leaves during a particular season of the year) or as flowering and foliage trees.

Trees are an important component of a garden.

- They Provide shade during summer and shelter during rainy season.
- Help in preventing soil erosion.
- Provide good nesting places for birds.
- Check air and sound pollution.
- Obstruct entry of dust and smoke into the house.
- Create required privacy.
- Generate fragrance in and around the house with scented flowers.
- Make the campus colourful with multicoloured flowers and foliage.
- Improve environment by creating humidity and coolness.
- Act as a background to the lawns and other garden features.
- Act as natural protection system for shade loving potted plants.

Tips for Planting & Maintaining Trees:

- Plant the trees and water them properly. Next day press at the base and stake the plants. Pressing is done to remove the air pockets created during planting. If air pockets are not removed, they will act as precursors to infections.
- Pruning and training by removal of lower branches results in a balanced plant growth.
- Regular weeding, mulching and watering in the plant basins during first three years of planting are essential.
- Periodic pruning of dried branches carefully with a pruning saw is desirable.

Apply copper oxi-chloride paste to the cut ends.

- Trees help us in many ways. Plant & protect them.
- Trees hold the soil with their roots and prevent it from getting eroded by heavy rains and winds.
- Trees in upland areas trap rainwater and prevent flooding of lowlands during heavy rains.
- Trees help to reclaim wastelands by improving soil texture and fertility.
- Tree roots create paths into the soil, through which water percolates down for use as ground water.
- Tree roots and leaf litter act as barriers to runoff water, and when stored for a period of time, it decomposes to form leaf mold manure which is excellent for the growth of plants.
- By releasing water in the atmosphere from tiny pores in their leaves, trees cool and refresh the air; this process also reduces dust pollution as the dust particles in the air stick to the water vapor thus released.
- Trees produce oxygen through the process of photosynthesis

S. No.	Name	Colour	Height	Flowering Season
1.	Bauhinia Var	White, pink, purple	Small to medium	Nov-Mar
2.	Cassia fistula	Yellow	Small	Feb-Apr
3.	Cassia javanica	Pink, white	Medium	Jly-Sep
4.	Cassia nodosa	Orange -Scarlet	Medium	Jly-Sep
5.	Colvillia racemosa	Pink	Tall	Jly-Sep
6.	Erythriana indica	Scarlet	Medium	Mar-Apr
7.	Erythrina crista-galli	Scarlet	Small	Year round
8.	Jacaranda	Blue	Medium	Oct-Feb
9.	Lagerstroemia florisregene	Purple, pink	Medium	Jul-Aug
10.	Delonix regia	Orange	Big	Mar-July
11.	Peltophorum	Yellow	Big	Year Round
12.	Plumeria sp.	White	Medium	Oct-Mar
13.	Spathodea companulata	Orange	Tall	Oct-Mar
14.	Tecoma argentia	Yellow	Small	Feb-Mar
15.	Tecoma gaudi chaudi	Yellow	Small	Year Round
16.	Tabebuia rosea	Pink	Small	Feb-Mar
17.	Saraca indica	Orange	Small	Apr-Jun
18.	Cordia sebestena	Orange	Small	Year Round

Magnolia Grandiflora

Callistemon Pollandi

Aegle Marmelos

Pithecelobium SP

Saraca Indica

Cordia (Yellow)

Cordia Sebestena

Golden Melaleuca

Artabotrys

Azadirachta Indica Vergated

Operculicaria Decary

Delonix Regia

Spathodea Campanulata

Melaleuca Linearlifolia

Cassia Spectabilis

Millettia Reticulata

Terminalia Mentaly

Cochlospermum Religiosum (Double)

Erythrina Cristagalli

Lagerstroemia

Bamboo (Black)

Simarouba Glauca

Brassaia Actinophylla

Alstonia Scholaris

Plumeria Obtusa

Leucophyllum Fruitesens

Dillenia Indica

Gauva

Ficus Carica

Bauhinia Alba

Citharexylum Spinosum

Melaleuca Armillaris (White)

Couroupita Guianensis

Artocarpus Hetrophyllus

Erythrina Blackiena

Chorisia Speciosa

Sterculia Alata

Colvillea Racemosa

Solanum Vergated

Mango

Cassia Marginata

Giant Bamboo

Ficus Createrisperma

Tabebuia Pallida

Sterculia Foetida

Millingtonia Hortensis

Anthocephalus Cadamba

Thespesia Populnea

Mesua Ferrea

Jacaranda

Ficus Bengalensis

Crataeva Religiosa

Agathis Robusta

Cassia Fistula

Bauhinia Purpurea

Tabebuia Rosea

Markhamia Lutea

Pachieia Aquactica

Ficus Roxburghii

Cassia Alata

Cananga Odorata

Kigelia Pinnata

Callistemon Pollandi

Swietenia Mahagoni

Plumeria Singapore Dwarf

Crescentia Cujete

Clusia Rosia Variegata

Clusia Rosea

Solanum Macranthum

Bombax Ellipticum

Nyctanthes Arbortristis

Pterospermum Acerifolium

Cochlospermum Regligosum

Bixa Orellana

Madhuca Latifolia

Schizostachyum Brachyculadum

Thevetia

Plumeria Pudica

Guaiacum Officinale

Aphanomixus Polysytachya

Milletia Ovalifolia

Cattleya Orchid

Quisqualis Indica

Portulaca Oleracea

Kadamba Dwarf

Monstera Deliciosa Variegated

Hanging

Hanging

Angelonia Serena Pink

Angilonium Red

Kalanchoe Variegated

Kalanchoe

Aquatic Plant

Philodendron Magestic

Canna Dwarf

Episcia Cupreata

Bamboo Variegated

Neodypsis Decaryi

Phoenix Sylvistris

Podocarpus

Ficus elastica

Ficus elastica

Ficus lyrata

Ficus macrophylla hillii

Ficus macrophylla

Ficus mysorensis

Ficus nitida

Ficus pumila wall creeper

Ficus pumila variegeta

Ficus religiosa

Furcraea foetida variegated

Furcraea foetida variegated

Gardenia jasminoides

Galphimia glauca

Hamelia patens variegata

Hamelia patens

Heliconia caribaea

Heliconia latispatha Starwiz

Heliconia psittacorum

Heliconia rostrata

Heliconia stricta huber

Heliconia wagneriana

Hibiscus rosa sinensis

Hibiscus rosa sinensis pink

Hibiscus rosa-sinensis hawaiian variety

Hibiscus rosa-sinensis hawaiian variety

Hibiscus rosa-sinensis hawaiian variety

Hibiscus rosa-sinensis viceroy variety

Hibiscus rosa-sinensis hawaiian variety

Hibiscus rosa-sinensis hawaiian variety

Cordea lutea

Crossandra infundibuliformis

Crossandra regular

Crossandra yellow

Datura metel

Cycus revoulta

Cycus circinalis

Duranta variegated

Duranta golden speciosa

Eranthemum laxiflorum

Euphorbia Cotinifolia

Euphorbia leucocephala

Euphorbia milii visoflora

Euphorbia milii Desert rose

Euphorbia milii Hybrid

Euphorbia-pulcherrima White

Euphorbia-pulcherrima red

Excoecaria bicolour

Ficus benjamina (black)

Ficus benjamina bushy king

Ficus benjamina Panda

Ficus benjamina rigenold

Ficus benjamina variegate

Ficus bnjamina variegata

Ficus benjamina variegata

Ficus benjamina

Ficus binnendijkii yellow (long island)

Ficus binnendijkii

Ficus carica (Angeer)

Ficus elastica burgundy

Cannas dwarf red

Caesalpinia pulcherrima Pink

Caesalpinia pulcherrima (Yellow)

Calliandra deep red

Calliandra protoricensis (Milk way)

Cassia alata

Cassia gluca

Cassia biflora (Bicapsularis)

Cestrum elegans (Night queen red)

Cestrum (Night queen pink)

Cestrum aurantiacum (Night queen yellow)

Clerodendron inerme

Clerodendron inerme variegated

Clerodendron thomsonae

Clerodendron bungei

Clerodendron variegata

Chrysanthemums Kanchil

Chrysanthemums Kargil

Chrysanthemums Karnal Pink

Chrysanthemums Kundan

Chrysanthemums Lalit

Chrysanthemums Lalpani

Chrysanthemums Little Darling

Chrysanthemums Little Orange

Chrysanthemums Little Pink

Chrysanthemums Haldighati

Chrysanthemums Thaichin Queen

Chrysanthemums Queen

Chrysanthemums Ranbil

Chrysanthemums Red Stone

Abutilon hybridum

Acalypha wilkesian phillipine

Acalypha wilkesiana inferno

Acalypha wilkesiana ceylon lime

Acalypha wilkesiana tahiti plain

Acalypha wilkesiana hoffmannii

Acalypha wilkesiana lousiana red

Acalypha wilkesiana dwarf

Acalypha wilkesiana brazen

Acalypha wilkesiana moorea chocolate

Acalypha wilkesiana moorea twisted

Acalypha wilkesiana bourbonstreet

Acalypha godseffiana heteropylla bronze

Acalypha godseffiana heteropylla variegata

Acalypha godseffiana heteropylla / kilauea

Acalypha hispida indica

Acalypha hispida rubra

Acalypha wilkesiana microphylla

Allamanda nerifolia

Allamanda violacea

Adenium arabicum

Adenium obessum grafts

Adenium obessum grafts

Adenium obessum variagatged

Angelonia angustifolia

Angelonia angel mistwhite

Artemisia arborescens lavender

Bambusa balcooa (giant bamboo)

Bamboo salsa maquonia

Bambusa variegated new

Prosopis juliflora

Sterospermum suberifolium

Putranjiva roxburghii

Samanea saman rain tree

Santalum album sandal wood

Saraca asoca ashoka tree

Saraca cauliflora

Sesbania grandiflra avisa

Simarouba glauca

Spathodea campanulata tulip tree-yellow

Spathodea campanulata tulip tree-orange

Sterculia foetida china badam

Swietenia macrophylla

Swietenia mahagoni

Syzygium cumini kala jamun

Tabebuia argentea

Tabebuia palmeri

Tabebuia chrysantha

Tabebuia pallida

Tabebuia avellanedae

Tabebuia rosea

Tamarindus indica tamarind

Tectona grandis teak wood

Terminali arjuna

Terminalia catappa

Thespesia populnea

Thevetia peruviana (Orange)

Thevetia peruviana (white)

Thuja orientalis

Tipuana tipu

Juniperus chinensis

Kigelia pinnata

Lagerstroemia speciosa rosea

Lagerstroemia speciosa

Lagerstroemia thorelli

Mangifera indica

Magnolia grandiflora

Markhamia platycalyx

Melia azedarach

Michelia champaca alba

Michelia champaca

Milligtonia hortensis

Mimusops elengi variegata

Mimusops elengi

Muntingia calabura singapore cherry

Murraya koenigii curry leaf

Nyctanthes arbor-tristis parijatham (coral jasmine)

Parkia biglandulosa

Parkinsonia aculeata

Peltophorum pterocarpum

Pinus longifolia

Plumeria lutea Frangipani

Plumeria obtusa Frangipani

Plumeria rubra forma tricolour Frangipani

Plumeria rubra Frangipani

Podocarpus macrophyllus

Polyalthia longifolia pendula variety

Polyalthia longifolia

Pongamia pinnata white flowers

Pongamia pinnata light pink flowers

Cassia siamea

Casuarina equisetifolia

Chorisia speciosa

Cochlospermum religiosum

Colvillea racemosa

Cordia sebestena

Couroupita guianensis

Crataeva religiosa

Crescentia cujete beggers bowl

Cycas circinalis

Cupressus sempervirens

Dalbergia sissoo

Delonix regia

Dillenia indica

Diospyros peregrina

Erithrina crystagalli

Erythrina indica

Eucalyptus citriodora

Ficus benghalensis krishne

Ficus benghalensis

Ficus craterostoma

Ficus hispida

Ficus infectoria

Ficus religiosa

Filicium decipiens

Gardenia latifolia

Gliricidia sepium

Grevillea robusta

Jacaranda filicifolia

Jacaranda mimosifolia

Adansonia digitata

Aegle marmelos

Agethis robusta

Albizzia lebbek

Alstonia scholaris

Amherstia nobilis

Anthocephalus indicus Kadamba

Araucaria cookii

Artabotrys

Artocarpus altilis

Azadirachta indica

Barringtonia acutangula

Barringtonia asiatica

Bauhinia blakeana

Bauhinia purpurea

Bixa orellana

Bombax ceiba

Brassaia actinophylla

Brownea ariza

Brownea coccinea

Butea monosperma

Callistemon citrinus

Callistemon pollandi

Calophyllum inophyllum

Cananga odorata

Cassia excelsa

Cassia fistula

Cassia javanica

Cassia marginata

Cassia nodosa

Jasminuim
Compact disc

Jasminuim

Jasmine

Jasmine

Jatropha
panduraefolia

Jatropha
panduraefolia
varigata

Jatropha
panduraefolia
varigata

Jatropha
panduraefolia

Jatropha
panduraefolia
varigata

Kopsia
singapurensis

Kopsia

Leea coccinea
green

Leea coccinea
rubra

Lagerstroemia
indic Pink

Lagerstroemia
indica Red

Lagerstroemia
indica White

Malpighia
coccigera

Malpighia glabra
West indian cherry

Manihot Esculenta
Green

Manihot Eseulenta
varigeta

Melaleuca golden
crest

Murraya exotica

Murraya paniculata

Mussaenda
erythrophylla
Scarlet

Mussaenda
erythrophylla rosea

Mussaenda
Frondosa mustard

Mussaenda
Frondosa

Mussaenda
Philippica aurorae

Nerieum olender

Nerieum olender
variegata

Nerieum olender Dwarf soft pink

Nericum olender Tall-Roseum

Nerieum olender Tall-Carncum flore-eleno

Nerieum olender Tall Yellow

Nerieum olender Tall-Carnea

Nerieum olender Tall-Album

Nerieum olender Tall-variegatum plenum

Pachystachys lutea

Pachystachys Coccinea

Pandans mini

Pennisetum setaceum Fountain grass red (Rubra)

Penniscum setaceum Fountain grass white

Pentas flower

Plumbago auriculata Blue flower

Plumbago auriculata White (alba)

Plumeria Singapore dwarf

Russelia juncea

Tabernaemontana coronaria

Tabernaemontana coronaria White wing

Tabernaemontana coronaria Flore-pleno (multi petel)

Tabernaemontana coronaria Variegata

Tabernaemontana coronaria Dwarf compact

Tecoma gaudichaudi

Tecoma stans

Tecomaria capensis

Thevetia peruviana Yellow

Thuja orientalis

Thunbergia erecta

Thunbergia alata white

Vinca rosea

Ageratum houstonianum floss flower

Althaea rosea Holly hock

Alyssum Madwo

Amaranthus tricolor Joseph's cost

Antirrhenum majus Snap dragon

Calendula Calendula flower

Calliposis Corepis

Celosia Cocks comb

Centaurea cyanus Cornflower

Chrysanthemum coronarium Annual Chrysanthemum

Cosmos Mexican aster

Delphinium spp Larkspur

Digitalis purpurea Fox glove

Dianthus caryophyllus Fairy queen

Gaillardia pulchella Blanket flower

Gomphrena globosa Bachelor button

Helianthus annuus Sunflower ornamantal

Helianthus annuus Straw/paper flower

Iberis sempervirens Candytuft

Impatiens balsa balsam

Flax

Pansy

Petunia grandiflora Picoti variety

Phlox drummondii Phlox

Salvia splendens Salvia red

Tagetes sp marigold

Torenia sp Torenia

Verbena Flower Verbena

Zinnia elegans red Youth and old

Zinnia linerals Perennial zennia

Alternanthera amoena

Alternanthera bettzickiana varigeta

Alternanthera bettzickiana

Alternanthera snowball

Asystasia gangetica

Lantana camara red

Lantana camara red

Lantana sellowiana purple

Lantana sellowiana white

Porchulaca

Verbina

Wedelia trilobata

Aspidistra elatior

Begonia semperflorens

Callisia Repens

Chlorophytum comosum milky way

Chlorophytum comosum vittatum

Euonymus japonicus albomarginatus

Hedera canariensis

Hemigraphis colorata

Impatiens linearifolia

Liriope muscari variegata

Liriope platyphylla

Liriope platyphylla

Pelargonium hortorum

Pilea cadierei

Rhoco spathacea vittata

Syngonium podophyllum white butterfly

Tradescantia albiflora albovittata

Zebrina pendula

Aechmea chantinii

Aglaonema colour

Aglaonema commutatum elegans

Aglaonema commutatum maculatum

Aglaonema commutatum

Alocasia amazonica

Alocasia korthalsii

Alocasia macrorrhiza variegata

Alocasia macrorrhiza

Alpinia sanderae

Alpinia zerumbet

Anthurium andraeanum

Aphelandra squarrosa

Asparagus densiflorus myers

Asparagus densiflorus myriocladus

Asparagus densiflorus sprengeri

Asparagus plumosus

Asparagus setaceus pyramidalis

Aspidistra elatior ‘variegata’

Begonia rex

Begonia semperflorens red pearl

Bromenia balansae

Caladium hortulanum canbidum

Caladium hortulanum attala

Calathea insignis

Calathea rufibarba

Codiaeum variegatum gold dust

Codiaeum variegatum mammy

Codiaeum variegatum petra

Codiaeum variegatum

Coleus

Cordyline terminalis

Cordyline terminalis ‘miss andrea’

Cordyline terminalis red ti

Cordyline terminalis rubra

Cordyline terminalis va baby doll

Cordyline terminalis vs fruticosa

Cryptanthus bivittatus

Cryptanthus bromeliades

Cryptanthus zonatus

Cyclame persicum

Cyclamen persicum

Dahlia

Dianella tasmanica variegata

Dianella tasmanica

Dieffenbachia amoena

Dieffenbachia bausei

Dieffenbachia maculata

Dizygotheca elegantissima

Dracaena fragrans massangeana

Dracaena marginata

Dracaena sanderiana gold

Dracaena sanderiana green

Dracaena sanderiana white

Dracaena sanderiana

Dracaena song of india

Dracaena song of jamaica

Dracaena tricolour

Epipremnum pinnatum

Euonymus japonicus yellow queen

Hedera canariensis variegata

Hedera canariensis

Hypoestes sanguinolenta

Impatiens linearfolia

Impatiens walleriana

Maranta leuconeura

Monstera deliciosa

Monstera obliqua

Nautilocalyx frogetii

Neoregelia carolinae

Nephrolepis biserrata furcans

Nephrolepis biserrata ‘macho’

Nephrolepis cordifolia

Nephrolepis exaltata

Nephrolepis green lady

Pelargonium hortorum

Peperomia clusiifolia variegeta

Phalaris arundinacea variageta

Philodendron bipinnatifidum

Philodendron congo

Philodendron lacerum

Philodendron xanadu

Sansevieria cylindrica

Sansevieria guineensis

Sansevieria trifasciata

Schefflera arboricola varigata

Schefflera arboricola

Scindapsus aureus marble queen

Scindapsus aureus

Spathiphyllum wallisii

Acanthocalycium violaceum

Carnegiea gigantea

Echinocactus grusonii

Hatiora salicornioides

Mammillaria hahniana

Notocactus leninghausii

Opuntia cylindrica

Opuntia falcata

Opuntia ficus indica

Pachycereus pringlei

Pereskia aculeata

Pereskia bleo

Schlumbergera bridgesii

Schlumbergera russelliana

Zygocactus truncatus

Adenium obesum

Agave angustifolia

Aloe abyssinica

Aptenia cordifolia

Beaucarnea recurvata

Butea monosperma

Cissus quadrangularis

Euphorbia milii

Furcraea gigantea

Kalanchoe blossfeldiana

Pachypodium lamerei

Pedilanthus tithymaloides

Sedum morganianum

Senecio radicans

Yucca aloifolianodosa

KLN Yadav Park Erragadda

Chacha Nehru Park, Masab Tank

Japnese Garden, Jubilee Hills

Clock Tower Park, Secunderabad

Lotus Pond, Jubilee Hills

Krishna Kant Park, Yousufguda

Krishna Kant Park, Yousufguda

Krishna Kant Park, Yousufguda

Krishna Kant Park, Yousufguda

Indira Park, Tankbund

Indira Park, Tankbund

Dr. Marri Channareddy Memorial Rock Garden, Indira Park

Road Island near G.H.M.C. Head Office

Tirumala Tirupathi Devasthanam Temple, Himayathnagar, Road Median

Herbal Garden, Ashwini Layout, Jubliee Hills

Colony Parks

Road Median at Gachibowli

Hitex Road Median, Hi-tech City

Golconda Textiles, Manneguda, Vikarabad

Green Valley Farm, Yenkapally Village, Vikarabad

Dr. V. Venkat, Villa No. 446, Pragati Green Villas, Proddutoor, Shankerpally

Pragati Green Meadows and Resorts Ltd.

Pragati Green Meadows and Resorts Ltd.

Pragati Green Meadows and Resorts Ltd.

Aparna Kanapy Tulip Apts, Owners Association

Trendset Winz Owners Welfare, Association Serlilngampally

Aparna Sarovar

Aalankrita Resorts & SPA, Thumkunta, Shameerpet

Adansonia Digitata (Boabab Tree) 500 Years Old Tree near Golconda Fort

Aalankrita Resorts & SPA, Thumkunta, Shameerpet

Rock Garden, Sanjeevayya Park

Basava Tarakam Indo-American Cancer Hospital Research Institute Banjara Hills

AFTON Chemicals Hyderabad Pvt. Ltd.

Potted Plants on Road Island near Cyber City Towers

Lahari Resorts, Bhanur Village

Road Island at Minister Road Junction

Nagpur National Highway Road Median

Mr. K Bhoopal Reddy, Villa No.-15, Micasa Stering Kompally

Raheja Mindspace Hi-tech City

Telugu Thalli Island

Telugu Thalli Island

Telugu Thalli Flyover

NTR Gardens

Kohinoor Garden, NTR Gardens

NTR Gardens

Japanese Garden, NTR Gardens

NTR Gardens

NTR Memorial Garden

Indira Gandhi Island, Necklace Road

Road Median at Kothaguda Junction

P.V. Gyana Bhoomi, Necklace Road

P.V. Gyana Bhoomi, Necklace Road

Lumbini Park

Buddha Purnima, Project Office

Road Island Opp., Shilparamum

Zen Garden, Kothaguda Junction

KBR National Park Walkway

KBR National Park Walkway

Railway Station, Necklace Road

Garchibowli Stadium

CHAPTER - 9

PALMS

Palms require very small ground space for growth. They can either have clear, round, upright trunk with a majestic ever green crown or clustering habit. Their root system does not require large surface area or depth in the ground. They are elegant to look at and well known for their symmetrical growth which makes an avenue look beautiful. They remain evergreen and do not litter the ground with leaves. Therefore, palms are more suitable and ideal for narrow passages and narrow strips of land, boundaries and near the building.

Note: Tips for planting can be adopted as in trees.

PALMS : 1

S. No.	Plant Name	S. No.	Plant Name
1.	Adonidia merrillii green	16.	Borassus aethiopum (African palmyra palm)
2.	Adonidia merrillii golden (Christmas palm)	17.	Borassus flabelliefer (Palmyra palm)
3.	Archontophoenix alexandrae (King palm)	18.	Brahea armata (Blue hesper palm)
4.	A. cunninghamiana (Piccabean palm)	19.	Butia capitata (Wine palm)
5.	Archontophoenix myolensis (Myola palm)	20.	Butia paraguiaensis
6.	Areca catechu cv.alba	21.	Caryota mitis (Clustering fish tail palm)
7.	Areca catechu dwarf (Dwarf betel nut palm)	22.	Caryota urens (Fish tail palm)
8.	Areca catechu (Betel nut palm)	23.	Chameadorea costaricana (Pacaya palm)
9.	Areca macrocalyx (Kawiwi palm)	24.	Chamaedorea elegans (Parlour palm)
10.	Areca triandra (Triandra palm)	25.	Chamaerops humilis (European fan palm)
11.	Areca vestiaria (Langlois palm)	26.	Coccothrinax argenata (Silver thatch palm)
12.	Arenga obtusifolia (Langkap palm)	27.	Cocos nucifera (East coast tall)
13.	Arenga pinnata (Black sugar palm)	28.	Cocos nucifera (Ceylon orange)
14.	Arenga tremula (Dwarf sugar palm)	29.	Cocos nucifera dwarf (Dwarf coconut)
15.	Bismarckia nobilis (Bismarck palm)	30.	Cocos nucifera (Malayan golden yellow)

PALMS : 2

31.	Copernicia hospita (Cuban wax palm)	46.	Livistona chinensis (Chinese fan palm)
32.	Cyrtosrtachys renda (Sealing wax palm/ lipstick)	47.	Livistona rotundifolia (Foot stool palm)
33.	Dypsis decaryi (Triangle palm)	48.	Nypa frutcans (Mangrove palm)
34.	Dypsis leptocheilos (Red neck palm)	49.	Phoenix dactylifera (Date palm)
35.	Dypsis lutescens (Golden cane palm)	50.	Phoenix roebelenii(Pygmy date palm)
36.	Elaeis guineensis (African oil palm)	51.	Phoenix sylvestris (Indian date palm)
37.	Euterpe oleracea (Assai palm)	52.	Pritchardia pacifica (Fiji fan palm)
38.	Howea forsteriana	53.	Pritchardia thurstonil (Thurston palm)
39.	Hyophorbe lagenicaulis (Champagne palm)	54.	Pscudophoenix ekmanii (Cacheo palm)
40.	Hyophorbe verschaffeltii (Spindle palm)	55.	Ravenea rivularis (Majestic palm)
41.	Latania loddigesii(Blue latan palm)	56.	Rhapis excelsa (Lady palm)
42.	Latania lontaroides (Red latan palm)	57.	Rhapis humilis (Slender lady palm)
43.	Latania verschaffeltii (Yellow latan palm)	58.	Roystonea regia (Cuban royal palm)
44.	Licuala grandis(Licuala palm)	59.	Washingtonia filifera (Petticoat palm/ desert fan palm)
45.	Licuala peltata (Giant fan palm)	60.	Wodyetia bifurcata (Foxtailpalm)

Ravenala madagascariensis

Musa palm

Carpentaria palm

Arenga Englari

Trinex palm

Wodyetia bifurcata

latania lontaroides (golden)

Butia capitata

Cycad dioon

Latania lontaroides(red)

Cycas Circinalis

Ravenea rivularis

Veichia merilli golden

Nolina Recurvata

Washingtonia filifera

Hyophorbe lagenicaulis

Bambusa vulgaris vittata (Golden bamboo)

Bambusa multiplex (Hedge bamboo)

Bamboo golden

Bambusa vulgaris wamin Strita (Buddha belly variegated)

Bambusa vulgaris Back bamboo

Bambusa Bamboo grass

Bambusa ventricosa (Buddha Belly)

Bauhinia galpini

Bauhinia tomentosa

Bauhinia acuminata

Barleria cristata Candida (White)

Barleria cristata Candida (Pink)

Beloperona gutatta (Yellow)

Beloperona gutatta (Red)

Brunfelsia americana

Bougainvillea glabra

Bougainvillea thimma

Bougainvillea Dr. Rao

Bougainvillea

Bougainvillea rosevelt delight

Bougainvillea lady mary baring

Bougainvillea subra white

Bougainvillea gold capalio

Bougainvillea glabra variegated

Bougainvillea Chitra

Bougainvillea mahara Coopacta red

Buxus

Beaucarnea recurvata Nolina variegated

Beaucarnea recurvata Nolina

Cannas variegated

Adonidia merrillii Golden vitegia palm | Adonidia merrillii Green vitchia palm | Archontophoenix Alexandrac (king palm) | Archonotophoenix Cunninghamiana piccabeen palm | Archontophoenix Myolensis (myola palm) | Areca catechu cv.alba Betel nut palm

Areca catechu Dwarf betel nut palm | Areca catechu Betel nut palm | Areca macrocalyx Kawiwi palm | Areca triandra Triandra palm | Areca vestiaria Langlois palm | Arenga obtusifolia Lang kap palm

Arenga pinnata Black sugar palm | Arenga tremula Dwarf sugar palm | Bismarckia nobilis Bismarck palm | Borassus aethiopum African palmyra palm | Borassus flabellifer Palmyra palm | Brahea armata Blue hesper palm

Butia capitata Wine palm | Butia paraguayensis | Caryota mitis Clustering fish tail palm | Caryota urens Giant fish tail palm | Chamaedorea costaricana Pacaya palm | Chamaedorea elegans Parlour palm

Chamaerops humilis European fan palm | Coccothrinax argentata Silver thatch palm | Cocos nucifera Coconut (east coast tall) | Cocos nucifera Coconut (cevlon orange) | Cocos nucifera dwarf Coconut | Cocos nucifera Coconut malayan golden yellow

Michelia champaca

Plumeria rubra

Plumeria verigated

Plumeria verigated

Plumeria verigated

Plumeria verigated

Bougainvillea

Euphorbia

Exocaria bicolor

Galphimia Glauca

Golden Juniperus

Rheo Tricolor Med

Acalypha wilkesiana

Rakhi creeper

Ficus blackeana

Ficus kingbush

Ficus long i land

Ficus nerifolia

CHAPTER - 10

SHRUBS

Shrubs are usually woody or semi-woody perennial plants with branches arising from the base of the plants and growing up to heights of 1-4 meters. Most of the shrubs are hardy and grow in all types of soil.

Shrubs can be classified into three groups according to the requirement of sunlight for growth and flowering.

- Plants that show normal growth and flowering in full sun,
- Grow only in partial shade,
- Can grow well both in sunny and semi-shady conditions.

Shrubs are usually grown for their showy flowers or beautiful foliage. Pruning of plants helps to get bushy growth. The practice of clipping shrubs into ornamental shapes, known as topiary, has been in vogue for centuries. Flowering shrubs need sun light and foliage shrubs grow well under partial sunlight and shade. Location can be decided based on the height and canopy of the plant.

Tips for Planting & Maintaining of Shrubs:

- Dig pits of 8 cft (cubic feet) and loosening bottom of the pit, expose to sun for at least 2 weeks or burn the pit with leaf trash.
- Maintain 2' to 6' distance between pits, depending on the growth potential of the plant.
- Fill the pits with dug out soil; 10 kg well decomposed cattle compost or 5 Kg vermi-compost, 1Kg neem cake and ½ Kg super phosphate and 100 gms of folidol dust.
- Plant the selected shrubs or creepers, water well, stake the plant next day. Regular watering is required thereafter.
- Rune and train the shrubs and creepers for controlling plant size, shape and giving a bushy growth.
- Take up weeding and mulching in the basin on a regular basis.
- Regular care is required to protect the plants against pests and diseases.

Common Shrubs:

Drought Resistant				Water Loving			
1.	Allamanda	11.	Jasmine	1.	Dambeya	1.	Crotons
2.	Bougainvillea	12.	Justicea	2.	Gardenia	2.	Coleus
3.	Caesalpinea	13.	Lantana	3.	Murraya exotica	3.	Phyllanthus
4.	Cassias	14.	Lagerstromia	4.	Mussaenda	4.	Eranthemums
5.	Cestrum	15.	Plumeria	5.	Plumbago	5.	Acalyphas
6.	Euphorbia	16.	Tecomas	6.	Ixora	6.	Aralias
7.	Hamelia	17.	Thevetia	7.	Lemonia		
8.	Hibiscus			8.	Pentas		
9.	Holmskoildea			9.	Bottle Brush		
10.	Roses			10.	Calliandra		

FLOWERING AND FOLIAGE SHRUBS

S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
1	Achania malvaviscus	Malvaceae	Cutting	A quick growing medium-sized shrub. Produces red mavue colour half opened hibiscus-like flowers throughout the year.
2	Acalypha sanderiana	Euphorbiaceae	,,	A small shurb with dark broad green leaves. Produces drooping catkins of crimson flowers. Flowers throghout the year. Prefers shady places. A wilkesiana have copper coloured leaves.
3	Artabotrys odoratis-simus (Hara Champa)	Annoniaceae	Seed	A small evergreen hardy shrub. Produces strongly fragrant flowers of green colour turning yellow on ripening.
4	Barleria cristata	Acanthaceae	Cutting	A bushy small shrub growing up to a height of 1.5 —1.8 m. produces blue flowers almost all the year round.
5	Caesalpinin pulcher-rima (Poniciana puleherima) (Peacock flower)	Leguminoseae	Seed or layers	A medium-sized shrub growing up to a height of 2.4-3 m. Produces red and yellow flowers almost all round the year with profuse flowering during rains and summer.
6	Caryapteris masta-canthus	Verbenaceae	Cutting	A medium-sized shrub reaching up to a height of 2.4-3 m. with. dark green leaves. Produces handsome blue flowers.
7	Codiaem variegatum	Euphorbiaceae	Cutting and goote	Handsome, medium sized shrub with numerous shades of leaves. Loaves may be twisted, thin or very broad.
8	Cestrum norturnum (Rat ki Rani)	Solanaceae	Cutting	A soft wooded shrub growing 1.5 m. in height. Produces small pale green flowers. Flowers open at night and are highly fragrant. Flowers during March-April and in July-August. C. drurnem, produces white scented flowers throughout the year.
9	Euphorbia pulcher- rims (Poinsettia)	Euphorbiaceae	Cutting	A tall shrub reaching up to a height of 2.4-3.0 m. Produces light yellow or yellow flowers on the terminals. Flowers throughout the year.
10	Duranta repens	Verbanaceae	Seed or Cutting	A small thorny shrub with light yellow leaves. Bears blue or white flowers in clusters during rains. The berries are also very attractive, makes an effec-tive hedge variety with varie-gated leaves look more pretty.

S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
11	Gardenia florida	Rubiaceae	Air-layering Cutting	A tall evergreen shrub with shining green leaves. Produces white highly fragrant flowers during summers and rains.
12	Gossypiun spp.	Malvaceae	Cutting	Produces white flowers during rains.
13	Hamiltonia-suaveo-lens	Rubiaceae	,,	A medium-sized shrub with coarse leaves. Produces sweet scented white or blue tinged flowers during winter months. Responds well to pruning.
14	Hamelia patens	,,	,,	A strong bushy shrub attaining a height of 3.0-4.5 m with attractive foliage of small green and greenish bronze leaves. Produces orange yellow tubuler flowers during winters. Good as an ornamental hedge.
15	Hibiscus mutabilis	Malvaceae	,,	A large deciduous shrub of 3-4.5m height with large leaves. Pro-duces large handsome double flowers of white, pink and yellow shades during September—October.
16	Hibiscus rosa-sinensis	Malvaceae	Cutting	Flower are single or double and appear throughout the year. Colour ranges from deep red, bright red, white red with white strips.
17	Hibiscus syriacus	Malvaceae	Cutting	White or purple blue flowers white single or double forms.
18	Ixora rosea (Rukmini)	Rubiaceae	Layering	A medium-sized shrub with handsome foliage. Produces pink fragrant flowers during March-April. I. lutea produces yellow flowers of large size.
19	Lxora coccinea	Rubiaceae	Layering	A medium shrub with handsome foliage. Produces abundant bright red flowers during rains.
20	Jasminum humile (Yellow Jasmine)	Oleaceae	Cutting	A dwarf shrub reaching up to a height of 1.5-1.8 m. Produces bright yellow flowers in April--June.
21	Jasminum sambac (Mogra Bela)	,,	,,	A dwraf spreading shrub growing up to 0.9-1.2 m height Bears creamy white flowers during May to August which are sweet scented.
22	Jasminum satnbac (var. Motia Bela)	,,	,,	A dwarf spreading shrub reaching to a height 0.6 0.9 m. Bears pure white highly fragrant flowers in May to August. The flowers opens loosely and look like a star in shape.

S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
23	Lagerstroetnia app (Sanwani)	Lytharaceac	,,	A medium-sized deciduous shrub. Bears flowers of pink, mauve and white colour during May to August. Responds well to pruning.
24	Murraya exotica (Kamni)	Rutaceae	Seed	A medium-sized, evergreen shrub with glossy green pinnate leaves. Produces sweet scented white flowers during May — August. Makes an excellent shrub and hedge.
25	Nerium indicum	Apocynaceae	Cutting	A tall, evergreen shrub reaching a height of 3.0-4.5 m. Bears white pink flowers in single double during May— November. Well suited for dry localities. Scented flowers appear on top of branches.
26	Russelia equisetifolia	Scrophulariaeae	,,	A dwarf, spreading, evergreen and graceful shrub. Produces bright red flowers. Well suited for rockeries and for hanging baskets R. coccinea produces red or scarlet flower. Plant is erect and leaves are small.
27	Stachytrpheta rosea	Verbenaceae	Cutting	A medium-sized, soft wooded shrub. Produces spikes of rose red colour flowers almost throughout the year.
28	Tecoma stans (Yellow elder)	Bignoniaceae	Seed	A tall, erect, globrous shrub growing up to a height of 3— 4 5 m. Produces flowers of yellow colour in panicles during rains and summers. Well suited for dry localities, can be used as a hedge
29	Tabernaemontana divaricata (Chandni)	Apocynaceae	Cutting	An evergreen, hardy shrub with glossy foliage. Produces pure white scented single cr double flow ers during summers and rains.
30	Thevetia neriifollia	,,	Cutting or Seed	A tall, evergreen shrub attaining a height of 3-3 6 m. Produces yellow white and bronze funnel-shaped flowers all the year round.
31	Thanbergia ereeta	Acanthaceae	Cutting	Dwarf, hard shrub produces blue funnel shaped flower all the year round.

Plumeria acuminata Grove farm

Plumeria acuminata Hon kong

Plumeria acuminata Incarnation

Plumeria acuminata India

Plumeria acuminata India

Plumeria acuminata Kane sun burst

Plumeria acuminata Kaiulaia

Plumeria acuminata Kaneeohe

Plumeria acuminata Kaneo ho sunrise

Plumeria acuminata Keywest-elizabeth

Plumeria acuminata Kona hybrid

Plumeria acuminata Keywest red

Plumeria acuminata Lisa marie

Plumeria acuminata Madam pon

Plumeria acuminata Madison white

Plumeria acuminata Mary susan

Plumeria acuminata Miami rose

Plumeria acuminata Mori

Plumeria acuminata Nebel gold

Plumeria acuminata Petersons gold

Plumeria acuminata Plastic pink

Plumeria acuminata Pink pansy

Plumeria acuminata Powder pink

Plumeria acuminata Puu kahea

Plumeria acuminata Rin wheel

Plumeria acuminata Ruby le

Plumeria acuminata Samoan fluff

Plumeria acuminata Singapore plumeria

Plumeria acuminata Tangerine

Plumeria acuminata Temple tree/Frangi pani

Heliconia Mathiasae

Heliconia Caribaea Bihai

Heliconia Carubaea Purpurea

Heliconia Pedro Ortez

Eltingera Elatior

Heliconia Bihai Lobster Claw

Heliconia Indica Spectabilis Var Rubra

Alpinia Pink

Heliconia Strkta Firebird

Heliconia Orthotricua

Heliconia Orthotricua Tricolor

Heliconia Orthotricha

Etlingera Elatior (White)

Torch Ginger (Red)

Torch Ginger (Pink)

Torch Ginger Rose

Water Lily

Water Lily

Water Lily

Bulrush

Quisqualis Indica Double

Passiflora Incarnata Hybrid

Passiflora Vitifoloa

Pyrostegia Venusta

Stictocardia Macalusoi

Ipomoea Horsfalliae

Ipomoea Morning Glory Indica

Ipomoea Wood Rose

Thunbergia Grandiflora

Thunbergia Mysorensis

Petrea Volubilis

Strophanthus Gratus

Bougainvillea

Bougainvillea

Bougainvillea

Bougainvillea

Annuals

Annuals

Annuals

Annuals

Duranta

Duranta

Erythrina Variegata

Nerium Oleander

Mussaenda

Bauhinea Galpini

Buxus

Crinum Black

Agave

Agave

Cryptanthus

Cryptanthus

Agave

Agave

Agave

Agave

Sansevieria

Sansevieria

Sansevieria

Echinocactus Gursonii

Juniperus (New Variety)

Juniperus

Juniperus

Juniperus

Phalaris Arundinaria Variegata

Pennisetum

Hypoestes

Chlorophytum

Ananas

Manihot Esculenta

Jatropha Varigated Inteferrima

Jatropha Hybrid Inteferrima

Clivia Miniata

Pandanas Baptistii

Asparagus Meyrii

Gardenia Jasminoides

Rhododendvon Azalea

Desmodium Pulchellum

Dillenia Suffruticosa

Combretum Constrictum

Codiaeum

Codiaeum

Codiaeum

Codiaeum

Codiaeum

Codiaeum

Adenium

Dracaena Angustifolia

Arundingacea

Calathea - Majestila
Rosea - Lineata

Calathea - Majestila
Uaralbo - Lineata

Stromanthe Sanguinea
Varigated

Zingiber Zerumbet

Alpinia Zerumbet

Calathea Zebrina

Calathea Makoyana

Anthurium

Aralia

Aralia

Nandina Domestica

Asplenium

Asplenium

Pteris Cretica

Platycerium

Nephrolepis

Nephrolepis

Nephrolepis

Nephrolepis

Nephrolepis

Nephrolepis

Nephrolepis

Nephrolepis

Nephrolepis

Nephrolepis

Adiantum

Adiantum

Dracaena

Dracaena

Dracaena

Dracaena

Aglaonema

Aglaonema

Aglaonema

Aglaonema

Dieffenbachia

Dieffenbachia

Dieffenbachia

Dieffenbachia

Aglaonema

Cordyline

Cordyline

Cordyline

Spahtiphyllum

Spahtiphyllum

Aphelandra

Alocasia

Philodendron

Philodendron

Philodendron

Philodendron

Plumeria Rubra

Plumeria Hanging

Plumeria Singapore White

Heliconea

Veitchia Merrilli

Bauhinea Variegated

Amarylis Variegated

Coccoloba Uvifera

Cryptostegia Grandiflora

Alpinea (Pink Ginger)

Ornamental Banana Variegated

Agave Variegated

Caronda Carambola

Elaeocarpus Angustifolia

Cordea Lutea

Spathoglottis Chameleon

Bombax Ellypticum

Passiflora

Ficus Topiary

Melleleuca Topiary

Bougainvillea

Bougainvillea

Bougainvillea

Bougainvillea

Bauhinea Blackeana

Alocasia Blackmagic

Cletoria

Spathyphylum Sensation

Allamanda Peach

Anthurium Veitchii

Anthurium

Staghorn Fern

Pandanus

Mandevilla Bolivienensis

Collevillea Racemosa

Scheffelera

Cordia Sabastena

Triplaris Surinamensis

Acocanthera Oblongifolia

Oncoba Spinosa

Haemanthus Multiflorus

Adansonia Perrieri

Dioon Edule

Mucuna Benetti (Jadevine Red)

Michelia Champaca

Datura Arborea

Ornamental Chinese Orange

Codiaeum

Gardenia Dwarf

Combratum

Combretum Constrictum

Filicium Decipiens

Solanum Macaranthum

Barringtonea

Scheffelera Haicolour

Ochna Kirkii (Tom & Jerry Plant)

Water Lily

Water Lily

Water Lily

Water Lily

CHAPTER - 11

HEDGES & EDGES

Plants grown in series in straight line or a smooth wave to serve as a barrier or screen are termed as hedges. They provide a natural background to a garden, like a frame to a picture which maybe external or internal. An external hedge is tall and may replace the compound wall. It also serves as a protection against wind. It may be 1.5 to 2.5 meters (5 to 9 feet) height. The internal hedge separates different parts of the garden and is not so tall. It may vary from 30 to 90 cm (1to 3 feet). Hedges may be of deciduous or evergreen plants. They may be flowering or non flowering plants. Hedges are generally created with fast growing plants so as to get the effect immediately as screen, or wind-break. They have a capacity to grow tall and are evergreen.

Essentials of a good hedge:

It needs to be thick and dense; it should have evergreen foliage from bottom to top; it should withstand regular pruning and be trim and neat. If it is a flowering hedge its bloom should not clash with the colour scheme.

Hedges are used for concealing unwanted and ugly locations or as a back ground to lawns, flower beds etc and for providing privacy. Edges are used as demarcating lines to lawns, flower beds, pathways etc. and low height is maintained with regular pruning with shears.

Tips for Laying Hedges and Edges:

1. Dig trenches of 1’ width and 1’ depth. Loosen the bottom of trench and expose to sun for about 15 days.
2. Fill the trench w it dug out soil if it is good or red soil. Mixed with 25 kg compost or 10 kg vermi-compost, 2.5 kg Neem cake and 1 kg Super Phosphate per 10’ length of the trench; 25 Gms of folidol dust., and water the filled trench for settling.
3. Plant rooted cuttings of the selected plant material at 4” - 6” gap and water. During rainy season with high humidity, uprooted cuttings can also be planted, at close range of 2”-3” spacing in two rows.
4. Water well thereafter.
5. First shearing should be done at 9” - 1’ height for edges and at 1’ - 1’.6” height for hedges to get bushy growth right from ground level. Further shearing at regular intervals to maintain desired height, shape and compactness. Shearing can be done for maintaining desired shapes.
6. Manure once in six months or whenever growth and vigour retards at the base of the trench and regular mulching also needs to be undertaken

Ornamental Hedges /Edges:

S. No.	Name	Planting Distance (cm)	Stands Pruning	S. No.	Name	Planting Distance (cm)	Stands Pruning
1.	Aclypha sp.	30-45	Poor	9.	Lantana sp.	30-45	Well
2.	Bougainvillea sp.	90-120	Well	10.	Murraya exotica	45-60	Well
3.	Cuphea	15-20	Poor	11.	Mynea erecta	15-45	Well
4.	Duranta sp.	30-45	Well	12.	Pedilanthus	15-20	Well
5.	Konocarpus	30-45	Well	13.	Ashoka pendula	90-100	Well
6.	Hemelia Patens	30-45	Well	14.	Tecoma stans	60-90	Poor
7.	Clerodendron inerme	15-20	Well	15.	Phyllanthus	30-45	Poor
8.	Justicia sp.	20-30	Well	16.	Crasulla (Jade)	20-30	Well

Protective Hedges:

1.	Carissa Carandas (Karonda)	20-60	Light
2.	Inga dulcis	90-100	Well
3.	Lawsonia inermi (Mehendi)	45-60	Well
4.	Parkinsonia aculiata	90-100	Light

A-ORNAMENTAL HEDGES

S. No.	English and Common Name	Botanical name and Natural order	Planting distance (cm)	Method of propagation	Description
1	Acalypha	Aclypha sunderiana Emphorbiaceae	30-45	Cutting	Makes a good hedge because of attractive coloured leaves ; can be trained up to a height of 0 9-1.2 m. Does not stand trimming well and is susceptible to low temperature.
2	Bougainvillea	Bougainvillea spp. Nyctaginaceae	90-120	Cutting air & ground layering	Most of the varieties make an effective beautiful and hardy hedge, produces pretty flowers almost all the year round. Stands trimming well. Can be trained up to a height of 0 9-1.2 m.

S. No.	English and Common Name	Botanical name and Natural order	Planting distance (cm)	Method of propagation	Description
3	Cupressus	Cupressus macro carpa	30-45	Seed Cutting	Makes an excellents, evergreen dense hedge. Stands triming well. Does better in cool area.
4	Duranta	Duranata plumeri Rubiaceae	30-45	Cutting and Seed	Beautiful, effective and hardy hedge. Stands trimming well. Variety with variegated leaves is better.
5	Hamelia	Hamelia patens Rubiaceae	30-45	Cutting	Makes a good attractive hedge with coloured foliage. Stands trimming well. Can be trained up to a height of 1 2-1.8 m.
6	Hibiscus	Hibiscus rosasinensis Malvaceae	30-45	Cutting	Makes an excellent hedge, stands trimming well. Can be trained to a height of 0 9-1 2 m. Produces attractive tubular flowers almost throughout the year.
7	Justicia	Justicia grandus Acanthaceae	22.5-30	Cutting	Makes dwarf hedge. Stands trimming well. Can be trained up to a height of 0 3-0 6 m
8	Lantana	Lantana spp. Verbenaceae	30-45	Cutting	Several varieties of Lantana make vigorus hardy and drought resistant hedge Produces flowers of different hue. Stands trimming well. Should not be planted close to residence.
9	Dadonia	Dadonia viscosa	22-30	Cutting and Seed	A quick-growing and ornamental hedge. Stands clipping well. Requires attention during summers.
10	Murraya (Kamni)	Murraya exotica Rutaceae	45-60	Seed	Makes a pretty hedge, because of its deep green compound leaves. Produces white highly fragrant flowers during July—Aug. and Feb.—March. Stands trimming very well.
11	Mayenia	Meyenia erecta Acanthaceae	15-45	Cutting	Makes pretty dwarf hedge. Produces beautiful purple flowers. Can be trained to a height of 0.6-0.9 m.

S. No.	English and Common Name	Botanical name and Natural order	Planting distance (cm)	Method of propagation	Description
12	Ashok	Polyalthia longifolia Anonaceae	90-100	Seed	Makes an effective hedges when properly trained and trimmed. The foliage is very attractive.
13	Surinam Cherry	Eugenia uniflora Myrtaceae	60-90	,,	Makes a hardy, beautiful and effective hedge. Red berries look very attractive. Fruits can be utilized for making jam and jelly. Can be trained to a height of 1.2-1.5 m. Does not require much irrigation or trimming.
14	Jaint	S sbenia sesban Leguminoceae	22.5-30	,,	A quick-growing and short-lived hedge Stands trimming well. Produces yellow flowers during rains and summers.
15	Mehndi	Lawsonia inermis Lythraceae	30-45	Seed and Cutting	A slow-growing drought resistant and effective hedge. Stands trimming very well. Can be trained to a height of 1.2-1 5 m.
16	Tecoma	Tecoma stans Bignoniaceae	60-90	Seed	Makes an ornamental hedge. Produces bright yellow flowers almost throughout the year. Does not stand trimming well. Can be trained to a height of 1.2-1.5 m.
17	Chandnee (Single)	Tabernaemontana coronaria Apocynaceae	60-90	Cutting	A fairly quick growing beautiful hedge Produces white flowers in abundance. Foliage very shiny. Stands trimming nicely. Can be trained to a height of 0.9-1.2 m.
B-PROTECTIVE HEDGES					
1	Karounda	Carissa carandas Apocynaceae	120-150	Seed	It is slow growing, drought resistant plant. It makes a very effective hedge due to long thorns. Light annual pruning is needed. Fruits make excellent jam and jelly.

S. No.	English and Common Name	Botanical name and Natural order	Planting distance (cm)	Method of propagation	Description
2	Natal plum	Carissa grandiflora Apocynaceae	60-90	Seed and gootee	A low, slow growing and drought resistant plant. Follage deep green. Produces fine white flowers almost through-out the year. Closely planted, hedge is almost impenetrable. Fruit can be utilized for making jam and jelley. Can be trained up to a height of 0.6-0.9 m.
3	Jangali karounda	Carissa bispinosa Apocynaceae	120-150	Seed	A tall, vigorous, thorny and drought resistant plant. Makes a dense and compact hedge. It makes a better hedge than Karounda. Well cared plants make almost an impenetrable fence, because of big stout thorns. Fruits can be utilized for making jam, jelly and refreshing drinks.
4	Karna Khatta	Citrus karna Rutaceae	60-90	Seed	A useful plant for hedge purposes Single row planting makes a very effective hedge. Can be trained to a height of 1.2-1.5 m.
5	Turanj	C. medica Rutaceae	90-100	Seed and cutting	Same as above.
6	Madras Thorn	Inga dulcis Leguminosae	60-90	Seed	Makes a beautiful and effective hedge when planted in double row. Stands trimming well. Can be trained to a height of 0.9-1.2 m.
7	Parkensonia	Parkensonia aculata	60-90	Seed	A quick-growing effective drought resistant hedge plant. Effective up to a height of 1 2-1.5 m. Double row planting is much more effective.

CHAPTER - 12

GROUND COVERS

Plants which are used to cover the soil surface as an alternative to lawns are termed as ground covers. They help in preventing dust pollution and to add colour through flowers or foliage. They also check soil erosion.

They enhance the aesthetic appearance of any garden. They can be classified into three groups according to the requirement of sunlight for growth and flowering.

- Plants that show normal growth and flower in full sun
- Grow only in partial shade
- Grow well in full sun and semi shade conditions.

Groundcovers are useful in the garden for covering bare patches of soil beneath trees or shrubs or for covering steep banks where access is difficult. Their roots also help to stabilize soilon steep slopes and check erosion. Ground cover plants brighten up otherwise dull areas and will suppress weeds, making them ideal for a low-maintenance garden.

Groundcovers:

S. No.	Plant Name	S. No.	Plant Name	S. No.	Plant Name
1.	Alternanthera sp.	11.	Verbina	21.	Impatiens linearifolia
2.	Asystasia gangetica	12.	Wede lia trilobata	22.	Liriope muscari variegate
3.	Senecio confucious	13.	Aspidistra elatior	23.	Liriope platyphylla
4.	Zebrina pendula	14.	Begonia semperflorens	24.	Liriope platyphylla
5.	Ruellia sp.	15.	Callisia Repens	25.	Dianella tasmanica
6.	Syngonium sp.	16.	Chlorophytum sp.	26.	Aptenia caudifolia
7.	Rhoeo spathacea vittata	17.	Pelargonium hortorum	27.	Scindapsis sp.
8.	Lantana sellowiana	18.	Euonymus japonicas	28.	Sansiveras
9.	Pilea sp.	19.	Hedera cana riensis	29.	Setcreasea
10.	Portulaca	20.	Hemigraphis colarata	30.	Spathyphyllum

CHAPTER - 13

CLIMBERS

Plants which have special structures to climb on supports are defined as climbers. These special structures may be tendrils, modified leaf stalks, rootlets or hook like thorns. The name rambler is usually used for climbing forms of roses which produce clusters of flowers.

Climbers can be trained on arches, pergolas, walls, trees and on pandals. Climbers can be used for screening even in narrow spaces over grills and wire meshes.

Tips for Planting & Maintaining of Climbers

1. Dig pits of 8 cft (cubic feet) and loosening bottom of the pit, expose to sun for at least 2 weeks or burn the pit with leaf trash.
2. Maintain 4' to 6' between pits.
3. Fill the pits with dug out soil, 10 kg well decomposed cattle compost or 5 Kg vermi-compost, 1Kg neem cake and ½ kg super phosphate and 100 gms of folidol dust.
4. Plant the selected climber, water well, stake the plant next day. Regularly water thereafter.
5. Prune and train the climbers for controlling plant size, shape and giving a bushy growth.
6. Take up weeding and mulching in the basin on a regular basis.
7. Regular care is required to protect the plants against the pests and diseases.

Common Climbers:

S. No.	Name	Common Name	Flower colour	Flowering season	Type	Propagation
1.	Agamosma caryophyllata	Maiati lata	White	Rainy	H	C
2.	Allamanda cathartica	.....	Yellow	AYR	L	CL
3.	Antigonan leptopus	.....	Rosy	AYR	L	S
4.	Aristolochia grandiflora	Birth wart	Purple	Summer, Rainy	L	CL
5.	Beaumonta purpuria	Nepal Trumpet	White	Winter	H	CL
6.	Bougainvilles sp.	.....	Multi	Summer	H	CL
7.	Bignonia purpuria	.....	Purple		L	L
8.	Bignonia venusta	Golden Shower	Orange		L	L
9.	Cleorodendron splendence	.....	Scarlet	Winter	L	C,S
10.	Ficus repens	Wall creeper	...	....	L	C,L
11.	Areca vestiaria (Langlois palm)	Madhavi Lily	Yellow	Winter	L	S,L
12.	Ipomea horsfolliae	.....	Crimson	Winter	H	G,L
13.	Jacquemontia	.....	Blue	AYR	L	C,L
14.	Jasminum SP.	Motia	White	Summer	L	C,L

Climber

S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
1	Allamanda cathartica var. grandiflora	Apocynaceae	Ground Layering	A climbing plant with bright green leaves grandiflora Layering leaves. Produces big showy yellow flowers from June—Nov. A violacea produces violet-purple flowers.
2	Antigonon alba	Polygonaceae	Seed	A quick growing climber. Pro-duces lovely spray of white flowers during rains and in winter. A. leptopus bears flowers of rose colour.
3	Asparagas plumosus	Liliaceae	,,	A highly ornamental evergreen dwarf climber. The foliage finely divided. Prefers shady places. A, spengri is a dwarf climber with white fragrant flowers.
4	Adenocalymma alliaceum	Bignoniaceae	Ground Layering	Produces pale mavue flowers in large clusters all the year round.
5	Banisteria laurifolia	Malpighiaceae	Ground Layering	A strong extensive climber with dark olive colourd leaves. Bears abund-ance of bright golden yellow flowers from December to March.
6	Bign nia venusta (Pyrostegiavenusta)	Bignoniaceae	,,	A quick growing evergreen creeper. Produces in abundance rich yellow tubular flowers from December to March.
7	Bignonia gracilis	,,	,,	A slender, creeper with pretty yellow flowers. Flowers are seen from Nov. till March
8	Bougainvillia spp.	Nyctaginaceae	Ground and air Layering	Bougainvillas are the most colourful garden plants. They are vigorous growing heavy creepers. Cultivated for showing brightly coloured bracts. Can be trained as standard, hedge and pergola. The important spp. are the following. Budding is possible.
9	B. Spectabilis	Nyctaginaceae	Ground and air Layering & Cutting	A quick-growing creeper. Bears rosy purple colour bracts from Jan. to March.
10	B. Mahatma Gandhi	,,	,,	Bears pink and purple bracts.
11	B. Louis Wathen	,,	,,	Bracts bright orange turning pinkish on maturity.
12	B. Mrs. Butt	,,	,,	A free bloomer with deep crimson bracts.
13	B. Mary Palmer	,,	,,	Rose pink and white bracts are borne on the same branch.

S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
14	B. Sannet	,,	,,	Bright rosy purple bracts. Plant makes a compact growth.
15	B. Magnifica	,,	,,	Produces bright large mauve Colour bracts.
16	B. Snow queen	,,	,,	A beautiful variety bearing white bracts green veins.
17	B. Thima	,,	,,	Similar to Mary Palmer except the leaves are varigated.
18	B. Shubhra	,,	,,	Produces white large bracts on the terminals.
19	Clerodendron splendens	Verbenaceae	Layering	A dwarf evergreen creeper with dark green foliage. Bears profuse beautiful flowers from Dec.-Feb. of vermilion colour.
20	Ficus ripens	Urticaceae	Cutting	A creeping species of fig foliage. Evergreen, without much branching.
21	Ipomea pulchella	Convolvulaceae	Seed	A quick growing, evergreen ex-tensive green creeper. Bears purple flowers during winters.
22	Jasminum grandifloram	Oleaceae	Layering	A small evergreen climber with bright green leaves. Produces pure white star-shaped frag-rant flowers during summer months.
23	Lonicera japonica	Caprifoliaceae	,,	A rambling evergreen creeper. Bears white fragrant flowers which turn yellow later.
24	Porana paniculata	Convolvulaceae	,,	A strong evergreen creeper. Pro-duces very small white flowers in great abundance during October—November.
25	Quisqualis indica (Rangoon creeper)	Combretaceae	,,	A strong, evergreen, bushy, climber. Produces shining scarlet and white flowers in abundance throughout the year. Suitable for training on buildings and walls.
26	Tecoma grandi flora	Bignoniaceae	,,	A strong woody creeper. Bears orange coloured flowers in abundance almost throughout the year.
27	Thubergia grandifiora	Acanthaceae	,,	A strong evergreen extensive clim-ber. Bears large bell-shaped blue coloured flowers from October till December.
28	Jacquemontia pen antha	Convolvulaceae	,,	Produces bell- shaped flower of ultramarine blue colour all year the round.
29	Passiflora recemosa (Passion flower)	Passiflorae	,,	Large flowers with whitish green sepals during winter.

Allamanda cathartica Hendersonii

Allamanda cathartica violacea

Allamanda cathartica Williamsii

Allamanda cathartica

Anemopaegma chamberlaynii

Aritigonon Leptopus Alba

Antigonon leptopus

Aristolochia elegans

Arrabidaea magnifica

Beaumontia grandiflora

Campsis grandiflora

Campsis radicans

Clematis flammula

Clematis gouriana

Clerodendrum splendens

Clerodendrum thomsonac

Clitoria ternatea

Clytostoma purpureum

Combretum coccineum

Cryptostegia grandiflora India rubber vine

Echites caryophyllata

Ficus pumila (wall creeper) variegata

Ficus pumila (wall creeper)

Ipomoea horsfalliae

Ipomoea learri

Ipomoea pes-caprae

Jacquemontia violacea

Jasminum angustifolium

Jasminum auriculatum

Jasminum nitidum

Jasminum sessiliflorum

Lonicera japonica
Japanese honey suckle

Lonicera sempervirens
Trumpet honey suckle

Odontadenia grandiflora

Pandorea jasminoides

Passiflora violacea
Purple passion flower

Passiflora caerulea
Blue passion flower

Passiflora coccinea
Red passion flower

Passiflora decaisneana

Petrea volubilis
purple wreath

Phaedranthus buccinatorius
Splendent flower

Podranca ricasoliana

Pseudocalymma alliace Garlic vine

Pyrostegia venusta
Golden shower

Quamoclit coccinea
Star ipomoea

Quamoclit pinnata
Cypress vine

Quisqualis densiflora

Quisqualis indica
double Ragoon climber

Quisqualis indica
Ragoon climber

Senecio confusus
Mexican daisy

Stephanotis floribunda

Stigmaphyllon periplocifolium

Thunbergia alata

Thunbergia grandiflora

Thunbergia mysorensis

Trachelospermum jasminoides

Vallaris heynei

Tristellateia australasiae

Vernonia elaeagnifolia

Wisteria sinensis

CHAPTER - 14

ROSES

I. Introduction

The rose has been loved and cherished from very ancient times. In modern age, its importance bas become still greater because rose breeders have been increasing its range of colours while at the same time adding valuable characters like disease resistance and a longer period of flowering. It is a versatile plant and the fantastically large number of types available is one of the reasons for its great popularity. There are now roses for every purpose and even the person with only a tiny plot of land will find there are varieties available to him which will provide a welcome splash of colour to a wall or furnish quantities of exquisite cut flowers. Now-a-days, roses are grown throughout the country and perhaps no flower is more loved in India. The rose is valued for purposes of worship and for making garlands in our country. Recently the Rose Society of India has laid out a beautiful National Rose Garden in New Delhi.

II. Climate

The climatic conditions of India are well suited to rose cultivation. Roses need bright sunshine and free ventilation. Sunshine for six hours is ideal for better growth and flowering.

In the northern plains, roses flower best during winter whereas in the temperate hilly regions of the Himalayas in summer. Western part of India have excellent agro-climatic conditions for rose growing. The plams of eastern India are suitable for the cultivation of many rose cultivars. Banglore has mild climate Where roses can be grown for flowers throughout the year.

III. Soil

Although any soil is good for rose cultivation provided it has proper drainage, the ideal soil should be medium loam having sufficient organic matter, pH of 6.0 -7.5. The land where the external drainage is poor and water stagnates during monsoon should not be selected for rose growing. In very heavy soils, gravel and sand may be mixed into the bed to allow drainage. The land with high water table is not suitable for rose beds.

IV. Layout of Beds

The plan of rose garden and design of the beds should be simple and informal. Rose beds may be of various design, depending upon the liking of the grower. However, rectangular beds are advantageous for maintenance. The width of the beds should be such that operations like weeding, hoeing, forking, cutting of flowers etc, can be done from both the sides of the bed, without stepping into the bed. A plot size of 6.0 x 1.2m or 6.0 x1.65m is suggested for better management of rose plants. The length can be increased to a limited extent depending upon the specific situations.

V. Growth and Flowering

Factors like genetic or inherent factors, climatic or environmental factors such as light, temperature, moisture, aeration and managemental factors like nutrition and soil conditions influence growth and flowering.

A. Genetic factors

Like other plants, growth and flowering behaviour of roses is governed by genetic factors. The range of variability in roses is very great. There are tall cultivars growing several metres high and are suitable for planting in backdrop and as hedges. On the other hand, miniature roses with dwarf habit and producing small flowers are also available. Several cultivars are bushy in nature while many are climbers and ramblers. A wide choice of cultivars with long sturdy stems having nice flower forms suitable for cut-flowers are also available today. Similarly, there are cultivars blooming in different periods and producing varied yield and quality of flowers. Some possess high quality perfume.

B. Environmental factors

Along with genetic factors, environmental factors play an important role on growth and flowering.

1. Light

Light is one of the most important factors influencing the growth and flowering of roses. This may vary with intensity, duration and quality o f light. The total plant weight may be reduced by the decrease in light intensity, and 'the number of flowers produced increases with increased radiation.

Plants growing under shade produce thinner leaves with low chlorophyll content However, because of high light intensity and the consistent rise in temperature, summer grower apply a light shading material on the roof of the glasshouse. Colour of rose flowers is also influenced by the high intensity of light The influence of duration of light is most marked and spectacular on growth and in inducing or suppressing flowering.

2. Temperature

Temperature affects the quantity and quality of the plant and the flower. At a night temperature of 15.5°C the quality and quantity of roses produced are considered to be satisfactory. Low temperature also brings about the development of pigment in the leaves stems or flowers. The stem and flower buds needs an exposure to cool temperature for their expansion. Winter chilling is necessary for flower bud formation.

3. Humidity

Humidity plays an important role in the incidence of pests and diseases affecting the growth and flowering. Certain disease like mildew's are associated with high relative humidity. Its importance, however, lies in the internal water conditions of the plants. By maintaining reasonably high humidity, the internal deficiency of water will be less. Enlargement of cells is caused by water and, therefore, we should the loss of water from the plants so that leaves and flowers would be larger and stems longer.

4. Aeration

Proper soil aeration and an exchange of air in green house are also desirable for the normal growth and development. Compact soils have restricted aeration which impede the activity of roots affecting the plant growth. Air circulation ensures an adequate supply of carbondioxide and oxygen for physiological processes occurring in the plant and also reduces the relative humidity which may cause serious infections. Carbon dioxide is an important factor in photosynthesis in increasing the stem length and dry matter.

C. Plant management practices

Pruning, pinching, disbudding, deshooting, defoliation and deflowering are the plant management practices done for rose cultivation.

1. Pruning

Pruning is an important operation regulating the growth and flowering of roses. Pruning

in roses is explained in detail the cultivation section. Following are some other plant management practices which influence the vegetative growth and production of flowers.

2. Pinching

Removal of a part of terminal growing portion of stem is called pinching. It reduces the plant height but promotes auxiliary branching and also prevents maturity of flower bud.

3. Disbudding

Removal of undesirable buds is known as disbudding. Keeping only the central bud and removal of others cause development of a quality bloom.

4. Deshooting

Deshooting is generally followed in Hybrid Tea roses. Young vegetative shoots developing from the axils of leaves of basal and lateral shoots are removed to allow only one terminal shoot. In several rose cultivars such side shoots develop from the eyes down the stem below the terminal flower bud. If these shoots are not inched off at the initial stage, plants become much branched and produce a number of small flowers.

5. Defoliation

Although defoliated plants produced about twice as many shoots as un-defoliated, many of them are blind and the total number of flowers is less. Complete defoliation causes atrophy of almost all flower buds. Removal of only mixture leaves causes about 50% blindness. Removal of only young leaves, however does not cause blindness.

Leaf removal on dormant shoots results in the production of short and nonflowering shoots. Removal of the upper most leaf at the time of pinching results in highly significant increase in flower production. Leaf removal from semi mature shoots is more effective on flower production than from young shoots. Flower quality, is also not reduced by this practice.

6. Deflowering

Removal of faded flowers is called deflowering. If the spent blooms are not removed in time, there is a chance of developing fruit bearing seeds. Once the hips are formed and reach the advance stage of development, growth and flowering are severely reduced during the season. Cutting of faded flowers forces strong laterals which produces a good quality flower.

VI. Propagation

Among propagation methods, budding is most popular in our country because it produces better quality flowers and faster growth of plants. Other methods like, seed propagation, layering, grafting are also important. For more details on budding and grafting refer booklet No.6, “Propagation of Fruit Trees”.

1. Budding

Budding is the most popular and successful method for multiplying roses. It provides larger number of plants than cuttings, layering or grafting, as a single shoot of the desired scion furnishes a number of buds for budding. Shield or T- budding is the method ordinarily used. On the selected rootstocks, the buds are inserted into a T-shaped incision and then tied with suitable wrapping material. It takes 3-4 weeks for the buds to unite. The side branches of the stocks are removed which compete with the scion for supply of nutrients and water.

2. Grafting

Inarching or grafting is another method of propagating roses but the cost of a grafted plant In the long run may be higher than that of budded plant. The rootstocks are raised in small pots or polythene bags. The scions are selected and the stocks are brought near the selected scion shoots. The scion shoot should be of medium texture, free from pests and diseases and 1-3 eyes in length. Larger

scions are not recommended. A strip of bark, about 3 cm long with a part of wood, is removed from the stock as well as from the scion, and the latter is attached properly on to the stock and wrapped. After union1he scion shoot is cut below the graft and the rootstock above the graft union.

3. Layering

This type of vegetative propagation is usually practiced in climbing and rambling roses during the monsoon or early spring season. Layered plants thrive and bloom quite well as budded or grafted plants. This method has two types, ground layering and air layering.

a. Ground layering

It is performed by bending shoots to the ground and covering it with soil, leaving the terminal end exposed. A wooden peg or stone and a bamboo stick can be used to hold the bent shoot and exposed shoot in their position. Rooting at nodes usually takes place in a month or so and the layered shoot is detached 15-2G days after root formation.

b. Air layering

It consists of removing a ring of bark, about 2.5 cm long, from around the shoot to be rooted and covering it with a rooting medium. The use of damp sphagnum moss around the ringed portion and covering with polythene film have been found beneficial. Application of some root promoting substances may further improve the root formation in air layers.

4. Cutting

Propagation of roses by cuttings is normally done to raise stocks for grafting or budding. Climber, Rambler. Polyantha and Miniature roses respond quite well to this method. Although cuttings are almost always prepared from shoots, root cuttings have also been found to form shoots and ultimately a new plant.

a. Root-cutting

Some rose species like *Rosa blanda, R. nitida* and *R. virginiana* can be propagated by root-cuttings. The cuttings should be taken from young and healthy plants and it is important to maintain polarity when planting. The proximal end (nearest to the crown of the plant) of root piece should always be up. The cuttings should be inserted vertically with the uppermost level of the rooting media.

b. Stem-cutting

Raising plants by stem-cuttings is one of the least expensive and easiest method of rose multiplication. Usually, stem cuttings give satisfactory results when rooted during the period from late June to November. Cuttings should normally be taken during the monsoon or spring. Each shoot should be cut clean just below the node and lower leaves removed.

Sand is the best rooting medium but vermiculite or perlite also gives satisfactory results. Addition of peat moss to the sand in proper proportions is useful as it increases the water-holding capacity of the medium. In case of Miniature roses, a mixture of perlite and peat moss in the ratio of 1 : 1 is good for rooting of cuttings. The cuttings are usually planted 3 cm apart in a row and 8 cm between rows and watered as per the need. Within a month or so, roots and shoots will develop from the cutting and in about a fortnight, the plants may be transplanted in another well prepared bed or in pots.

Regeneration of rose plants from cuttings is influenced by various factors such as type of cutting, treatment of cuttings, the age and physiological condition of the stock plant, type of wood selected for cuttings and environmental conditions during rooting. Hardwood cuttings are widely used in the propagation of rose rootstocks. Cultivars of Miniature roses are easily propagated by cuttings of soft-wood or semi- hardwood

under mist. Hardwood cuttings taken from basal and mid portion of the shoot shows much better rooting than those taken from apical cuttings.

5. Seed propagation

This method of propagation is generally adopted by breeders for developing new cultivars with desirable characters. When the fruits are fully ripe, they are harvested and thoroughly dried before the extraction of seeds. Most rose seeds when mature are in a resting condition requiring an after-ripening period before germination. Stratificaiton of seeds at 1.6-4.4° C is required after harvest. Stratification for 6 weeks is sufficient for Rosa multiflora, R, rugosa and R. hugonis require 4-6 months, and R. blanda requires 10 months. Warm stratification followed by cold stratification has also been found beneficial in Rosa canina seeds which requires warm treatment at 26.6°c for 2 months followed by 3 months at 4.4°C for better germination. Hybrid rose seeds usually respond best to a stratification temperature of 1-4.4°C for 69-90 days.

Clean seeds are sown about 5 cm apart in pans or in small plots to raise the seedlings. Soil used for this purpose should be prepared adding a good quality of well rotten farm yard manure. Though the time of sowing mainly depends upon temperature, sowing in the months of October- November is ideal in most of the places. Seeds may take several weeks to germinate. Germination is probably pre- vented in rose seeds by inhibitators occuring in the seed coat, as well as by the mechanical restriction imposed by the massive pericarp. The stage of hip-ripeness is an important factor effecting germination. Temperature is another very important factors influencing the germination. Treatment of seeds with sulphuric acid and for 1-2 hours before sowing was found to improves the germination.

Rose seedlings tend to flower even when they are very small and this exhaust themselves. Therefore, the flower buds should be pinched off as soon as they appear, until the plants are reasonably large and sturdy. It is important to keep the seedlings growing continuously without any check in development. A continuous moisture and nutrient supply, control of weeds and of diseases and pests contribute to successful seedling growth.

VII. Root Stocks

For grafting or budding, proper selection of rootstock is of immense importance. Rootstocks are known to impart marked effects on the vigorous, precosity, productivity, quality of flowers, longevity of bushes, disease resistance, adaptability to soil climatic conditions etc, and therefore, it is necessary to choose the most suitable rootstocks for budding or grafting roses. The rootstock should have the following qualities.

i. It should produce fibrous root system.

ii. It can easily be propagated from cuttings.

iii. It should have vigorous growth habit, be healthy and resistant to diseases and frost.

iv. Plants should have uniform growth.

v. It should have a bark, thick enough to hold the bud firmly and provide sap to the budded plant.

vi. It should be reasonably free from suckers

vii. It should support the budded plant for a long time.

viii. It should withstand a wide range of soils and climatic conditions.

ix. Some of the commonly used rootstocks are given here.

a. Rosa barboniana (Edward rose)

It is one of the most popular stock and used extensively in the northern plains of India. Plants are hardy, vigorous, propagated easily by cuttings, provide straight stems of suitable length and is found useful for budding standards.

b. Rosa canina (Dog rose)

It is usually propagated by seed since the cuttings do not root easily. However, the seeds are difficult to germinate. The prominent thorns make it difficult to handle. It also tends to produce sucker.

c. Rosa indica

This is a large climbing shrub and is used extensively as rootstock for greenhouse forcing roses. It is easily propagated from cuttings and under suitable conditions produces a large symmetrical root system. It is well adapted to both excessively dry or wet soil conditions and can withstand high soil pH. Since it is not cold hardy, it should be used only in areas with mild winters. Plants raised on this rootstock are vigorous and produce flower with longer stems. The rootstock is also quite tolerant to powdery mildew and insect pests. In India, it has been recommended for northern plains.

d. Rosa laxa

This is well adapted to rich heavy soils and plants budded on it have vigorous growth. It can be propagated both by seed and cutting and have a very good root system.

e. Rosa manetti

This is a very old stock used for propagating dwarf roses and for planting in sandy soils. It is easily propagated from cuttings, produces plants of moderate vigour, and is resistant to some strains of verticillium wilt. This rootstock has, however, proved unsuitable for the production of cut flowers in greenhouse.

f. Rosa multiflora

This is a widely used rootstock for outdoor roses. Several strains are available, some giving better bud unions and bud development than others. Cuttings of this species root easily, develop a vigorous, nematode resistant root system, and do not sucker excessively. It is adaptable to a wide range of soil and climatic conditions. In India, it does well In Bihar, Bengal and in the hills when used as rootstocks.

VIII. Preparation of Beds

Preparation of soil is the key to success with roses. It should be rich, porous and well drained. The initial preparation of rose beds should preferably be started during summer season, so that soil gets exposed to sun and air and during the monsoon it gets a chance to settle down before planting. The area selected for rose growing should be cleaned of weeds. According to the plan, the borders of the proposed beds should be properly marked.

If the soil is light, sandy and stony, the top 30 The dug up I soil is heaped on the ground cm of the soil in the bed should I be dug up to make trench. The dug up soil is heaped on the ground. The next 30 cm of soil In trench should be dug as deep as possible, and properly pulverized and levelled in the trench itself. After that about half portion of the dug out soil, heaped on the ground surface, should be returned to the trench. This layer needs manuring with organic manure @ 50- 60 tonnes/ha or FYM or compost. The remaining portion of the dug out soil should be returned to the trench. Application of superphosphate @ 30 kg/ha, and Aldrin or BHC (5% dust) @ 100 kg/ha is done, and the beds are irrigated thoroughly.

On the other hand, if the soil is heavy it would be necessary to dig out the second 30 cm layer of the so i) and heap on the ground

surface. The next layer of the soil should be deeply dug, pulverized and levelled. The second layer of soil after it is pulverized and sun-dried, should be returned to the trench and manured with organic manure. @ 50 tonnes/ha. The remaining operations will be similar as in the case of sandy soil.

IX. Cultivation

Planting, pruning, application of manures and fertilizers, irrigation, weed control are some of the cultivation practices that are described here.

A. Planting

Few important preliminaries for planting are given here.

1. Cut away all immature, dead or diseased shoots and snags. Also as far as possible, eacl1 shoot to the next outward growing bud should be cut.
2. Remove all suckers growing below the point of union.
3. Reduce the possibility of loss of moisture, leaves including dried and yellow ones should be removed.
4. If the roses are with shriveled bark, immersing of the plants in water for 24 hours is necessary to plump them.
5. Immerse each plant in a suspension of one gram blitox in one litre of water to lessen the risk of attack of fungi.

At the planting time beds should be thoroughly prepared. At the planting time the soil should neither be too wet nor too dry. At each marked spot, a hole measuring 20-30 cm in diameter and 30 cm deep should be dug, and the plant with earth ball should be lowered into the hole. Then the soil around the plant should be pressed firm to avoid air pockets in the soil. The bed after planting should be thoroughly irrigated.

If the rose plants, are with bare roots, the roots along with stem up to the bud union should be dipped in water for about 6 hours before planting, to restore the loss of moisture during transit period.

Planting should be done with the bud union 2.5 -5.0 cm above the soil level. Roses can be planted any time except in very hot summer and during heavy rains when the soil is very wet. The suitable time for planting roses in most plains of India is during September-October and in the hills it is during October-November or February-March. In general a spacing of 60-75 cm between plants and rows is suggested.

B. Pruning

Pruning refers to the removal of certain portion of plant. It is an important operation for maintenance of flariferousness and flower quality along with vigour of rose plants. The practice of rose pruning consists of two operations.

i. Thinning out, i.e. removal of old, weak, dry, twigs and diseased stem and branches from the point of start, and

ii. Shortening of stems, which aims at cutting down of last years growth to a desirable height.

1. Pruning time

The best time of pruning is the period plant is at dormant or near dormant stage. Pruning time will depend entirely on the climatic conditions of the region. The most usual time for pruning is during October-November after the rains are well over and the cold season is approaching. In Bangalore and around the coastal towns of Madras and Bombay pruning is practised twice in the months of November and June for winter season and monsoon season blooms. Pruning in the hills by the end of March or April.

2. Where and how to prune

While pruning a plant a cut has been made at about half- a-centimeter above a vigorous bud and the cut should be slightly slanting, sharp and clean.

All wounds are dressed with cane scaler to protect against attack of fungus and cane boring insects. The cut surface may be painted with fungicide or chaubattia paint(prepared by mixing 4 parts of red lead, 4 parts of copper carbonate, 5 parts of linseed oil, and a small quantity of BHC). Spraying of insecticides like rogor or malathion immediately after pruning.

3. Types of pruning

Depending upon the extent and level of shortening, there are 3 types of pruning light, moderate and hard. In light pruning, the healthy shoots, left after thinning of diseased and unwanted portion, are cut. Moderate pruning is done by cutting back the ripe 'main and lateral shoots of the previous years growth at about half the length of the growth. Hard pruning consists of keeping only 3 or 4 shoots of the last year and heading back at about 3 or 4 eyes from the base.

As preliminary to the main pruning operation, all weak, diseased, dead and slender growing and overlapping branches are to be completely removed. In the remaining healthy growing shoots, the amount of pruning largely depends upon cultivar and class of rose, the health and vigour of the plant, space provided for each plant, fertility of soil and the desired flower quality etc. Generally, strong and sturdy plants are pruned lightly moderate growers moderately and weak plants relatively hard. If the soil is sandy, and the nutrient level in the soil is not high, pruning should be light. In case of heavy and fertile soils, pruning may be a little harder. Hard pruning is also advisable to obtain blooms with longer stems.

4. Pruning of one-year old plants

Rose plants should never be pruned until they are properly established and adapted to the new environment. In the first year of planting the pruning is done of weak, dead and crowded branches to give a definite shape to the plants. The real pruning starts in the second year of the growth of plants. viz. Hybrid Tea and Floribunda groups.

Climbing and rambling do not require any pruning except the removal of weak, unhealthy, deed and interlaced twigs. The polyanthas are pruned lightly whereas the miniatures are not pruned.

5. Pruning of established rose plants

i. Hybrid teas

The established Hybrid Teas should have all dead, weak, damaged and crossing shoots removed from their point of origin, leaving only 4 or 5 healthy basal shoots. It has been observed that hard pruning, reduces the number of flowers per bush but increases the flower size and the length of stem.

ii. Floribundas

The main object of pruning roses of this class is the production of abundant flowers with mass effect in the bed. It is necessary to remove the mass of twiggy growth at the ends of the main stems and extra growths should be trimmed. Thus light or moderate pruning is the general recommendation for floribundas.

iii. Polyanthas

The primary objects of pruning roses of this group are to obtain large number of flowers and to give a good shape to the plant. Thinning of dead, weak and overcrowded shoots and tripping of the end of branches that have already flowered are all that is really necessary.

iv. Miniatures

Miniatures roses are generally not pruned except the removal of dead, diseased and overcrowding branches. Some of the older stems may also be pruned to make a well balanced compact bush which is the most desirable character of this class.

v. Climbers and ramblers

The hybrid tea climbers hardly need any pruning because it is desirable to promote the growth of the lateral and side branches to bear flowers. The best flowers are produced on the short branches that emerge from older canes. So they require only removal of tips. The climbing Floribunda, Polyanthers and some shrubs of the Hybrid Musk group only bloom in the new wood.

vi. Standard

Standards which are generally hybrid teas or floribundas do not need drastic pruning. Growth which comes in the way of its main stem, should be removed to give symmetry to the plant.

vii. Shrubs

In general, the majority will not need any pruning but they may be cut back to keep them in shape. The weak and dead shoots should also be removed.

viii. Species of roses

Rose species and their allies also need no pruning. Once established and growing strongly, the dead and weak growth of the plants should be removed entirely from the base in the first year itself.

C. Manuring and fertilization

Rose is a nutrient loving plant and both major and micro nutrients play an Important role for its proper growth.

1. Manures

Organic manures like FYM, oil cakes, bone meal etc. are very essential which supply plant nutrients and maintains a good soil structure. Green manuring with sunnhemp and dhaincha can also practised. For the light soils, cattle manure and for the heavy soils horse or pig manure are best suited.

a. Rate of application

Sandy soils need heavier and more frequent application of organic manure than heavier soils. Application of well decomposed cowdung or FYM @ 8-10 kg/plant (4.5 tonnes/ ha) has been found useful for the growth and flowering of roses.

b. Time and method of application

The bulky organic manures in order of preference may be FYM, compost, cow dung slurry from biogas plants, cattle dung and activated sludge. Oil cakes and droppings of poultry, sheep or goat (@ 1 litre/plant) may be used for supplemental manuring. The quantity of these manures is smaller than in the basic manuring. Basic manuring in case of new planting should be done at the time of preparation of rose beds.

Supplementary manuring should be done after the first flush of blowing is over and there is pause for the next flush. The manure should be spread in a band around each rose plant, at least 20-30 cm away from the stern or between the rows of plants.

c. Liquid manures

Manures are decomposed in water so that plant nutrients from complex organic forms are converted to simple soluble forms. The liquid when applied to the soil reaches the plant roots directly and provides them with nutrient elements in readily utilizable forms. Excreta of animals and oil cakes after rotting are also used as liquid manure. The diluted liquid becomes lighter than that of tea liquor. The liquid (about 1 litre) is put around each plant, about 20-25 cm away from the stern. The soil should be moist at the time of liquid manuring. The application may be repeated at an interval of 5- 7 days till the flower buds start opening.

2. Inorganic fertilizers

For sustained production a plant health it is essential to apply fertilizer to roses. Urea, single superphosphate and both potassium sulphate and muriate of potash are the widely used fertilizers. The most common practice is to apply these fertilizers mixed to the soil in certain proportions, known as fertilizer mixtures. Micronutrients are usually supplied through foliar sprays.

a. Fertilizer rates

For improving the growth and flowering of roses, some formulae of the mixtures are given here. (by weight)

i)	Groundnut cake	-5kg
	Bonemeal	-6kg
	Ammoniumphosphate	-2 kg
	Ammoniumsulphate	-1 kg
	Single superphosphate	-2 kg
	Potassium sulphate	-1 kg
ii)	Nitrate of potash	-6 parts
	Ammonium sulphate	2
	Superphosphate	-16”
	Sulphate of potash	-8”
	Magnesium sulphate	-2
	Iron phosphate	-1/2

This mixture is applied @ 50-100 g/plant.

b. Time and method of application

Fertilizers are applied in three split doses and application should be made when there is sufficient moisture in the soil. Normally, the first application of the mixture is given about 15 days after pruning when the new growth has started. After the first flush is over the second does of fertilizer mixture is applied.

The method of application varies according to plant density and size of the plants. If the plant density is low, the requisite quantity of fertilizers mixture can be applied in a continuous band around the plant, 20 -25 cm away from the stem. If the plant population is fairly large, the fertilizer dose should be fixed according to smaller units and placed in continuous band in between the rows of plants, also between the plants and edges of the borders. The applied fertilizers incorporated into the soil but should not be deep.

c. Liquid fertilizers

A solution prepared by dissolving 0.680 gm KNO3, 340 gm ammonium sulphate and 170 gm potassium phosphate in 432 litres of water and applied at the rate of half gallon per plant three times a week for a month and thereafter once a week before slow, produced outstanding blooms suitable for exhibition. Another solution prepared by dissolving ammonium sulphate, 56.6 gm superphosphate and 28.3 gm sulphate in 36 litres of water and applied at 9 litres per plant is also found very useful to improve the quality of flowers.

The advantage of this method is that the nutrients in solution reach the plant roots immediately for utilization. The disadvantages are the extra cost of application, the risk of toxicity and fixation of phosphates to soil, rendering it unavailable to plants. As a regular feeding of rose plants this practice seems unnecessary.

d. Foliar feeding

This is an excellent supplement to root feeding because the. leaves can directly absorb the nutrients. At minimizes the amounts of fertilizer mixture used. The concentration of solution should not be very high (not more than 0.3%) it damages the leaves.

For supply of macronutrients, the composition of the spray solution should be 7 gm of potassium sluphate, 14 gm ammonium sulphate, 28.3 gm potassium nitrate in 36litres of water and is applied @ 1.36 g/litre. Good results can also be obtained by using ammonium phosphate and potassium nitrate in equal proportions by weight, and applying the mixture @ 2.5 g/litre of water.

In case of micronutrient deficiency foliar application of a solution prepared from the mixture containing 15g manganese sulphate, 20 g magnesium sulphate, 109 chelated iron I and 5g borax @ 2g/litre has been found very effective for obtaining brighter colour in flowers and foliage.

e. Combination of organic and inorganic manures

A pot mixture of 14 kg castor-cake, 9.5 kg finely powdered charcoal, 226 gm super phosphate, 113.2 gm carbonate of potash, 113.2 gm nitrate of soda, 283 gm leaf mould and 45.5 kg loamy soil is helpful for obtaining increased yield of flowers.

D. Irrigation

Adequate soil moisture at all stages of vegetative growth and flowering is essential for the rose plants to meet the water loss through transplantation and evaporation from soil. Water requirement also depends upon the size of the plant and the growth period.

In lighter soil more frequent irrigation is required than that in heavy soil. Rose beds can be watered once a week or 10 days in winter and twice a week during summer season.

E. Mulching

Mulching conserve soil moisture, supply humus making material and suppress weeds resulting in improved growth and flowering. Mulches also keep the soil some what cooler in summer.

Among the substances used for mulching, well rotten garden compost, FYM, Peat, straw sawdust, ground or whole corn cobs and other similar materials make satisfactory mulches. Mulches can be applied soon after the newly benched plants are established and growing satisfactorily.

F. Hoeing

Light hoeing is a very effective way to keep the soil porous so that light, air and water may reach the roots better to improve moisture retention capacity and to keep rose beds free from weeds. Roses are shallow rooted plants and roots of established plants tend to grow near the surface. Therefore, shallow hoeing is preferred.

G. Weed control

Weeds pose a very serious problem in rose cultivation as they not only consume water and nutrients from the soil, but also act as hosts for a number of diseases and pests. Manual weed control is effective if done frequently. Chemical weed control is comparatively economical, convenient and efficient in eradicating weeds. Application of CMU and DCMU four to five weeks after planting in late December and early January controls all weeds, in a rose nursery.

X. Diseases and Pests

Major diseases and pests on rose are given here.

A. Diseases

Like any other crop, roses are also prone to many diseases, some of which have been found to be very destructive. The most important diseases and the measures for their control are described here.

1. Die-back

The causal organism is a fungus namely *Diplodia rosarum*. The disease causes death of the plant from top to downwards.

When plants are pruned, sometimes, blackening of twigs starts below the pruned surface which extends further down, killing the whole plant. The older plants are more prone to the attack of the disease.

Control

a. Cut the affected parts and burn it.

b. The secateur should be disinfected with spirit and the cut ends immediately coated with a paste containing 4 parts of copper carbonate, 4 parts of red lead, and 5 parts of linseed oil. c. Add 0.1 % BHC to the paste to check the digger wasp attack. d. Grow resistant varieties like white Christmas, royal ascot, blue moon and crimson glory .

2. Black spot

This disease is caused by Diplocarpon rosae characterized by dark brown, circular spots with fringe borders, present on both sides of leaflets. At a later stage, the leaves becomes yellow and fall. If left uncontrolled, the whole stem is defoliated and the plant becomes weak. Leaf buds and the flower buds are also affected.

Control

Since the black spot fungus is located under the protecting cuticle, no fungicide can kill it without destroying the leaf. Hence, cure of this disease is difficult and prevention seems to be the only hope. The infected leaves, as soon as they are observed should be clipped off, taken out of field and burnt. Preventive sprays of fungicides like Zineb reduce the damage to a large extent. Martin Frobrisher, Belaya , John Cabot, and Carefree Beauty are also found to be resistant to black spot disease.

3. Rose wilt

It is a viral disease caused by *Marmor flaccumfascines*. The first symptom appears in the form of recurving of leaflets at the tip of young shoots which are brittle. Defoliation may happen, with leaves turning yellow and falling off. The stem also gets infected and the whole plant dies. In epidemic form, one infected plant could ruin the whole garden within a couple of years.

Control

Control of aphids, which transmit the disease, helps to control the infection. The affected plants should be removed and burnt.

4. Rose mosaic virus

Chlorotic areas along the midribs of the leaflets and localized distortion are the principal symptoms. Sometimes one finds ring and watermark pattern. Another strain of this virus causes brighter and light yellow patterns.

Control

Diseased plants should be destroyed and never used for propagation.

B. Pests

Roses attract a large number of pests which cause considerable damage. At almost every stage, be in the nursery or in beds, rose plants are prone to attack by various pests. Some of the commonly reported insects and other pests attacking roses are mentioned in detail here.

1. White ants

White ants also known as termites cause damage to rose plants even before they are established. Small colonies are formed inside the soil and the insects multiply very rapidly during the rainy season. The insects destroy the underground parts including the roots of the young as well as old plants. Sometimes rose plants wither.

Control

Apply .5% BHC or Aldrin in the pits before planting roses. Drenching of rose beds with Aldrin also controls the damage in established gardens.

2. Red scales

They infest roses in the green house and in the garden and the affected branches become dry. The insects can easily be detected by the reddish brown encrustations on the lower portion of old stem and at times the younger shoots also which sucks the plant sap.

Control

The menace can be removed by rubbing the scurfy encrustations with a used tooth brush, or a cotton swab dipped in methylated spirit. Spraying the affected plants with insecticides like malathion or rogor will control the insect. Application of granular insecticides like carbofuron at 1.5 kg a.i/ha and Disulfoton and Phorate at 3.0 kg a.i. /ha also gives good control of rose scales.

3. Jassids (Leaf hopper)

These are very small, light grey or pale green insects which suck the cell sap from the leaves. It causes yellowing or whitening of the attacked surface, giving the plants a sickly appearance.

Control

Jassids can easily be controlled by spraying with 0.03% parathion, 0.1% Metacid or 8% Thimet as soil application. The use of 0.05% Monocrotophos is also effective in controlling jasids.

4. Red spider mite

As result of their feeding, white specks appear on the leaves and these specks coalesce and appear as white patches. Ultimately, affected leaves become mottled, turn yellow and fall. Some polyantha and floribunda roses completely lose their leaves prematurely due to the attack of this pest. The damage is more pronounced during warm and dry season.

Control

Frequent spray with sulphur helps to control this mite. Several mite-killers such as kelthane morestan, dimite, Tedion have been reported to be very effective in controlling rose mites, 1 ml of kelthane is throughly mixed with 10 m of water with 10-15 drops of any sticker and application of this chemical every 5 or 6 days may be sufficient to control the mites. Spraying the affected plants with 0.05% parathion or 0.1 % Metasystox is also suggested.

XI. Harvesting and Post-harvest Handling

Time and stage of harvesting, storing and transportation of the flowers are the important aspects to be considered.

A. Harvesting

The stage at which flowers should be cut, either for decoration or for despatch, is the tight-bud stage when the buds show full colour but the petals have not yet started unfolding. If harvested at this stage, they last longer and retain colour and freshness during transportation. If a flower bud of red cultivar cut at a little earlier stage it fails to open later. Pink and red cultivars should be allowed to develop to a stage where one or two of the outer petals begin to unfurl. Loose flowers, used for making garlands, preparing perfumes etc. are harvested only when they are fully open and collected in large open baskets.

The flowers should be cut in the early morning before sunrise or late in the afternoon when the sun is about to set as to avoid damage of buds due to high temperature during the day. Late harvest results in short vase life of cut flowers and low oil content in loose flowers used for preparing perfumes. For cut flowers, stem with two, five leaflet leaves should be cut and immediately dipped into clean water up to the base of the flower buds. The delay in keeping the flowers in a bucket of water will cause air entry and result in vascular blockage. The stems should be cut in water

about 2 cm above the previous cut end. If they are not required for immediate use, the cut-flowers along with stems dipped in water in the bucket should be stored at a cool air temperature of 4.4 -7.2 C for about 6-12 hours to harden the buds and thus enhances their keeping quality. During winter (December-January) a shorter treatment for 6-8 hours is sufficient while a longer duration of 8-12 hours is required in March-April.

B. Packaging

The cut blooms are graded according to the length of stem and then packed in corrugated card-board boxes. The size of box varies with the quality and quantity of roses to be packed. The inside area of the box will be cushioned with polythene or soft materials. The blooms are generally packed in bundles. The upper half of each bundle having flower buds is wrapped in a corrugated paper which is fixed with an adhesive tape. Labeled flower bundles are placed opposite to another in such a way that their flower buds face the sides of the box and their stem ends towards the centre of the box The inside of the box is finally covered with a sheet of tissue paper before putting on the cover of the box. Along the outer edges of the box, adhesive tapes can be fixed to close it.

C. Yield

The yield of cut-flower depends on a number of factors such as type of cultivar, and cultural practices adopted from time to time. Gold strike and pink garnette, are high yielding cultivars which produces 24-28 flowers per plant. Sonora and Coral princess give low yields (15 flowers per plant per years) of 60% grade. Plant density has much influence on the yield of quality blooms per unit area. About 1,20, 000 cut flowers of exportable quality from an area of one hectare is obtained by close planting and providing plastic cover over the plants during November-February. In an essential oil-bearing rose, a yield of 6977 kg petals per hectare was recorded when planting was done at 2.5 x 0.5 cm apart. One of the best methods for maximization in yield and quality of flower is through balanced application of fertilizers.

XII. Importance and Uses

The rose, because of its utility, occupies a pre-eminent, place amongst the flower crops and is one of the oldest of fragrant flowers to be cultivated by man. Its different types having beautiful flowers of exquisite shape, different sizes, bewitching colours and most delightful fragrance has made it an important flower or its varied uses. The various ways in which rose can be used are mentioned in detail here.

A. Exhibition and decorative purposes

Varieties of roses which are most suitable to a particular type of decoration are given here.

1. Shrub or bush

Shrub or bush roses are planted in small groups at a height of 5-10cm from the ground level to create excellent mass effect in a rose or flower garden. They may also be mixed with other plants in a shrubbery, e.g. christian, midele double delight, first prize, gladiator, kiss of fire, midle meilland, montezuma, paradise, peace and super star.

2. Standard Rose

Standard rose or tree rose, is a very important feature in the rose garden. They are allowed to form buds only at the top leaving the entire stem clear of any vegetative growth. According to their height of budding they may be full standard (1.0 -1.5 metres high), half standards (45-60 cm high) or weeping standard (1.6 5m or higher above the ground). Hybrid Teas and few grandiflora are suitable for making the frill standard roses. Floribunda and Polyantha roses are excellent for growing as half standards. For weeping

standards, climbing and rambling roses are used as the long branches of the crown may be allowed to hang down.

3. Climbers

The climbing and rambling roses can be used to coyer the walls of houses or fencing or pergdas, arbours and arphes. Ramblers produce flowers only once in a year and flowers ate in clusters lasting for several weeks. The beautiful climbers and Ramblers like America pillar, Blaze, Delhi Pink Pearl, Don Juan, Golden showers, Lamargue, Mardan white, Mardan Pink, Marechal Neil, royal gold add to the beauty of the garden.

4. Hedges and edges

A rose can also be used for making hedge or edge. Rose hedges except when pruned, remain full of life and colour and give protection due to the presence of thorns. Vigorous Floribundas are suitable for hedge and of necessary the plants can be planted in two rows. Some suitable cultivars are Border coral. Circus, Frensham and Runiba, Climbing or rambling roses may also be used for making tall hedges. Rose cultivars like coral in, Lady Reading, Magic, white Button etc. may be used for making edges.v

5. Rockery

Roses may also be grown in rockeries and for this purpose hardy miniature and pompon cultivars such as Fairy Queen and Magic may be selected.

6. Pot plants

Roses can be easily grown as pot plants in suitable containers kept both indoors as well as outdoors. For balconies and terraces which receive limited sunlight minitares and dwarf polyanthas should be selected. The cultivars like Baby Darling, Cindrella, Starina etc. are quite suitable for this purpose. Bush roses may also be grown in pots for beautifying the compounds around the building and for display in rose shows.

7. Hangers

Miniatures can also be grown in hanging baskets and cultivars suitable for making rose hangers are climbing Miniatures-Red cascade and Yellow Doll.

B. Cut-flowers

Apart from making garlands, bouquets, button-holes their use for worship in temples, rose makes one of the best cutflowers and as such is in great demand in the internal as well as foreign markets. Germany is the biggest consumer and importer of cut-flowers. Rose cut-flowers are being exported from Maharashtra (India) to the Middle East countries.

Rose cut-flowers arranged in flower vases looks extremely beautiful and they have a rightful place in the scheme of interior decoration. In general, cultivars with more petallage and opening slowly with long lasting quality are chosen as cut flowers. Some of the cultivars suitable for this purpose are christian Dior, Happiness, Montezuma, Queen Elizabeth, Sea pearl and Super star. Presently cvs. Belinda, golden times, Illona, Laminuette, Montreal, Mercedes, Red success, Somia Meilland are in great demand as cut-flower in foreign markets. Two Indian or Arjuna and Raktagandha producing flowers with long stems are also suitable for cut-flowers.

C. Perfume and allied products

Oils, perfumes and other products made from rose petals are of superior quality.

I. Rose oil (Rose perfume)

Rose oil is an important commercial product obtained from rose petals. Apart from sweet fragrance it has medicinal value and is often used in Ayurveda. Bulgarian rose is largely used in perfuming soaps and cosmetics. Limited quantities of the oil are used in flavouring soft drinks and alcoholic liquors.

Rose oil has antibacterial property. The commonly grown rose species for rose oil are *Rosa damascena*, *R. borbonians*, *R. centifolia, R. alba* and *R. Gallica*. In India, *R. damascena* and *R. borborniane* are cultivated for rose oil.

Though France, Cyprus, Greece, India, Iran, Italy, Morocco and the USA are important countries producing roseoil, Bulgaria is a major producer and exporter of the roses and the rose perfumery .The oil is extracted by steam distillation and its quality depends much and cultivars and stage of picking. Generally 1 Kg oil is obtained from 3,000-4,000 kg petals. Among the different species, *R. Damascena* gives the maximum oil yield. *R. borboniana* and *R. tepltiz* are also good. The principal constitutents of normal rose oil are l-citronellol (40-65%), Geraniol, neroll-linalool, phenyl ethyl alcohol, small quantities of esters, nonyl aldehyde, citral, engenol sesquiter penes and the vaxy constituent stearoptene.

To obtain good quality rose oil, the flowers are to be harvested early in the morning, as the percentage of volatile oil decreases with the advancing day.

2. Rose water

Rose water is also an important commercial product obtained from rose petals. It is used as a perfume and in medicines and confectionary. It has the property of cooling the body and is often used in eye lotion and eye drops for its soothing qualities. It is also used in drinking water and social occasions. The roses used for preparing oil are also used for making rose water.

3. Gulkand

Rose petals are also preserved for direct consumption by making gulkand which is prepared by pounding equal proportions of petals and white sugar. It is considered both a tonic and laxative. *Rose damascena*, *R. chinem's*,. *R. Gallica*, *R. ponifera* and some other scented roses. e.g. Edouard are used for preparing gulkand.

4. Pankhuri

Dried rose petals are known as 'pankhuri' which is occasionally used {or preparing sweetened cold drinks.

5. Gul-roghan

It is a rose hair oil prepared from rose petals by enflurage with wet sesamum seeds.

D. Source of vitamins

Rose hips are a very good source of ascorbic acid, i.e. vitamin C. Every 100g of rose hips syrup contains 150 mg of ascorbic acid as compared with only 50 mg present in fresh orange juice, 20 mg in tomatoes and 5 mg in apples. The ascorbic acid content, however, varies with species and some of the promising vitamin C bearing species are *R. rugosa, R. ambhyotis, R. aciculari R. davaricas, R. pendulina, R. glauca and R. canina*. Apart from Vitamin C, the hips of R. roxburghil, *R. acicularis, R. rugosa, R. davurica* and some of the species are found to contain vitamins, Ai, B2, K and E.

E. Other Uses

In Europe, roses are used for making pot-pouri, conserves, rose vinegar and rose petal wine. Jams, jellies and syrups have been made for centuries in Bulgaria and exported. Rose aids in digestion and has certain curative properties. In Czechoslovakla, fruits of wild roses are used for preparing a hot drink like tea and a popular wine. In America, bushes of *R. multiflora* are utilized as shock absorber or crash barrier.

Hybrid tea Black tea Brownish red

HT rose Hotel calofornia Yellow

HT rose scandia Mauveblend

HT rose sweet water Salmon orange

HT rose sungodess Golden

HT rose scentsation Peach blend

Hybrid tea White arrow White

Hybrid tea Kanchan Yellow

Hybrid tea Norma Red

Hybrid tea Majestic Pink

Hybrid tea Maria shriver White

HT Rose Mother of pearl Pink with apricot

HT Rose Marcel pagnel Red

HT Rose Hot romance Orange blend

HT Rose Elvis White

HT rose Shanghai autumn Yellow blend

HT rose Sweet promise salmon orange

HT rose Delicate beauty White

HT Rose Ashwini Blackish crimson

HT rose dream come true Bicolour

HT Rose Celebration day Pink blend

HT Rose Espresso Chocolate vermilio

HT Rose lco delight sport White

HT Rose Rose osaca Deep red

HT Rose Ksg manas Salmon yellow blend

HT Rose Lily the pink Pink

HT Rose Reba mcintire Deep Orange

HT Rose Fire and ice Bicolour

HT Rose Janice Kellog Red

HT Rose Blue time Mouve

Floribunda cream abundance Creamy pink

Floribunda Lavaglut Blackish red

Floribunda bewit ched Fuchsia pink

Floribunda living fire Bicolour

Floribunda raven Red

Floribunda deep purple Deep lavender

Floribunda remembrance Scarlet

Floribunda Harkness marigold Peach blend

Floribunda Clara Silvery white

Floribund Home & Garden Pink

Floribunda Gebruder grimm Bicolour

Floribunda Irene Apricot blend

Floribunda Embrrsement Scarlet crimson

Floribunda Autumn spray multi colour

Floribunda For your with love Orange vermilion

Floribunda Roserarses de chatlet Pink

Floribunda Red hot Red

Floribunda Ebbtide Purple

Floribunda Cubana Brilliant apricot

Floribunda Love struck Pink

Floribunda Neon Multi colour

Floribunda Red Finess Red

Floribunda Profumo Rosso Red

Floribunda Gisella Coral pink

Floribunda Fairy White White

Floribunda Bad Worishofen Rosepink

Floribunda Bad brambach Pink

Floribunda Careless Beauty Pink

Floribunda Silvina Donvito Yellow blend

Floribunda Golden memories Yellow

Miniature Phoenix Bright red

Miniature Candy free Pink

Miniature yellow fairy Yellow

Miniature Baby love Yellow

Miniature Lupo Bright pink

Miniature Petitefolie Vermillion Orange

Miniature Incognito Lavender gold

Miniature Red beauty Dark red

Miniature Red fairy Scarlet red

Miniature Magic carrousal White & pink

Miniature Spray delight Scarlet

Miniature Choo Choo Soft pink

Miniature Libby White & pink

Miniature Wild plum Lavender

Miniature Flower power gold Yellow

Miniature George best Red

Miniature Janna sport Bright pink

Miniature Pink puff Pink

Miniature Cindy Carmine pink

Miniature Ice fairy Ice white

Miniature Sanjit Pink

Miniature Hot & howler

Miniature Happy trail Bright pink

Miniature Tear drops White

Miniature Hula girl Orange

Miniature Don don Red

Miniature Careless moment Bicolour

Miniature Blue blood Red

Miniature Orange flame Orange

Miniature Over the rainbow Pink blend

CHAPTER - 15

LAWNS

Some facts about Lawns:

Lawns and yards transform strangers into neighbors, neighbors into neighborhoods, and neighborhoods into communities. Rainfall, Erosion and Recharge:

- Lawns are ten times better at soaking up rainfall than crop farms, they serve as rainwater harvesting pits.
- Grass is exceptionally good at preventing erosion. Rain will remove up to 2200% more top soil from bare earth than from a lawn. Properties of Grass:
- Grass is the only plant which responds to severe cutting with increased growth.

Cleaning up pollutants:

- The microorganisms in a turf grass/ soil ecosystem can clean up petroleum products, metals such as lead, copper, zinc, and cadmi-um, and a variety of organic chemicals, including pesticides.
- An acre of grass will absorb hundreds of pounds of sulfur duixude every year.
- Lawn grass can be used as the last step for treating domestic wastewater.

The Lawn Ecosystem:

- A turf grass ecosystem the size of a football field can support up to 13 lakhs earthworms.
- Grass enriches the soil by adding over 2600 kgs of organic matter each year to an area the size of a football field.

Watering:

- Lawns require less water than shrubs or trees.
- Excessive usage rates for watering are a people problem, not a plant problem.
- Restrictions on watering and irrigation during local drought conditions can save potentially significant amounts of municipal water with no lasting harm to lawns that are allowed to go dormant. But the restrictions have to be done right.

Lawns & the Environment:

- A 50’ x 50’ square of healthy lawn supplies enough oxygen for a family of four.
- More and more homeowners are leaving grass clippings on the lawn where they belong and where microorganisms can recycle the nutrients.
- Lawn pesticides are not harming the environment. Lawn fertilizers properly applied at the right times will stay in the lawn. They will not be washed away by rain or leached down into the subsoil.
- They stay where they are applied, and they are broken down into benign components in short periods of time. They do not accumulate. Where traces are found, they are in harmlessly low concentrations of a few parts per billion.

Lawns & Health:

- Regularly mowed lawns will produce a minimum of pollen and look green all around the year.
- Nothing beats turf for safety and comfort on play areas of children and recreational areas.
- Majority of the gardeners who do all or part of their own yard work; consider it a healthy physical and mental exercise.

- A well-tended lawn and garden will harbor fewer snakes, rodents, mosquitoes, ticks etc. than untended areas.
- 60% of the garden lovers say that the primary benefit of their avocation is peacefulness and tranquility.
- Horticultural therapy is a recognized therapeutic tool.

The Economics of Lawns:

- Homeowners say a well-maintained lawn can add 15% to the selling price of a home. Appraisers estimate that attractive landscap-ing adds at least 7% to the appraised value of residential property.

Grass & Lawns:

S. No.	Name	Common Name
1.	Cynadon dactylon.Sp	Bermuda Grass
2.	Cynodon dactlyon.Sp	Calcutta Doob Grass
3.	Festuca.Sp	Fescue Grass
4.	Paspalum notatum	Buffalo Grass
5.	Poa prapensis	Kentucky Blue Grass
6.	Stenotephrum secundatum	St. Augustine Grass
7.	Stenotephrum secundatum Ver	St. Augustine Variegated
8.	Zoysia japonica	Jade Velvet Grass
9.	Zoyasia matarella	Korean Carpet Grass
10.	Zoysia teunifolia	Mexican Grass

Lawns:

1. Turfed lawns give instant garden effect. Even the dibbled lawns take good shape within 2-3 months time.
2. Lawns prevent dust rising and avoids slushiness during rains, and provide good pavement effect.
3. Walking bare footed on lawns gives best satisfaction and health.
4. Will act as backdrop for other garden features like flower beds, edges, shrub, ground covers.
5. Lawns are the best permanent ground covers.
6. Lawns provide excellent sit out place for the family and small gatherings.
7. It is cool and refreshing in summer. It is pleasant and relaxing in winter.
8. For children lawns provide an excellent space for playing.
9. Any home garden is incomplete without a lawn, smaller or bigger.

Tips for Lawn Laying:

1. Dig out the soil for 16” depth.
2. Pick out weeds, stones, Bricks etc.,
3. Give required shape as gentle slope, terraces, mounds etc.,
4. Spread 4”-6” thickness of weed free red soil, break clods.
5. Wet the land and if there are any shrinkages cover with extra red soil.
6. Turfing or dibbling of selected lawn species such as Calcutta doob, Fescue, Burmuda varieties like Sun bird, transcontinenta l, Mexican or Korean Carpet etc.,
7. Immediately after dibbling sprinkle water, followed by regular daily water ing.
8. Rolling of lawn may be done for better set.
9. Application of neem cake, urea, vermi-compost and water whenever lawn become pale green or sickly.
10. Periodic lawn mowing and spraying. (Mow Fescue or Burmuda grasses every 15 days and carpet grass every 60 days).

Turf Varieties

Hybrid Bermuda Selection 1 (Cynodon Dactylon)

Fast growing soft variety, suitable for well drained areas with moderate rainfall. Easy to mow, suitable for very large areas. Repairs itself quickly from damage. Suitable for sports fields, party lawns and public parks. Requires frequent mowing to be kept in top condition.

Korean (Zoysia Matrella)

Slow growing dense grass, slightly shade tolerant, requiring infrequent mowing at a level of 1". Useful for small areas, semi-shaded, slightly coarse and a little pricky. Mowing this variety is comparatively difficult.

Paspalum (Paspalum Notatum)

Suitable for all areas including very heavy rainfall and large lawns. Tolerant to shade & temporary submergence. Grows aggressively over-running weeds.

St. Augustine Green (Stenotaphrum Secundatum)

Dark green dense grass, broad flat blades, commonly known as "runners". Used best as ground cover, underneath trees. Tolerates heavy rainfall, most suitable to resolve a difficult situation where grass cannot be put due to shade.

Turf Varieties

Centipede (Eremochloa Ophiuroides)
Warm-season dense, grass medium to coarse textured grass blade, requires low fertilization & maintenance. Excellent growth in humid climates, withstands water submergence. Ideal for usage in areas with heavy rainfall and humid climates such as the coastal regions.

Turf Selection Guide

Variety	Color	Texture	Shade Tolerance	Maintenance	Ideal For
Hybrid Bermuda Selection 1	Dark Green	Very fine and soft	4	Moderate to high	Sports Fields, party lawns, sunny areas of heavy usage
Korean (Zoysia Matrella)	Leaf Green	Medium coarse, little pricky	6	Moderate	Small areas, light use, semi-shade
Paspalum Notatum	Emerald Green	Medium coarse	8	Low	Landscape, ground cover, soil conservation, shaded areas
St. Augustine Green	Dark Green	Semi-coarse	9	Moderate	Landscape, ground cover, soil conservation, shaded areas
Centipede	Medium Green	Medium coarse	4	Lowest	Heavy rains, humid climate , coastal areas

*The color reflected above is indicative. The actual grass color may vary depending on soil, fertilizer & climatic conditions.

CHAPTER - 16

CHRYSANTHEMUM

Chrysanthemum is next only to rose in importance among the flowers in the world. it is versatile, can be planted in the bed, cultured in the pot, used for garland - making and also as cut flower for flower arrangement.

Chrysanthemum Blooms are Two Types

a. Disc-floret situated, in the center, tubular with five united petals. They are usually shorter and contain both male and female reproductive parts; they are called perfect flowers

b. Ray-floret which surround the disc-florets and are comparatively longer, vary in shape, colour and direction of growth. The ray-florets are called imperfect flowers as they contain only the female reproductive parts.

Growing Requirements of Chrysanthemum

Chrysanthemum plants are easiest of all perennials to grow

1. Produce large number of flowers if they are planted / placed in full sunshine. They respond to plenty of food and moisture
2. There are hundreds of vanities of Chrysanthemums, Giving you a multitude of options for height, colour, flower size and time of bloom. You can pick and choose to fit your wants and needs when you visit the Nursery.
3. They should be planted into well prepared, fertile, sandy media, they resent 'WET FOOT' .

Cultivation

1. Chrysanthemum plants have a fibrous root system which is sensitive to waterlogging. prone to attack by diseases and pests, but, fairly tolerent to drought.
2. Ideal soil mixture pH to be'6.2-6.7 is required.
3. Light. Chrysanthemum plants continue to grow vegetatively till the nights are shorter than critical level (91/2 hr for most traditium 'I varieties.)
4. Temperature : The growth rate in chrysanthemum remains at low level at or below 100C. As the temperature is raised to 150 C the growth rate increases rapidly.

Cultural Practices

1. Propagation Age-old method of propagation from suckers, it is easy to establish and almost no mortality and easy take-off due to already persistent roots. However cuttings also root well
2. Feeding : In early stages supply nitrogen using only organic manures. Phosphorus is best applied as basal dressing since it is released slowly. Proportion of Potassium should be increased as the flower buds appear.
3. Water management : The frequency of watering depends on the stage of growth, soil and weather conditions. Avoid water logging during the rainy season. Potted plants are either provided temporary shelter or kept in horizontal position during the constant downpour.

4. Nipping of growing tips encourages multiple branching and results better plant shape and more flowers.

Plant Protection

Pests

1. Aphids and Thrips (Sucking pests) : Spraying of mild insecticides like tobacco leaf decoction or malathion 2m1 / liter of water is effective against them.
2. Red spider mite : Spraying with Metasystox or Kelthane 2m1/liter of water controls the pest
3. Hairy caterpillar (Diacrsia obliqua) : Manual collection in mild attacks and spray of Ekalux 2m1/litre of water at weekly intervals in heavy infestation.
4. Grub (Holotrichia) : Soil application of Carbofuran 3G 10gms/cubic feet of soil in the pot.

Diseases

1. Root rot (caused by Pythium spp. or Rhizoctonia sp.) : Use sterilized medium, and treatment of cuttings and the medium with Thiram and Captan effectively control it
2. Leaf spot (caused by Septoria Chrysanthemella) : Greyish brown spots appear on leaves which turn yellow and ultimately die. The disease spreads from below upwards. It can be controlled by Bavistin lgms or Dithane M-45 3gms/litre of water
3. Wilt (caused by Verticillium) : The leaves turn yellow to grey and the branch or whole plant gradually. The use of disease-free planting material and planting in sterilized medium prevent the infection.
4. Stunt (caused by stunt virus) : Spreads by mechanical means through cutting knife or secateur resulting in the overall dwarfing, paleness in leaf colour and the appearance of small yellow green dots in summer in some varieties.
5. A spermy (caused by aspermy virus) : This virus is transmitted by aphids and results in distortion of flower and reduction in flower size with florets becoming wary. Heat therapy considerably reduces the incidence and consists of keeping the plant at 400C for 2 hours and also control of sucking pests

Aloha

Aztec gold

Candy stripe

Cancun

Courtade

Dean conklin

DWF deciduous

Elena

Fngle wood

Mother theresa

Neelima

Pink cloud

Purnima

Purnima white

Pusa anmol

Shanti

Shanti

Shukla

Swetasagar

Tata century

Texas gold

Vasastica

Vasnilika-B

Vijay

Vijay karan

White bouquet

White prolific

White star

Yellow gold

Yellow reflex

CHAPTER - 17

RARE TREES IN CPWD LOCATIONS

Maha Bodhi Tree at Budha Jayanti Park

1. Maha Bodhi Tree (Ficus relegiosa)

A Bal – Boudh Tree was planted in the Budha Jayanti Park by then Prime Minister Shri. Lal Bahadur Shastri on 25.10.1964, which was presented by Her Highness Sri Mao Bhandar Nayake the then Prime Minister of Sri Lanka. A sapling was planted in this park which was taken from the Holy Bodhi Tree in Sri Lanka. It was during the 3rd century when Princess Sanghamitra who was King Ashoka's daughter took a sapling from the ancient original Bodh Tree situated in Bihar believed to be the tree under which lord Buddha spent days during his meditation period up till he attained Nirvana or Enlightenment and hence is considered very Holy and Sacred to all and carried it to Sri Lanka where she planted, nurtured and attended to it with love and care up till it grew very tall, thick and green. It was also known that she used to preach Buddhism under this very tree which exists even today.

A small temple beneath the Bodhi tree, Bodh Gaya, built in 7th century, after the original built by King Ashoka in 3rd century BCE, c. 1810 The spot was used as a shrine even in the lifetime of the Buddha. King Asoka was most diligent in paying homage to the Bodhi tree, and held a festival every year in its honour in the month of Kattika. His queen, Tissarakkhā was jealous of the Tree, and three years after she became queen (i.e., in the nineteenth year of Asoka's reign), she caused the tree to be killed by means of mandu thorns. The tree, however, grew again, and a great

monastery was attached to the Bodhimanda called the Bodhimanda Vihara. Among those present at the foundation of the Mahā Thūpa are mentioned thirty thousand monks from the Bodhimanda Vihara, led by Cittagutta.

Ficus Krishnae Tree at Budha Jayanti Park

Leaf of Ficus Krishna

2. Makhan Katori (Ficus krishnae)

A small tree with folded leaves joined at the base which appear like containers of ice-cream (kulphis). The legend is that Krishna used to store butter in the leaves.

Propagated from seed, as a curiosity, it should be grown in all public parks and gardens. FicusKrishnae Tree, or Krishna Fig Tree, is known as Makhan Katori or Krishna Badh in local languages. The leaf of the tree is in the shape of a cup – Krishna's Butter Cup. There is an interesting story which narrates how the leaves of the tree got the shape of a leaf. It is said that in the beginning, the leaves of Krishna Fig tree were straight and it did not have the cup shape. A naughty episode of Krishna was responsible for the leaves taking cup shape. The "Sacred fig tree" probably a form of benghalensis, small tree sacred to the Hindu god Krishna, said to have folded its leaves into cups to leathery, irregularly cupped, deep green leaves with raised ivory ribs, finely pubescent inside, on grayish branches. Very interesting collection plant because of its curious leaves.

Kalapvriksha at
Budha Jayanti Park

Kalapvriksha at Raj Ghat

3. Kalapvriksh (Adansonia digitata)

A genus of eight species of tree, six native to Madagascar, one native to mainland Africa and the Arabian Peninsula and one to Australia. The mainland African species also occurs on Madagascar, but it is not a native of that island, and was introduced in ancient times to south Asia and during the colonial era to the Caribbean. A ninth species was identified in 2012, incorporating upland populations of southern and eastern Africa.A typical common name is baobab. Other common names include boab, boaboa, tabaldi, bottle tree, upside-down tree, and monkey bread tree. The generic name honoursMichelAdanson, the French naturalist and explorer who described Adansoniadigitata Adansonias reach heights of 5 to 30 m (16 to 98 ft) and have trunk diameters of 7 to 11 m (23 to 36 ft). Glencoe baobab – an African baobab specimen in Limpopo Province, South Africa, often considered the largest example alive – up to recent times had a circumference of 47 m (154 ft). Its diameter is estimated at about 15.9 m (52 ft). Recently the tree split up into two parts and it is possible that the stoutest tree now is Sunland baobab, also in South Africa. The diameter of this tree is 10.64 m (34.9 ft), with an approximate circumference of 33.4 m (110 ft).Some baobabs are reputed to be many thousands of years old, which is difficult to verify, as the wood does not produce annual growth rings, though radiocarbon dating may be able to provide age data.

Terminalia Bellirica at Budha Jayanti Park

4. Baheda (Terminalia bellirica)

Baheda is a large deciduous tree found throughout India, in areas up to an altitude of 1,000 meters. The tree takes a height of 30 meters, while the bark is brownish grey in color. The alternate, broadly elliptic leaves are clustered towards the end of the branches. They are 10 to 12 cm in length and 7 to 14 cm in breadth. The simple, solitary flowers are in auxiliary spikes, with offensive odor. They blossom in the month of May. The fruits are ovoid grey drupes and the kernels are sweet, but narcotic. The tree is found in abundance in Madhya Pradesh, Uttar Pradesh, Punjab and Maharashtra. It is known as vibhitaki, karshaphala and kalidruma in Sanskrit and bahera in Hindi.

Uses & Benefits of Baheda

- Beleric is a rejuvenative and laxative. It proves beneficial for hair, throat and eyes.
- Beleric seed oil or fruit paste is applied on swollen and painful parts.
- The seed oil gives excellent results in skin diseases and premature graying of hair.
- Fruit pieces are baked and chewed for cough, cold, hoarseness of voice and asthma.
- Beleric fruit is powdered and used to dress wounds to arrest the bleeding.
- Beleric fruits and kernels are used in making medicated hair oil, used to alleviate pain and burning sensation, boost hair growth and impart black color to the hair.
- The paste of the fruit is applied on eyelids, in case of conjunctivitis.
- The herb is used in various eye ailments, such as myopia, corneal opacity, pterigium, immature cataract, chronic and acute infective conditions.
- Beleric helps in loss of appetite, flatulence, thirst, piles and worms.
- The ripened fruit acts as an astringent and anti-diarrheal.
- The decoction of the kernels is used in case of excessive thirst and vomiting.
- Beleric plant alleviates cough, relieves blocked phlegm, controls bleeding in the sputum and eases bronchospasms.
- It prevents ageing, imparts longevity, boosts immunity, improves mental faculties and enhances the body resistance against diseases.
- It helps in lowering cholesterol and blood pressure.

Largerstroemia Lancasterai at Rajpath

5. Largerstroemia (Largerstroemia lancasterai)

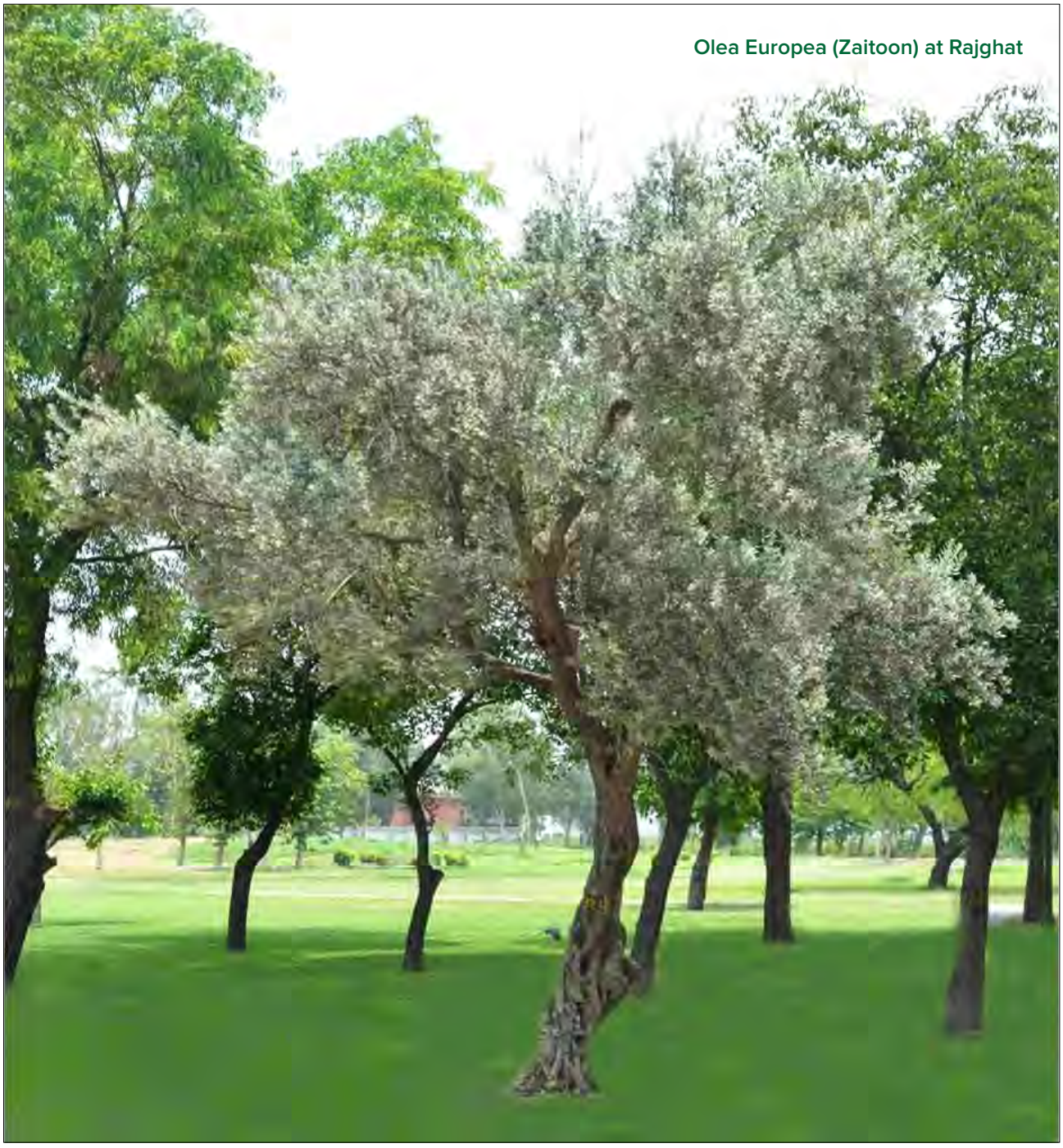
Lagerstroemia, commonly known as Crepe Myrtle, is a genus of about 50 species of flowering shrubs and trees. Native to the Indian subcontinent, South Asia and Oceania, most species of Lagerstroemia are found in Pakistan, India, Bangladesh, China, Australia and parts of Central America.

Lagerstroemia Lancasterai bears beautiful flowers of white colors in summer. In full bloom, bright green leaves and clusters of flowers make it an excellent choice as ornamental tree for homes and gardens. Lagerstroemia sheds its leaves in a gradual process so you would hardly find it completely bare. Flowers contain six or seven crumpled and wrinkled petals, that is why, Lagerstroemia is also called Crepe Flowers tree.

Ficus Macdonald at Rajghat

6. Ficus (Ficus macdonald)

It is a gynodioecious (functionally dioecious), deciduous tree or large shrub, growing to a height of 6.9–10 metres (23–33 ft), with smooth white bark. Its fragrant leaves are 12–25 centimetres (4.7–9.8 in) long and 10–18 centimetres (3.9–7.1 in) across, and deeply lobed with three or five lobes. The complex inflorescence consists of a hollow fleshy structure called the syconium, which is lined with numerous unisexual flowers.



Olea Europea (Zaitoon) at Rajghat

7. Zaitoon (Olea europea)

Zaitoon tree is also known as olive tree and produces the gray green flowers in winter season. The plant of olive reaches the height of 3 meters, leaves are bright green and very attractive and the fruits are of bright bluish or violet color, possesses a metallic taste. It is known from old ages. During the excavation of ancient Egyptian graves, vessels full of olive oil were found with other articles. According to the scholars of Hadith, on subsidence of Toofan-E-Nooh (The Great Flood of Noah), when water level came down, the first thing on the earth that was seen was the olive plant.

Bombax ceiba tree
at 1 Moti Lal Nehru Marg

8. Cotton tree (Bombax ceiba)

Like other trees of the genus *Bombax*, is commonly known as **cotton tree**. This tropical tree has a straight tall trunk and its leaves are deciduous in winter. Red flowers with 5 petals appear in the spring before the new foliage. It produces a capsule which, when ripe, contains white fibres like cotton. Although its stout trunk suggests that it is useful for timber, its wood is too soft to be very useful. Bombax ceiba grows to an average of 20 meters, with old trees up to 60 meters in wet tropical weather. The leaves are palmate with about 6 leaflets radiating from a central point, an average of 7~10 centimeters wide, 13~15 centimeters in length. The leaf's long flexible petiole is up to 20 cm longer. Seeds are numerous, long, ovoid, black or gray in colour and packed in white cotton. The fruit, which reaches an average of 13 centimeters in length, is light-green in color in immature fruits, brown in mature fruits. This tr It is widely planted in parks and on roadsides there because of its beautiful red flowers which bloom in March/ April. This tree is quite common in New Delhi. The cotton fibers of this tree can be seen floating in the wind around the time of early May. This tree shows two marked growth sprints in India- in spring and during the monsoon months. This tree is commonly known as *Semal (Hindi:* सेमल*)* This tree is also found in the eastern parts of Pakistan, especially in the eastern city of Lahore. The local Urdu and Punjabi name for the tree is 'Sumbal'. Plant pacifies vitiated pitta, wounds, ulcers, skin diseases, hemorrhoids, urinary calculus, cystitis, inflammations, cough, bronchitis and dark discolorations on face.

Swietenia Senegalensis Tree at Govt. Sunder Nursery

9. Swietenia (Swietenia senegalensis)

Swietenia senegalensis (Khaya, African Mahagony) :- It is tree with shining leaves upto 100ft tall. Leaves are compound drying pale glaucous green. Flowers normally have four parts. Sepals are pale green, petals and stamina tube are cream colored, fruit is normally very much valuable.

Celtis Tetrandra at Govt. Sunder Nursery

10. Khirk (Celtis terandra)

A medium sized tree up to 30m height. Leaves simple, alternate, obliquely ovate. Margin, serrate from apex to below. Flowers polygamous, yellow born on leafless shoots. Fruit is hard when dry, edible bitter to taste. Flowering from January to March. Fruiting from Feb. to April a medium sized tree.

Guazuma Ulmifloia Tree at Govt Sunder Nursery

11. Guazuma (Guazuma ulmifolia)

It is small to medium size tree upto 30m height and 30 to 40 cm in diameter. Leaves are in alternates pattern, ovate, finely saw toothed margin with darker green upper surface and pale green below. The flowers come in panicles and are short stalked, have brown yellow color and are lightly fragrant. The fruits, which are capsules, have many seeds.

Agathis Robusta Tree at Govt. Sunder Nursery

12. Kauri Pine (Agathis robusta)

it is a large evergreen trees growing straight. Height 30 to 50m with smooth scaly bark. The leaves are broad, tough and leathery in texture. The seed cones are globose and mature in 18 – 20 months after pollination. They disintegrate at maturity to release the seeds. The male cones are cylindrical.

Swietenia Mahagoni Tree at Govt. Sunder Nursery

13. Swietenia (Swietenia mahagoni)

it is a tall tree 30 m height upto 1 m dia and large spherical crown, dense shade. The bark is reddish brown on large trees. Leaves are shiny dark green, lance shaped, flowers greenish yellow. The light brown seeds capsule stands upright with 5 valves. Each valve releases about 20 flat brown winged seeds.

Bolusanthus Speciosus Tree at Govt. Sunder Nursery

14. Bolusanthus (Bolusanthus speciosus)

The tree is evergreen may drop leaves in winter. Leaves are lanceollate, shiny green above paler below. Fruit is flat thin light brown to grey, pod, 0from Sept. to January. The dark fissured bark drooping foliage and attractive flower. Low maintenance garden tree.

Atalantia Monophylla Tree at Govt. Sunder Nursery

15. Jangli Nimbu (Atalantia monophylla)

Indian atalantia is a small much branched tree with single sharp spines. Leaves are bright green above paler and reticulate-veined below, ovate or elliptical with margins slightly wavy. Flowers are long stalked in clusters. Fruit globose yellowish green when ripe.

Albizia Lucidor (Potka Siris) Tree at Govt. Sunder Nursery

16. Potka Siris (Albizia lucidor)

It is fast growing beautiful trees. The large compound leaves are unique. Flower are clusters of small powder puff. Fruit pod is flat, dark brown. Flowering June to July.

Caesalpinia Ferrea (Khirk) Tree at Govt. Sunder Nursery

17. Khirk (Caesalpinia ferrea)

It is a beautiful tree with white and chocolates flaking bark thus called leopard tree. The tree is long, drooping branches with feathery leave. The flower are yellow small fragrant. The wood is used for finger boards of electric basses, guitars, flooring, fancy furniture.

Mesua Ferrea Tree (Nag Keshar or Nag Champa at Govt. Sunder Nusery

18. Nag keshar or Nag Champa (Mesua ferrea)

A handsome Indian evergreen tree, of small to medium size upto 13m. Simple oblong green leaves, the emerging young leaves are red to yellowish pink. The flower are white with numerous yellow stamens. The flower's are used for making incense and used to stuff pillows. The national tree is Sri Lanka. The oil from seeds is used for treating sores, scabies, wounds and rheumatism. The root is used as an antidote for snake poison.

Bridelia Retusa Tree at Govt. Sunder Nursery

19. Kasai (Bridelia retusa)

Tree is indentified by rigid leathery leaves, strong spines on the barks of young stems. Flowers are arranged on leafless branches appearing as spikes with small acute bract. Fruit is globose, fleshy, sweetish taste, size of a pea, purple black. Flowering May- August. The bark is used for the removal of urinary concretions in Ayurveda. Root and bark are valuable astringents.

Dillenia Indica Tree at Govt. Sunder Nursery

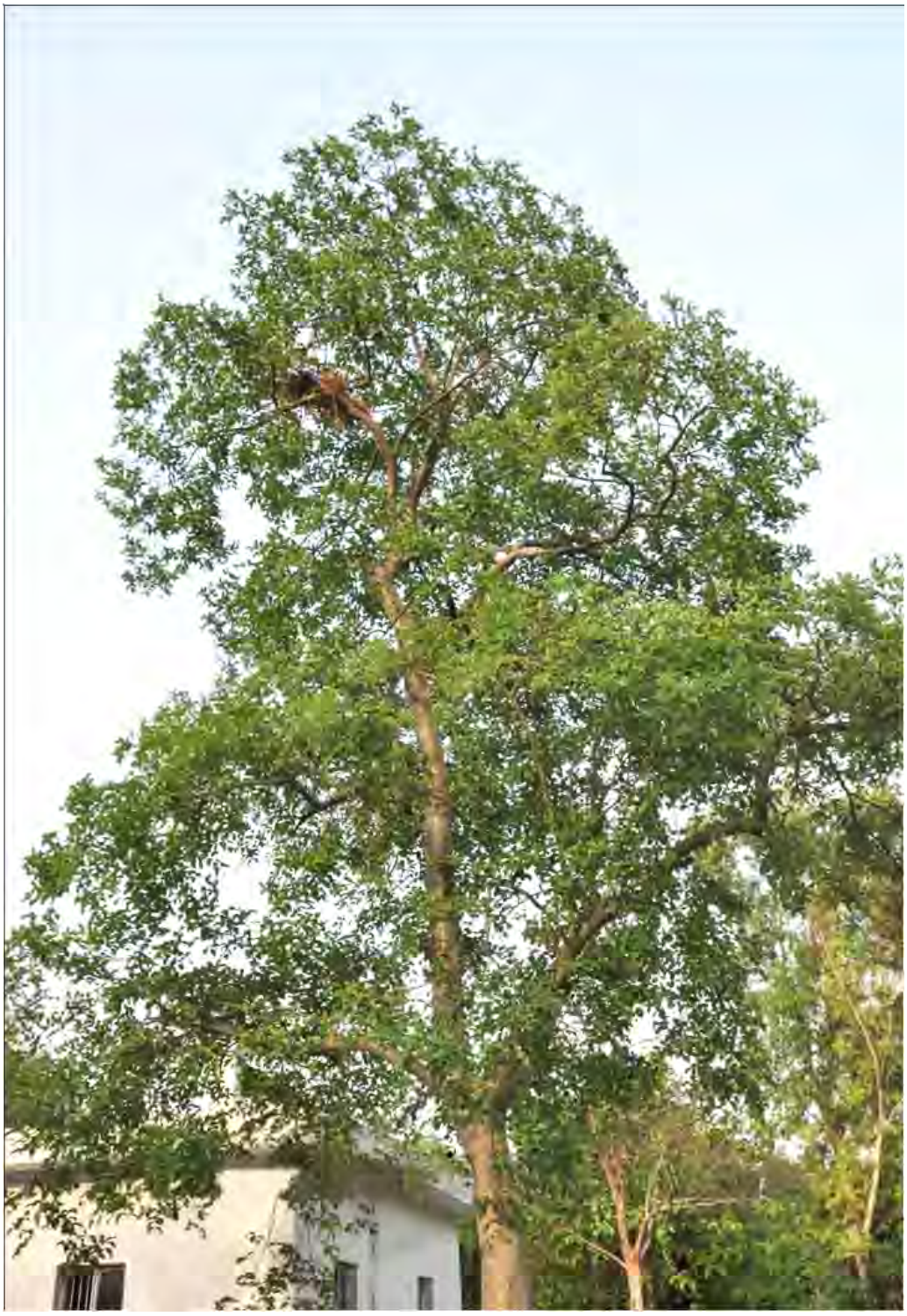
20. Elephant Apple (Dillenia indica)

Elephant Apple (Chalta) is small to medium sized tree upto 15m tall. The leaves are long with corrugated surface. The flowers are large with five white petals and yellow stamen's. The fruit having seeds with edible pulp. The pulp is used in curries, Jam & Jellies.

Pterospermum Xylocarpum (Tada) Tree at Govt. Sunder Nursery

21. Tada (Pterospermum xylocarpum)

Trees are small 5-8 m tall. Leaves ovate, elliptic base uniquely cordate white wooly beneath glabrous above. Flower's white solitary, capsules pyriform seeds winged. Wood is used for furniture.



Largerstroemia Microcarpa (Benteak) Tree at Govt. Sunder Nursery

22. Benteak (Largerstroemia microcarpa)

It is a deciduous tree. Grow upto 10-15m height. The bark is of ash color oppositely arranged leaves. White flowers are borne in large compound panicles. Seeds are winged. Flowers in May – June.

Markhania Lutea Tree at Govt. Sunder Nursery

23. Siala (Markhania Lutea)

The tree is 10-15m high having leaves 20-30cm in length. Bark light brown. Flowers are bright yellow trumpet shaped. Fruit is very long thin brown capsules borne in clusters, release winged transparent seeds.

Bistendu (Diospyros Cordifolia) Tree at Vijay Chowk

24. Bistendu (Diospyros montana)

Bistendu is a small deciduous tree with spiny trunk and spiny older branches. Leaves are elliptic lanceshaped, somewhat heart-shaped at the base and sharp or blunt at the tip. They are smooth above and velvety on the underside. Male and female flowers grow on separate trees. Male flowers are borne in 3-flowered clusters, and the female ones singly. Flowers are creamy white or greenish-white, tubular, with 4 petals which are curved back. Sepals are ovate, velvety. Stamens of male flowers are longer than the flower tube. Fruit is spherical, cherry sized, yellow when ripe. Flowering: March-April.

Branch of Rudraksha Tree

25. Rudraksha (Elaeocarpus Ganitrus)

Rudraksha grows in the area from the Gangetic Plain in foothills of the Himalayas to South-East Asia. Rudraksha seeds are covered by an outer shell of blue color when fully ripe, and for this reason are also known as blueberry beads. The blue colour is derived not from pigment but is structural. It is an evergreen tree that grows quickly. Rudraksha Tree starts bearing fruit in three to four years. As the tree matures, the roots buttress rising up narrowly near the trunk and radiating out along the surface of the ground.

The seeds show variation in the number of grooves on their surface, and are classified on the basis of the number of divisions that they have. Different qualities are attributed to the rudraksha based on the number of grooves, or 'faces' that it has. A common type has five divisions, and these are considered to be symbolic of the five faces of Shiva. It can only be worn with red string or a gold chain.

Rudraksha Tree at 6 Moti Lal Nehru Marg

According to the Ayurvedic medical system, wearing Rudraksha can have a positive effect on the heart and nerves, and relieve you from stress, anxiety, depression, palpitations and lack of concentration. It is also known for its anti ageing effect, and electromagnetic and inductive properties. People with high blood pressure have been found have benefited from the use of Rudraksha seeds.

CHAPTER - 18

MIRACLE FRUIT

Miracle fruit, (Synsepalum dulcificum), also called miracle berry, of the family Sapotaceae, grown for its mild fruits that make subsequently eaten sour foods taste sweet. The miracle fruit is native to tropical where it is used locally to sweeten palm wine and other beverages. The unrelated sweet prayer plant (Thaumatococcus daniellii) is also known as miracle fruit for its similar ability to make sour foods taste sweet.

The miracle fruit plant grows as a dense shrub or small tree, usually not more than 5.5 metres (18 feet) in height in the wild and generally smaller when cultivated. The simple leaves are oval and tapering at the base with smooth margins and feature a waxy underside; they grow in spire like clusters at the ends of small branches. The small white flowers give rise to red drupe fruits that are about 2–3 cm (0.8–1.2 inches) in length. Plants typically begin producing fruit after three or four years and require acidic soil.

The flavour-altering mechanism of miracle fruit is due to a glycoprotein named miraculin, which was first isolated by Japanese researcher Kenzo Kurihara in 1968. Although miraculin itself is not sweet, it binds to receptors on the taste buds and causes acidic foods to be perceived as sweet. The effect typically lasts from a half hour

Miracle Fruit Leaves and unusual flowers of the Miracle Fruit plant (Synsepalum Dulcificum)

to two hours, with the intensity declining over time. The fruit has been proposed as a treatment for the taste changes experienced by some chemotherapy patients, though further studies are needed. In the United States an attempt was made in the 1970s to commercialize the fruit extract as a low-calorie or noncaloric sweetener for use by diabetics and dieters, but the U.S. Food and Drug Administration (FDA) classified the product as a food additive requiring further safety testing, and the venture was abandoned. Similarly, the European Union required a safety assessment before miracle fruit extracts could be used as a food additive, though miraculin has been approved in Japan. The purchase of powdered or whole fruits is legal in most places, and the fruit is commonly consumed as a novelty.

For people looking for a delicious and exotic berry to add to their diet, the miracle fruit is an excellent option. It has a plenty of benefits for your body which include its ability to aid in weight loss, improve vision health and boost immunity, among others. That being said, before adding any new food to your diet, it is critical to understand where it comes from, what it contains, and the possible health benefits it may hold.

Miracle fruit is one of the common names of Synsepalum dulcificum, a shrub that is native to western Africa, where it has been in use for centuries. Most notably, miracle fruit has the ability to make sour food taste sweet, thanks to a compound called miraculin. Miraculin is able to bind to the tongue's taste buds, which blocks the receptors when the pH level of the mouth is neutral. However, when we eat sour fruit, the pH of the mouth drops, and miraculin is able to activate the sweet receptors while blocking the sour ones.

Aside from the novel aspects of miracle fruit, also known as miracle berry, sweet berry, and as this fruit has a number of unique nutrients that can positively affect health. These small berries are the size of cherry tomatoes and each contains a single seed, roughly the size of a coffee bean. The berries are typically consumed raw and are actually tasteless when eaten alone, but the fruit pulp can also be mixed into fruit smoothies or other sweet desserts. Some restaurants around the world use miracle fruit as a complement to their dishes, allowing diners to revel in the strangeness of eating sour food, but tasting a sweet treat instead!

Miracle fruit is not a great source of traditional nutrients, but there are notable amounts of vitamin C, vitamin K, vitamin A, vitamin E and various amino acids that the body requires for numerous functions. The fruit is incredibly low in calories, only 1/2 calorie per berry, and also boasts a number of polyphenolic compounds and antioxidants that make you healthy.

The most notable benefits of miracle fruit include its ability to manage diabetic symptoms, aid in weight loss efforts, improve the strength of the immune system, boost vision health and prevent chronic disease, among others.

By acting as a low-calorie, sugar-free additive in many meals, this fruit is an excellent aid in your weight loss efforts. It will not contribute to your overall calorie intake, nor is it packed with simple sugars and carbs that can lead to weight gain.

Although only trace amounts of vitamin C are present in this fruit, it can still give a small boost to your immune system. Vitamin C stimulates the production of white blood cells, which are the body's main line of defense against pathogens and infections.

There are also trace amounts of vitamin A found in this fruit, which has been directly

linked to improved vision health, specifically a lower risk of macular degeneration and cataract formation as you age.

Perhaps the most important health benefit of miracle fruit is enjoyed by diabetic patients, who can safely replace sugar in their diet with this berry. Apart from the flavor impact, some of the active ingredients in this fruit can naturally lower insulin sensitivity, which is good news for diabetic patients.

The number of polyphenolic compounds found in this fruit will give your body an antioxidant boost, which can lower levels of free radicals and reduce oxidative stress in organ systems.

Miracle fruit is used in various ways around the world, but its use is primarily linked to its flavor-altering properties. It is commonly added to desserts and other foods that may have a tart flavor, or it is used as a replacement for sugar in foods. For example, if you have a sweet tooth but are trying to cut down on your sugar intake, using miracle fruit in conjunction with sour food can give you the sweet burst you're looking for.

Miracle fruit is also used by some for medical purposes, such as changing the flavor of unpleasant medications or lessening the side effect of certain treatments. Miracle fruit is often found as a complementary item in a dish at restaurants that advertise unique flavor experiences.

Despite the potential health benefits and novel abilities of this fruit, miracle fruit does have some side effects that should be considered, such as high acidity and gastrointestinal problems.

Acidity – Using this fruit can enable you to eat more sour foods, but only taste them as being sweet. While this is a unique property, it can allow you to eat an excess of sour foods, which could result in elevated acidity levels in the body.

Stomach Issues – Similarly, this fruit could also allow you to eat spicy food without feeling the heat, which could lead to heartburn or gastrointestinal distress. Use this berry in moderation, and be aware of what types of food you are eating to avoid unnecessary problems.

Landscape Design

CHAPTER - 19

DETAILS OF CPWD PARKS

1. Buddha Jayanti Park

Pt. JawaharLal Nehru, pioneer of Modern India and a man of far sightedness had the idea to commemorate the 2500th birth anniversary of Lord Buddha by laying a park commiserative to his status and teachings of making the mankind free from sufferings. The Buddha Jayanti Park is seen with a large Statue of Lord Buddha in a sitting posture covered in Gold Coloured paint erected on a flat raised Platform supported by pavilions on all directions. The platform and Statue were established on October 1993 over an artificial Island created within the premises of this park as a respect and tribute to H.H. Dalai Lama the 14th . A sapling was planted in this park which was taken from the Holy Bodh Tree in Sri Lanka. It was during the 3rd century when Princess Sanghamitra who was King Ashoka's daughter took a sapling from the ancient original Bodh Tree situated in Bihar believed to be the tree under which lord Buddha spent days during his meditation period up till he attained Nirvana or Enlightenment and hence is considered very Holy and Sacred to all and carried it to Sri Lanka where she planted, nurtured and attended to it with love and care up till it grew very tall, thick and green. It was also known that she used to preach Buddhism under this very tree which exists even today.

The speech of 1st Prime Minister of India Pt. JawaharLal Nehru in UN General Assembly New York in Nov. 10th 1961 had also been displayed on a big stone in 1965 on international co-operation year in Hindi and English version. A Bal – Boudh Tree was planted in the park by then Prime Minister Shri. LalBahadurShastri on 24.10.1964, which was presented by Her Highness Sri Mao BhandarNayake the then Prime Minister of Sri Lanka.

The approximately 70 acres of land for this park was allotted by the L&D.O. long back. A great care has been taken to keep the Buddha Jayanti Park free from all sorts of pollution after preserving the topography of land, rocks and hillocks and flora and fauna of the ridge in which it is located. This Park is being maintained by CPWD . The natural trees, shrubs and other flora and fauna had not been disturbed at all while making the park. Most of the trees planted there are of indigenous nature and ecological balance has been maintained in a nice way. In the last year Colour Garden, Canna Garden, Medicinal Garden, Rose Garden, Palm Garden, Cactus Garden, Bulbous Garden, Bamboo Garden, Rock Garden and Fragrance Garden have been created. The Buddha Jayanti Park is seen crowded with mostly with Youngsters, early morning joggers and Yoga enthusiast; however, most Family along with Friend's are seen here, especially during weekends, where they spend fun time after a good picnic lunch with each other. Young couples mostly visit this park during weekdays as it generally remains quit and free of the usual family crowd and hence gives them a quiet time and ample space to spend private time with each other.

Major part of the Garden is covered by different varieties of Bougainvilleas which gives a very good look during its flowering time and those can be seen in these pictures.

Buddha Statue at Buddha Jayanati Park

BUDDHA GARDEN

BUDDHA GARDEN

BUDDHA GARDEN

BUDDHA GARDEN

Buddha Statue in the Buddha Jayanati Park

The installation of the statue of Lord Buddha at Buddha Jayanti Park in New Delhi is an historic event. This monument with a canopy is being dedicated as a symbol of the gratitude of His Holiness the Dalai Lama to the people and government of India for their sustained effort in promoting the cause of world peach and understanding. In 1983 His Holiness expressed a wish to erect a monument in Delhi under such a dedication. Following that, Tibet House, the Cultural Centre of His Holiness, approached the Government of India with a proposal to install a statue of the Buddha under a canopy in Buddha Jayanti Park. This would not only be an ornament to the park but also a befitting monument in honour of one of the greatest sons of India, who showed the Universal path to Freedom from suffering through personal example over 2,500 years ago.

Through the sympathetic consideration of the Ministry of Urban Development, the Delhi Urban Art Commission and other authorities, a plot of land was made available to Tibet House for the installation of the statue and canopy in Buddha Jayanti Park. In 1987, the then Prime Minister, Shri Rajiv Gandhi, approved a model of the proposed structure, the design and proportions of which were finalized in consultation with the appropriate authorities in 1988. The design as a whole symbolizes a harmonious union of diversities-racial, linguistic, communal etc. – a unit which has been the core of the message of His Holiness the Dalai Lama. The structure in its entirety may be viewed as a journey through stages to this goal, rising from the base to the topmost spire, of the complete realization of compassion and wisdom. It is a symbol of this process of manifestation, and a representation of non-daulity.

Its name, natural topography and pattern of vegetation made Buddha Jayanti Park an appropriate setting for the statue of the Buddha. Placed on an island in the Park, this new monument faces east, exactly as the Kalacakra Mandala is oriented, and the direction in which the Buddha sat under the Bodhi tree at Bodh Gaya when He attained Enlightenment.

The entire structure embodies a cluster of Buddhist symbols and meanings. The base is set within an embankment with five concentric rings representing the five elements – earth, water, fire, wind and space. The design of the base is fashioned after the Kalacakra Mandala, the last system of mandalas introduced to Tibet from India. (Besides their deep spiritual message, the teachings of the Kalacakra were a historical response to the various threats, such as internal riots and external aggression, that endangered the unity of the diverse communities of the India of the time.)

The canopy has a three-tiered base on each of its four sides, which together signify the twelve channels (nadis). Its four pillars represent the four energy drops (bindus), apart from supporting the dome and upper parts of the canopy. The ten directions of the canopy represent the ten vitalities (pranas). The nadis, bindus and pranas are the vital constituents of the human body in the Kalacakra system of Tantra. The parapet and the upper reaches of the canopy are ornamented with intricate Tibetan designs, while the dome symbolizes the vital factors of enlightment. Above the dome, a square and conical structure represent the constituents of the Noble Path, while thirteen rings on the core are symbols of the ten strengths and three mindfulnesses of an Enlightened being. The chatra represents the all pervasive compassion (mahakaruna) of the Buddha, and the topmost spire the nobility of his attainment.

Altogether, the six parts of the canopy – base, columns, dome, cone – chatra and spire, correspond to the six chakras which form the centres of subtle energy in this human body; but the design of the upper reaches of the canopy follows that of the historic Gyantse Stupa, Palkhor Choten – in Tibet.

The statue of the Buddha has been designed in traditional Tibetan style of Mr Pemba Dorje, a skilled Tibetan craftsman in Dharamsala. It is made from beaten copper glided with gold, and is eight feet high including the pedestal. The right hand of the Buddha is shown in the Bhumisparsa Mudra, and the positioning of the statue on a raised throne symbolizes His message that all beings have the potential to attain the highest goal of Buddhahood.

The statue is placed on a throne which contains an engraving of Bhumidevi, the Earth Goddess. When challenged by Mara to provide a witness to testify to the merits He had attained, the Buddha touched the earth (bhumisparsa), invoking it to bear witness. Bhumidevi emerged from the earth to testify for Him. It is our responsibility now to care more deeply for Mother Earth, who is depicted in the engraving as pleading for the attention of her children.

The canopy is about forty feet at its highest point and is built in sandstone mined and transported from Bansi Paharpur in Sikar district, Rajasthan. The craftsmen who transformed the stone into a beautiful edifice are also from Rajasthan and belong to communities of traditional temple builders. An initial design of the canopy was done by Kazuhiro Nakahari of Thanka Architects and his team, but that assumed a larger structure and site than ultimately became feasible. The beautiful structure that has now been completed was designed and its construction and landscaping coordinated by M.N. Ashish Ganju Mark Warner Rajiv Narain Architects.

2. Bhagwan Mahavir Vanasthali Park

Bhagwan Mahavir Vanasthali Park is situated on the Ridge Road towards the southern ridge which lies close to Dhaula Kuwan or alternatively from Sardar Patel Marg and is easily reachable by local transport. It spreads over the area of 25 acres of land and is seen planted with ornamental and green trees, shrubs, flower beds and lawns that's creates natural effect to the environment. Gardens in Delhi are been constructed since the Mughal Emperor rule over Delhi. The park is seen crowded with mostly young couples, morning walkers and yoga enthusiasts, however most families along with friends are seen here especially during weekends. This park also attracts tourists and sacred for Jain religion.

MAHAVIR VANASTHALI PARK

MAHAVIR VANASTHALI PARK

3. Delhi Chalo Park

Delhi Chalo Park is situated behind the Red Fort along the Ring Road, it's approx area is 12.30 acres seen from this park is Musamman Brij in the centre. Rang Mahal is the right and Deewan-E-Khas on the left. This beautiful park increase the beauty of the Red Fort.

DELHI CHALO PARK

4. Jai Prakash Narayan Memorial Park

The Lok Nayak Jai Prakash Narayan Memorial Park is situated at Bahadur Shah Zafar Marg. This was offered to public in year 2004. This park was developed by CPWD and it has lush greenery. Having more than 4.50 acres of area, this park is having 127 Nos. of trees of 22 different varieties. A number of trees are planted in a circular manner around a circular lawn having a circular bed of Cannas in the centre. There is a huge statue of Lok Nayak Jai Prakash Narayan fixed on a high rise mound. Garden light, fittings and fixtures are very beautiful at the night. This park was made open for use of public without any ceremonial/opening ceremony. The park has excellent boundary structure and gates etc. The park is having a huge statue of Dr. Shyama Prasad Mukherjee in a side surrounded by a cluster of good looking Thuja plants.

5. Deen Dayal Upadhyay Park

Deen Dayal Upadhyay Park is located at Deen Dayal Upadhyay Marg, near CAG office, New Delhi. The park is designed and developed by Central Public Works Department in the year 2017. This park covered approximate 16.00 acres area and divided with 3 Pockets known as Pocket-7A, 3A and 6B. The park is developed with concept of Rashiphal, Nakshatra, Navgrah, Panchvati, Tirthankar, etc which is unique and probably first of its kind in Delhi.

Recently BJP Chief Shri Amit Shah inaugurated the Deen Dayal Upadhyay Park. Shri Amit Shah was accompanied by Urban Development Minister Shri Hardeep Puri and Party MP Smt. Meenakshi Lekhi.

The redeveloped park has a rich variety of plants and large expanses of grass lined by flower beds with colourful blooms well laid walking tracks and several plant and bushes with their full names put up alongside.

BJP Chief Shri Amit Shah inaugurating the Deen Dayal Park accompanied by Urban Minister Shri Hardeep Puri.

Nakshatra Garden

One of the attractive areas of Deen Dayal Upadhyay Park is Nakshatra Garden. This garden is developed in Pocket-7A by planting 27 species of plants representing each Nakshatra. List of auspicious plant for nakshtra is:

Nakshtra	Common Name	Botanical Name
Ashivini	Poison nut	Strychnos nux vomica
Bharani	Amla	Embilica officionalis
Krittika	Fig	Ficus racemosa
Rohini	Jamun	Syzygium jambolanum
Mrigashirsha	Kadhira	Acacia catechu
Ardra	Agard wood	Aquilaria agallocha
Punarvasu	Bamboo	Bambusa
Pushya	Peepal	Ficus religiosa
Ashlesha	Naga kesar	Mesua ferrea
Megha	Banyan	Ficus bengalensis

Nakshtra	Common Name	Botanical Name
Purva phalguni	Flame of Forest	Butea monosperma
Uttara phalguni	Juvi	Ficus infectoria
Hasta	Retha	Sapindus mukorrassi gaertn
Chitra	Bel	Aegle marmelos
Swati	Arjun	Terminalia arjuna
Vishakha	Wood apple (Kaith)	Limonium acidissimum
Anuradha	Bakul	Mimusops elengi
Jyeshtha	Chir	Pinus roxburghii
Mula	Black dammar	Canarium strictum
Purva ashadha	Jack fruit	Artocarpus heterophyllus
Shravana	Milk weed	Calotropsis gigantia
Dhanishtha	Shami	Acacia ferruginea
Shatabhisha	Kadamba	Anthocephalus cadamba
Purva bhadrapada	Neem	Azardirachata indica
Uttara bhadrapada	Mango	Mangifera indica
Revati	Ippe	Madhuca indica

Nav Garh Garden

This garden developed in Pocket-7A by planting 09 species of plants with every plant symbolically represents or attached with every Graha. It is beautifully designed and maintained. The list of auspicious plants for Nav Graha Garden is:

Garha	Common Name	Botanical Name
Surya (Sun)	Aak	Calotropsis
Chandra (Moon)	Dhak, Palash	Butea monosperma
Mangal (Mars)	Kadhira	Acacia catechu
Buddha (Mercury)	Chirchirta	Achyranthes aspera
Brihaspati (Jupiter)	Peepal	Ficus religiosa
Sukra (Venus)	Gular, Udamber	Ficus glomerata
Shani (Saturn)	Shami	Acacia ferruginea
Rahu (Rahu)	Kush	Cynodon dactylon
Ketu (Ketu)	Dev kush	Imperata cylindrica

Rashiphal Garden

This garden developed in Pocket-7A by planting 12 species of plants each plant represents different Rashiphal. The list of auspicious plants for rashi is:

Rashi	Common Name	Botanical Name
Mesha (Aries)	Red Sandal Wood	Petrocarpus santalinus
Vrishabh (Tarus)	Satwin	Alstonia schloaris
Mithun (Gemini)	Jack Fruit	Artocarpus hetrophyllus
Karka (Cancer)	Flame of Forest	Butea monosperma
Singh (Leo)	Wid ber	Ziziphus mauritiana
Kanya (Virgo)	Mango	Mangifera indica
Tula (Libra)	Bakul	Mimusops elengi
Vrischik (Scorpio)	Kadhira	Acacia catechu
Dhanu (Sagittarus)	Peepal	Ficus religiosa
Makar (Capricon)	Shisham	Dalbergia latifolia
Kumbh (Aquarius)	Khejri Tree/ Shami	Prosopis cineraria
Meen (Pisces)	Bargad	Ficus benghalensis

Tirthankar Garden

This garden designed and developed with the concept of Tirthankar Van in which 24 species of identical plants of Tirthankar are planted. The list of plants planted in Tirthankar van is:

Tirthankar	Common Name	Botanical name
Shri Rishabhdeva Swami	Banyan	Ficus benghalensis
Shri Ajitnath Swami	Kalpavriksha	Adansonia digitata
Shri Sambhavnath Swami	Sal	Shorea robesta
Shri Abhinandan Swami	Chir	Pinus roxburghii
Shri Sumatinath Swami	Priyangu	Callicarpa macrophylla
Shri Padmaprabha Swami	Banyan	Ficus benghalensis
Shri Suparsvanath Swami	Siris	Albizia lebbek
Shri Chandraprabh Swami	Sultan champa	Calophyllum inophyllum
Shri Suvidhinath Swami	Bel	Aegle marmelos
Shri Shitalnath Swami	Anjeer	Ficus lacor
Shri Sreyanshnath Swami	Ashok	Sara indica
Shri Vasupujya Swami	Lodh Tree	Symplocos racemosa
Shr Vimalnath Swami	Jamun	Syzygium cumini
Shri Anantnath Sawmi	Ashok	Sarica indica
Shri Dharamnath Swami	Palash	Butea monosperma
Shri Shantinath Swami	Deodar	Cedrus deodara

Tirthankar	Common Name	Botanical name
Shri Kanthunath Swami	Lodh Tree	Symplocos racemosa
Shri Arnath Swami	Mango	Mangifera indica
Shri Mallinath Swami	Ashok	Saraca indica
Shri Suvrat Swami	Golden Champa	Michelia champaca
Shri Naminath Swami	Maulshiri	Mimusops elengi
Shri Neminath Swami	Salix	Salix caprea
Shri Parsvanath Swami	Fire Flame Bush	Woodfordia fructicosa
Shri Mahavir Swami	Sal	Shorea Robesta

Play Ground

The playground developed in Pocket-7A. It covered approximate 1.00 acre area. Play Ground is developed for children. The lush green lawn along with children playing equipment is developed in this garden.

DEVELOPMENT OF LAWN AT DDU PARK (POCKET-3A)
DEVELOPMENT OF LAWN AT DDU PARK (POCKET-6B)

DEVELOPMENT OF LAWN AT DDU PARK (POCKET-7A) PARK 3A TRELLIS

PARK 7 A – OPEN AIR THEATRE

6. National Police Memorial Park

National Police memorial park is located in chankyapuri it's approx area is 3.93 acre. This park was developed to commemorate the memory of Martyrdom of all the 9 or 10 Police Forces serving the nation. This forces are such as CRPF, ITBP, BSF etc. Its ownership belongs to Ministry of Home Affairs. In the beginning a huge global structure was proposed to be established at a much high location in the center of the park. But due to some objection raised by different organization this global structure was removed from here & shifted to some other park probably in Noida.

CHAPTER - 20

COLLECTION OF SPECIMEN BONSAI PLANTS AT GOVERNMENT SUNDER NURSERY, CPWD, NIZAMUDDIN, NEW DELHI

"BONSAI"

Bonsai comprises a tree or shrub planted in a small container for developing as a miniature plant showing the general appearance of that plant species found in nature. It differs from a pot plant where the foliage and flowers are important, whereas for Bonsai the appearance of the plant in a miniature form is to be maintained for many years.

The Government Sunder Nursery is also making Bonsai plants by their trained staff by binding with wire, shaping them, cutting them, training them, fixing moss grass, using small pebbles repotting, watering and selling to the public also. The Government Sunder Nursery is having specimen collection of bonsai, some of them donated by Shri Agnihotri. These bonsai are preserved in the nursery for imparting training to the scholars as well as to the public. The new bonsai house was also constructed at Government Sunder Nursery and inaugurated by DG, CPWD on 3rd March 2012. The specimen bonsai were displayed in various flower shows and won many prize in the flower show.

1. Khirni (Manilkara hexandra)

It is a slow growing evergreen tree. The bark is grayish black and rough. The wood is used for big beams. Its fruits are edible.

2. Saptaparni (Alsotnia schloris)

The name schloris means children used the slated made from wood of tree for writing purpose. In October small green fragrant

flower appear. All parts of the trees is poisonous. The dark green leaves form whorls of 4-7 and regular branching gives tree a beautiful shape.

3. Pakur/Pilkhan (Ficus infectoria)

The trees can grow upto 10mtr. to 12 mtr. The leaves are glossy, green thick, copper new growth. The white flower appears in spring.

4. Pipal (Ficus religiosa)

It is a semi evergreen tree, normally grown on roadside, near temple. It is a religious tree of India. The leaves are broad cordate in shape. The fruit is a small fig green ripening to purple

5. Ficus (Ficus long island)

For making bonsai 3 to 5 year old plant is selected . The height of the bonsai can be maintained upto 30cm. The Bonsai plants require 3 to 4 hours sunlight. The leaves are leathery and thick and branches can be easily train.

6. Savani (Largestromia indica)

It is deciduous tree grows near rivers. The plants have separate male & female flowers appear in summer in white, pink or red color.

Height of bonsai can be kept upto 30cm to 45 cm. The pruning is done in late spring. Wiring is essential. Informal, cascade bonsai forms from medium to extra large size.

7. Putranjiva (Putranjiva Roxbunghii)

Tree with drooping leaves having medicinal properties. Flower yellowish green leaves and fruits used for rheumatism.

8. Bistendue (Diospros Montana)

It is a small deciduous tree. The stem is having thorns. The male and female flower grow on separate trees. The flower are creamy white. The fruit is cherry became yellow after ripening. Flowering

9 Ficus (Ficus tsiela)

The tree is large spreading tree without aerial roots. Leaves coriacepus. Fruits when ripe become purple during April to October. A good avenue tree.

10 Papri (Pongamia glabra)

It is also called pongam oil trees. The oil kept away the insects from the skin. The oil of the seeds beneficial in treating skin disease and antimicrobial.

11 Amrood (Psidium guajava)

The tree became tall upto 15 mtr. Height having leathery leaves small fruits but very sweet and white flowers in March & October.

12 Schefflera (Schefflera sp.)

It is having more than one leaflet. Due to the wood and bark it is bit difficult to shape with wire. The cutting of branch a new apex grown on the cut.

13 Savani (Largestromia indica) dwarf

The plant is attractive to bees, butterflies and birds, due to violet/ lavender color flowers. The plant can be grown by soft wood cutting. Average water requirement bloom in April. The leaves are shiny/ Glossy.

14 Ficus (Ficus panda)

The Bonsai plant of this plant can be made in one month by using air layering. It is big tree having shinning leaves.

15 Maulsiri (Mimusops elengi)

The plant is having small shiny leaves. The flower are tiny cream colored fragrant star shaped. In the morning the flower spread scent in the air. The flower are offered in temples and shrines. Fruits are eaten fresh. It medicinal value is to prevent the bad breath and keep the gum healthy.

16 Limonium (Limonium sp.)

It is a herbaceous perennial plant produce from a rhizome. The leaves are simple the flowers are of pink, violet or purple color. The fruits is small having single seed. These are grown “as everlasting flower.

17 Jatropha (Jatropha sp.)

It is small flowering plants. The plant is resistant to drought and pests and produce seeds. Seed is used for extracting future biodiesel. The flower appear from April to Sept.

18 Malpighia (Malpighia coccigera)

The plant is having less height, toothed leaves, pinkish/ white flower throughout the year. It makes a beautiful bonsai. It has light fragrance. Height of the plant 15.

19 Chiku (Achras zaptoa)

It is much branched tree upto 8mtr. Height. Flower are hairy outside. Fruit sare brown and fleshy, having 5 or more shiny blackish brown seeds. The fleshy part is sweet with flavor. Seeds are diuretic, and antipyretic. It contain sapotin (which is rich source of sugar, protein, vitamins c and mineral).

Landscape Design

CHAPTER - 21

DECORATION AT DIFFERENT SAMADHIES

1. Flower Decoration at Shanti Van. Shanti Vana (Samadhi of Late Sh. Pt. Jawahar Lal Nehru, Former Prime Minister of India)

One of the most able sons of India who not only shaped India's destiny but also played an instrumental role in framing the future of the world, Pandit Jawaharlal Nehru was cremated here at the ShantiHYPERLINK "http://www.sodelhi.com/memorials-modern-architecture/337-shanti-vana" HYPERLINK "http://www.sodelhi.com/memorials-modern-architecture/337-shanti-vana"Vana. The Campus of Shanti Vana is around 60.00 acres area including forest and lawn area. It has 2776 Nos. of trees of 65 different species.

Shanti Vana or the Forest of Peace truly lives up to its name. Lush greenery, sprawling gardens, numerous trees & saplings keep the atmosphere cool & serene. The stretches of greenery run endlessly and in almost every nook & corner, a beautiful plant stands in humility to welcome you.

All the visiting dignitaries & the heads of the states include a visit to Shanti Vana as an integral part of their itineraries. As a sign of respect, one has to take off his footwear to visit the sacred site of his cremation on 27th May of every year. On 14th November of

every year, which is his birth anniversary, he is remembered & honoured by the country's people; and for his ardent love for kids, 14th November has been recognized as National Children's Day.

Certain prayer sessions & cultural programmes are organised in Shanti Vana to celebrate the event. The place provides you with an absolute peace & calm and has a perfect atmosphere for meditation.

2. Flower Decoration at Vir Bhumi (Samadhi of Late Sh. Rajiv Gandhi, Former Prime Minister of India)

Vir Bhoomi stands near the memorials of Sh. Mahatma Gandhi (Father of Nation) & other prominent leaders of the country on the Mahatma Gandhi Marg (Main Ring Road) New Delhi. Sh. Rajiv Gandhi was India's youngest Prime Minister when he was sworn in as the Prime Minister of India in 1984. Unfortunately Sh. Rajiv Gandhi assassinated by an LTTE lady suicide bomber in 1991 and India lost one of its most dynamic and visionary Prime Minister. Vir Bhoomi (the land of the Brave) is a memorial dedicated to him, where he was cremated. The campus of Vir Bhoomi is around 22.30 acres. It has 950 Nos. of trees of 54 different species. The lawns of this site is seen covered with well trimmed green grass and lined with trees, plants and shrubs that add on heavenly look to the entire area and its surroundings.

As a sign of respect, one has to take off his footwear to visit the scared site and can also attend the special prayer sessions held every 20th of August (Birthday) and 21st of May (Death Anniversary) every year in order to remind us of the dreams and aspiration he had for his country and admire the fact that after his demise

3. Flower Decoration at Kissan Ghat. Kisan Ghat (Samadhi of Late Sh. Ch. Charan Singh, Former Prime Minister of India)

The literal meaning of Kisan Ghat is “Farmer’s Court”. Kisaan Ghat is the Memorial of Chaudhary Charan Singh, was the sixth Prime Minister of India. He was born on 23rd December 1902 and died on 29th May 1987. He was appointed as a prime minister of India for a very short period in 1979. The area of Kisan Ghat has a beautiful park sorrunded with trees planted by visiting dignitaries and heads of state. The campus of Kisan Ghat is around 8.84 acres area. It has 255 Nos. of trees of 19 different species.

As a sign of respect, one has to take off his footwear to visit the sacred site of his cremation on 29th May of every year. On 23rd December of every year, which is his birth anniversary, he is remembered & honoured by the country’s people.

4. Sadaiv Atal Samadhi

1. Sadaiv Atal, the Samadhi of Atal Bihari Vajpayee was dedicated to the Nation on the birth Anniversary of the former Prime Minister Atal Bihari Vajpaye 25-12-2018.
2. The Bharat Ratna awardee was born on 25 December. The day is celebrated as 'Good Governance Day' by the BJP.
3. Prime Minister Modi, President Ram Nath Kovind and Home Minister Amit Shah, among other BJP bigwigs, were in the attendance to pay their respects. President Ram Nath Kovind pays his respects to Atal Bihari Vajpayee on his first death anniversary.
4. To emphasise on the unity in diversity, stones from various parts of the country have been used in the construction of Samadhi near Rajghat in New Delhi. The Samadhi has a central platform comprising of nine square blocks, capped with a Diya in the centre. The number nine represents the navarasas, navaratras and navagrahas. The placement of the nine square blocks is in a circular lotus shaped pattern.
5. "Tributes to Atal Ji on his Jayanti. We reiterate our commitment towards creating the India he dreamt of," PM Modi said in his tweet.
6. Land was made available for the memorial at Rashtriya Smriti Sthal by the Union Housing and Urban Affairs Ministry.
7. It was constructed by the Centre Public Works Department (CPWD) at a cost of Rs 10.51 crore. The project was funded by the Atal Smriti Nyas Society.
8. The memorial is spread over approx. 10 acres of land at Rashtriya Smriti Sthal, where Vajpayee was cremated on August 17, 2018.
9. Not a single tree was cut down in developing 'Sadaiv Atal' at Rashtriya Smriti Sthal, which also houses samadhis (memorials) of former presidents, prime ministers among others.
10. Sadaiv (always) Atal memorial will be managed by a trust headed by Ex. Lok Sabha Speaker Sumitra Mahajan.

Former prime minister of India Atal Bihari Vajpayee passed away on 16 August 2018. Marking his first death anniversary, a 'Saidev Atal' memorial was organised in New Delhi on 16th August 2018.

President Ram Nath Kovind, Vice-President M Venkaiah Naidu and Prime Minister Narendra Modi were among the dignitaries who paid floral tributes to the former statesman at the memorial built near the Rashtriya Smriti Sthal, where his mortal remains were consigned to flames on 17th August 2018.

Namita Kaul, daughter of Atal Bihari Vajpayee with her family members and others pays tributes to former prime minister AB Vajpayee on his 95th birth anniversary at his memorial, Sadaiv Atal, in New Delhi. “Tributes to Atal Ji on his Jayanti. We reiterate our commitment towards creating the India he dreamt of,” Modi.

Prime Minister Narendra Modi pays tributes to former prime minister AB Vajpayee on his 95th birth anniversary, in New Delhi.

A vacant piece of land was made available for the memorial at the Rashtriya Smriti Sthal here by the Union Housing and Urban Affairs Ministry. Spread over approx. 10 acres of land, the memorial was constructed by the Central Public Works Department in a very short period. The project was funded by the Atal Smriti Nyas Society.

President Ram Nath Kovind with Prime Minister Narendra Modi, Amit Shah, JP Nadda & other BJP leaders attend prayer meeting to pay tributes to former prime minister Atal Bihari Vajpayee at his memorial, Sadaiv Atal, on his first death anniversary, in New Delhi.

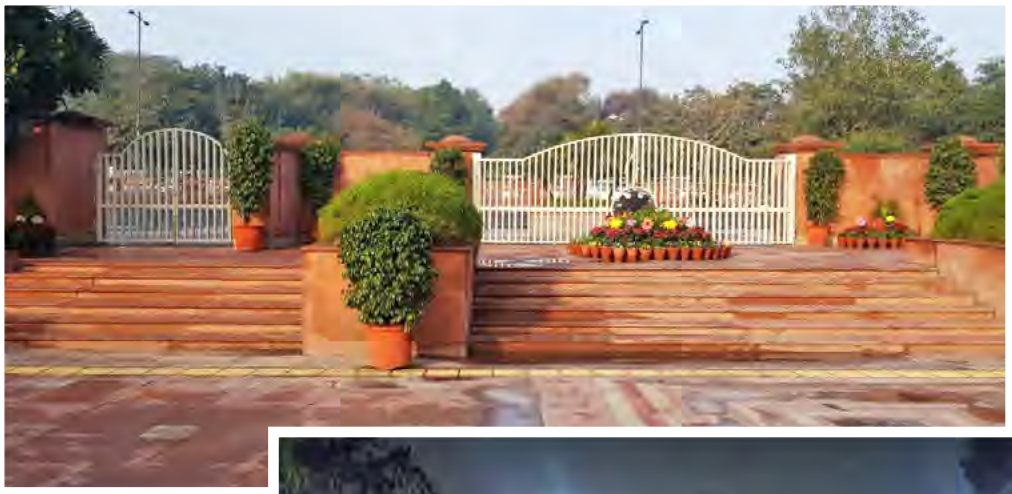
President Ram Nath Kovind with Prime Minister Narendra Modi pays tributes to former prime minister Atal Bihari Vajpayee at his memorial, Sadaiv Atal, on his first death anniversary, in New Delhi.

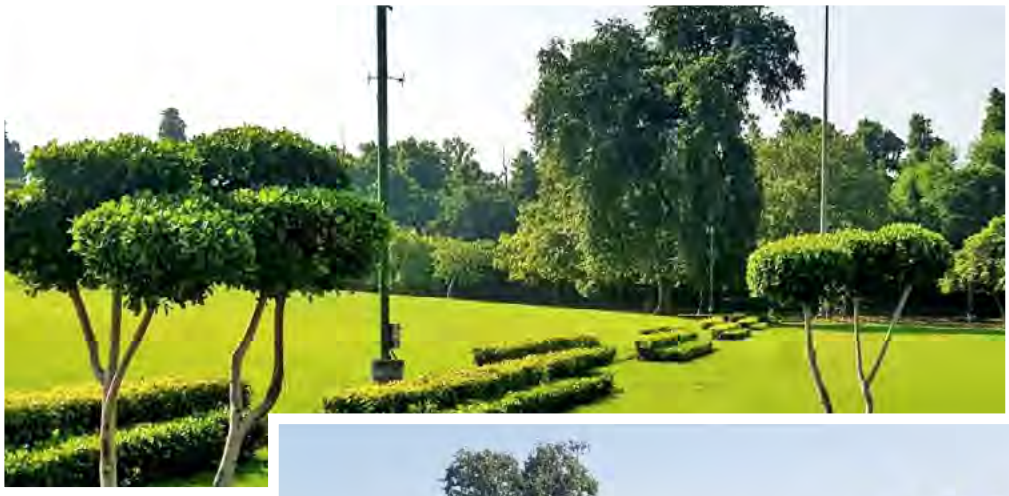
Prime Minister Narendra Modi and BJP President Amit Shah arrive to pay tribute to BJP veteran late Atal Bihari Vajpayee at Sadaiv Atal Samadhi, ahead of former's swearing-in ceremony as prime minister for the second consecutive term, in New Delhi.

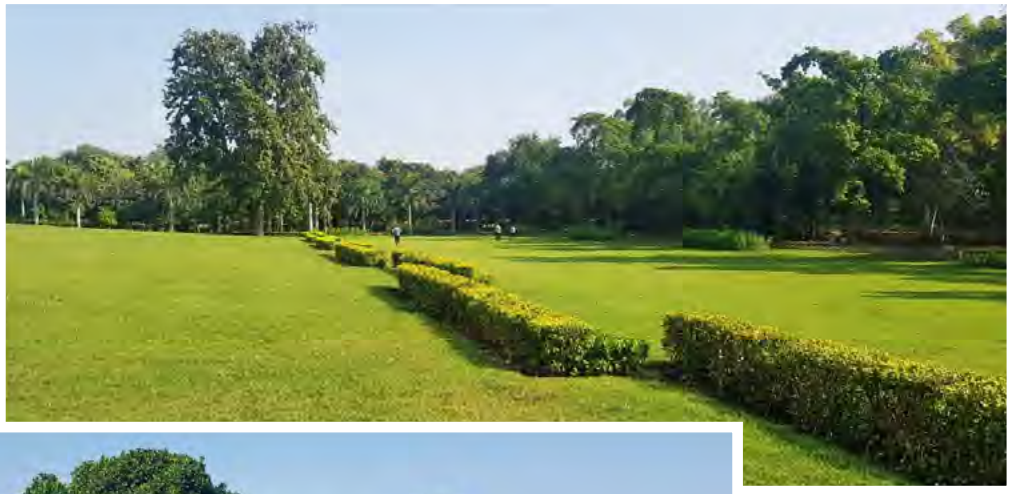
5. Rajghat

1. Raj Ghat is the memorial of Mahatma Gandhi, the Father of the Nation.
2. Black stone platform in an open air complex marks the spot where Gandhi was cremated.
3. A flame constantly burns at one end of the platform and visitors are required to remove their footwear before they enter Raj Ghat.
4. This memorial is located between Ring Road and the banks of the Yamuna River, towards the southeast of Red Fort.
5. His last words, 'Hey Ram,' are inscribed on the marble which is always adorned with flowers.
6. Foreign dignitaries visiting India pay respect to Gandhi by laying flowers on the platform.
7. United State Ex-President Barack H. Obama visited the Rajghat on 25, January, 2015.
8. United State President Donald Trump visited the Rajghat on 25 February, 2020.
9. Horticulture Activity in the Rajghat Complex:-
    a. Samadhi of Mahatma Gandhi is the well-known place in the world.
    b. Specially landscaped beautiful and lush green lawn (35.47 Acres).
    c. It has 1056 numbers of trees of 42 different species
    d. Large number of tourists and school children visiting every day.
    e. All the heads of Nations visit this place during their stay in India.
    f. Flower decoration of Rajghat Samadhi on the occasion of birth and death anniversaries.
    g. There is also a Gandhi Memorial Museum where a film is shown – between 9:30 am and 5:30 pm except on Thursday – about his life and philosophy. It is also presented on Sunday in Hindi at 4 pm, and at 5 pm, it is shown in English.

राजघाट
RAJGHAT







No. 5- DDR/VIP/2000-DDVI

Ministry of Urban Development and Poverty Alleviation

(Delhi Division)

****

Nirman Bhawan, New Delhi

Dated 21st July 2000

OFFICE MEMORANDUM

Sub: Environmental damage use to unnecessary and wasteful building exercises undertaken by Municipal agencies – Issuing of guidelines.

The undersigned is directed to state that after considering the view of experts Government agencies local bodies and NGO's the Guidelines for Greening of Urban Areas and landscape have been formulated. These guidelines are issued to all concerned for taking follow up action.

(MAHENDRA KUMAR)

Under Secretary to the Govt. of India

To

8. Principal Secretary (UD) GNCTD, Vikas Bhawan, I.P. Estates, New Delhi.
9. Commissioner, MCD, Town Hall, New Delhi.
10. Chairperson, Palika Bhawan, New Delhi.
11. Vice Chairman, DDA, Vikas Sadan, New Delhi.
12. CEO, Delhi Jal Board, Jhandewalan, New Delhi.
13. Chairman, DVB, Shakti Sadan, New Delhi.
14. DG (W), CPWD, Nirman Bhawan, New Delhi.
15. Engineer –In-Chief PWD(Delhi Admin), GNCTD, K.G. Marg New Delhi.
16. Director of Horticulture, CPWD, I.P. Bhawan, New Delhi.
17. Director of Horticulture, MCD, Under School Lane Fly over. Deen Dayal Upadhyay Marg, Rouse Avenue, New Delhi.
18. Director of Horticulture, NDMC, Palika Kendra, New Delhi.
19. Director of Horticulture, DDA, Vikas Minar, New Delhi.
20. Conservator of Forest, GNCTD, Kamla Nehru Ridge Delhi 110007.
21. Head of Department Floriculture IARI Pusa Road, New Delhi.

Copy to

1. APS to UDM/PS to MOS (UD)
2. SPPS to Secretary (UD)/ PS to JS (UD)/PS to JS(DL)/PS to DS(DD)

Guidelines for greening of urban areas and landscaping

3. **To avoid use of excessive tiling of payments : porous materials to be used :-** Unnecessary and excessive tiling of the road side pavement should be avoided. The area around trees lined along the road should not be covered with tiling as it hampers the basic necessary function and needs of the trees i.e. root aeration and availability of water get drastically reduced. Whenever tiling is done, porous tiles preserved while taking up civic works Indiscriminate tiling of road dividers and footpaths should be avoided.

4. **Tiling should be done only on pavements with heavy pedestrian traffic:** - Tiling should be only done don't on the roadside which have heavy pedestrian movements. In case of bridges and such areas where there are no pedestrian movement, tiling may be avoided and in case tiling is to be done, preference is to be given to porous tiles as porous materials allows seepage of ground water. The species of trees may be chosen for their pollution reduction abilities including dust trapping to avoid reliance of a single species, a combination of trees, shrubs, grasses should be grown.

5. **Growth of grasses to be encouraged : -** The necessary of grasses playing a vital role in making soil suitable for vegetation should be realized and unnecessary digging of soil should be stopped forthwith.

6. **Excessive pruning to be avoided: -** Practice of excessive pruning of crops should be avoided. Pruning of plants in a well nurtured garden and pruning of roadside plants should be differentiated Excessive pruning may lead to upsetting the root shoot ratio. Leaf pruning should not be resorted to.

7. **Compost to be made of leaves:** - Leaf is an excellent material for making of compost and burning of leaves causes pollution. A system of composting of leaves in nearby parks should be adopted which will provide water retentive manure to civic agencies. Some fallen leaves may be left near the base as water retentive mulch.

8. **Adequate space to be left around trees: -** An area of 6"x 6" around the trees should be left un-cemented. Widening of roads, upto the trunk of trees is to be avoided as roots come under the asphalted roads and will gradually die. In case of storm, these trees can topple down. Activities which adversely affect the roots are to be kept at a minimum.

9. **Digging near trees to be avoided: -** Digging near the trees by allowing telephone, electricity, sewage lines should be avoided to avoid root injury, sufficient space should be left along the ground for the trees. In no case should roots be exposed. Washing avenue trees foliage may be done on a tri-monthly basis to get rid of particulate matter from the foliage.

10. **Use of Organic Compost: -** The dead trees may be replaced by young plants after providing sufficient compost in the pits. Organic manure added with compost FYM mix with nitrogen fixing bacteria culture and neem cake should be spread on the green and poured into the soil before either irrigating the tree basin or before rains.

11. **Planting of second line trees to be encouraged: -** New trees which may be called as second generation trees must be planted preferably 2-3 matters behind

12. the existing road trees in an alternate position or inside the bungalow compounds. A mix of foliage and fruit trees should be planted. Planting of fairly well established large trees should be undertaken as chances of their survival will be more. Cues of species to be adopted may be taken from the old trees hiring Delhi's roads.

13. **Initiation of EEC Activities: -** Horticulture department may initiate education/ awareness campaign with school students and elders and users of the park where the difficult species of trees are present in the particular park and importance about preservation of eco-systems is explained School Student may be taken for nature walks in a major garden to get them associated with the flora and fauna around them. Also the citizens of an area residing near a park can be involved for this awareness campaign.

14. **Compactness of soil near trees to be avoided: -** Compactness of soil should be avoided within at least one matter around the tree Perforated metallic frame can be used for this purpose. Soil surveys around the trees should be done by removing stones.

15. **Setting up a Central Resource Centre :** - A Central Resource Centre should be set up to aid and **advise** the State Government, Municipal Corporations and other development agencies dealing with matters pertaining to Horticulture and landscaping. A manual on the subject should also be prepared.

16. **Stress on shelter beds of thick trees :-** Around the cities vulnerable to desert wings, shelter- beds of special design of thick trees should be planted.

17. **Updating technology of transplantation of trees: -** Technology of transplantation of trees should be updated to ensure at least 80 percent of the success rate of planted trees. As far as possible, trees grown in the nursery with a height of four to six meters should be planted. Presently, survival rate of trees is less due to animal menace and non-caring of trees. The public participation in caring of trees planted around their houses may be ensured.

18. **Setting up of a tree disease surgery unit in Horticulture Department: -** A small tree disease/surgery unit should be created in all Horticulture departments to cure tree maladies.

19. **Earmarking of some cost of projects for landscaping: -** In any layout plan of land and housing development, at least two and a half percent of the cost of the project should be earmarked for landscaping and green development.

20. **Use of kitchen and garden waste for compose: -** Technology to use kitchen waste to fabricate building and landscaping material should be perfected and made available to all the urban development agencies.

21. **Proper care of water fronts :-** Underground water does not gets recharged sufficiently because of use concrete around them. Efforts should be made to get the water fronts recharged and these fronts kept clean.

22. **Heritage building to be landscape:** - Areas around heritage buildings should be suitable landscaping and beautified.

23. **Greening of void areas not required for minimum construction:-** Urban void areas should not allowed to exist and the area not required for immediate

development or construction, should be made green and fenced with suitable landscaping. Similarly road berm/right of way required for future road widening should be landscaped and maintained as green.-

24. **Encouragement for water harvesting technologies**:- Information regarding water harvesting has to be disseminated in public and its use encouraged. It should be ensured that quality of water does not get deteriorated for which required measures are to be taken.

25. **For maintenance of greens internally** :- Criss-cross paths should be provided for in the gardens and lawns. There should be connecting gated at all corners so that people do not walk on the grass.

26. **Public participation to be ensured** :- Public participation at present is poor in maintenance of green. This has to be activated and Residents Welfare Association and to be involved in planting of new trees and in their survival. User groups need to be activated, NGO's can play a catalytic role in this. Each NGO may earmark a selected area for its activities thereby dividing the entire net area. Committee with officials from MCD, NDMC, DDA, GNCTD etc. will act as a nodal agency and will review every month or as necessary.

Landscape Design

DEPARTMENT OF FORESTS & WILDLIFE
GOVT. OF NATIONAL CAPITAL TERRITORY OF DELHI
A-BLOCK, 2ND FLOOR, VIKAS BHAWAN, I.P. ESATTE, NEW DELHI-110002 .

F.No.8(193)/CF/TA/07-18/Part file/18-19/8473-80 Dated :01/10/19

GUIDELINES
FOR PRUNING OF TREES
UNDER DELHI PRESERVATION OF TREES ACT, 1994

1. The Delhi Preservation of Trees Act, 1994 was enacted to safeguard the forest area in and around NCT of Delhi and to provide for preservation of trees. The Department of Forests & Wildlife, GNCTD has regulatory control for implementation of DPTA 1994 which prohibits felling or pruning/ head backing of trees.
2. The Sec.2 (h) of DPTA, 1994 states that "to fell a tree" with its cognate expression, means severing the trunk from the roots, uprooting the tree and includes bulldozing, cutting, girdling, lopping, pollarding, applying arboricides, burning or damaging a tree in any other manner as factors causing the death of a tree. Thus it would be apparent that its implied meaning does not appear to carry any implicit connotation that pruning of trees which do not cause damage or death of a tree could be termed as a Tree Offence.
3. In the light of above, general guidelines for pruning of trees are prescribed for adherence by all concerned, so that the trees grown with great care and precision over a period of several years are not pruned recklessly leading to their untimely death (which is an offence under Section 8 of DPTA, 1994) or result in reduction of green cover of Delhi which is an essential strategy to combat pollution.
4. Pruning means cutting off or removing dead or living parts or branches of a tree to improve shape or growth. It is a horticultural and silvicultural practice involving selective removal of parts of a plant, such as branches, buds, or roots. Reasons to prune plants include deadwood removal, shaping by controlling or directing growth, improving or maintaining health, reducing risk from falling branches, preparing nursery specimens for transplanting, etc. However, the pruning cut should not be too large so as to damage the tree.

5. For the purpose of clarity and transparency to the meaning of light and heavy pruning, following would constitute as above:

Term	Branches of girth size	Permission required or not	Remarks
Regular Pruning/ General Tending	Upto 15.7 cm.	No	May be got done by Civic Agencies at regular intervals
Light Pruning	Greater than 15.7 cm but less than and equal to 40 cm.	Required	From concerned Tree Officer on submission of prescribed Form B and other documents as prescribed in DPTA, 1994.
Heavy Pruning	Greater than 40 cm	Required	

6. The forest department does not get the trees felled or pruned/ head backed directly but only accords permission for the same to the owner of land on which the concerned tree is standing after due inspection/ investigation.

7. The actual pruning of the concerned tree/ trees is got done by Deputy Director (Hort.) of the MCDs/ NDMC/DDA/ PWD/CPWD (whoever is the land owning agency) of the concerned area or by the property owner himself/ herself.

8. For obtaining permission for felling or pruning/ head backing of trees, guidelines are in place for information to all and ease of Public/ Govt. agencies towards achieving their desired objective which are available on the department website "www.forest.delhigovt.nic.in".

9. If **Individuals/ General Public/ Society /RWAs** is desirous that any tree inside his house/premises is posing problems to him or the public and needs to be felled or pruned/ head backed, then he may apply for the same in 'Form B' along with photographs and number of tree/ trees in question to the DCF/ Tree Officer of his area for the permission. After inspection, the permission or otherwise is communicated to him/ her within 60 days as per merit of the case.

10. If the tree/trees for which felling or pruning/ head backing is required is standing on **Govt. land/ roads/ Parks/ govt. property in front of the house/ shop/ private property of an individual** and is posing problem to him, he has to apply for felling or pruning/ head backing of such tree on a simple piece of paper to the Deputy Director (Horti.) of the MCD/ NDMC/ DDA/ PWD/ CPWD (whoever is the land owning agency) with photographs of such tree/ trees.

11. It should neither be applied directly to concerned DCF nor Form B submitted directly which has to be filled and signed by the concerned Dy. Director (Horti) of the land owning agency. After inspection, the permission or otherwise is communicated within 60 days of receipt of such completed application/ Form B to the concerned Dy. Director (Horti), as per merit of the case.

12. If a tree is standing on **govt. land but leaning on private land/ building** and is considered dangerous and likely to cause damage to life and property, it should be informed immediately with photograph by the concerned aggrieved person. Permission is granted for its felling or pruning/ head backing within 48 hours of inspection, as per merit of the case. In case permission/ any intimation to the contrary is not received within this time, the person can go ahead and fell or prune/head back the dangerous/ leaning tree and intimate the concerned Tree Officer (DCF) within 24 hours of such felling or pruning/ head backing.

13. There are three (3) Deputy Conservator of Forests (DCFs) who are designated as Tree Officers to look after the cases of tree felling or pruning/ head backing and accord permissions for the same, after inspections, as per merit of the case. Their respective jurisdictions in Delhi are shown in table below.

S.N.	Name of the Division	Name of the Revenue Districts	Name of the Sub-division
1.	North Forest Division	North	Model Town, Narela & Alipur
		North West	Rohini, Kanjhawala & Sarawasti Vihar.
		West	Punjabi Bagh, Patel Nagar & Rajouri Garden.
		North East	Seelampur, Yamuna Vihar & Karawal Nagar.
		East	Gandhi Nagar, Preet Vihar & Mayur Vihar.
		Shahdara	Shahdara, Seemapuri & Vivek Vihar.
		Central	Civil lines
2.	West Forests Division	South West	Dwarka, Najafgarh & Kapashera
		New Delhi	Chankyapuri, Delhi Cantt. & Vasant Vihar
3.	South Forest Division	South	Saket, Hauz Khas, Mehrauli
		South East	Defence Colony, Kalkaji & Sarita Vihar
		Central	Kotwali & Karol Bagh.

14 Pruning/ pollarding/ burning/ lopping/ applying arboricides or damaging a tree in any other manner would be considered as tree offence when, as per ocular estimation of such damage, the Tree Officer, in all his wisdom, holds that such act is likely to lead to the death of the tree, in near future.

15 If a tree standing on any govt. land/ road side/ private land/ building is considered dangerous and likely to cause damage to life or property, or hindrance to traffic signals, it should be pruned immediately by the concerned Civic Agency and informed to concerned Tree Officer within 24 hours and for which no permission is required from Tree Officer.

Deputy Conservator of Forests (HQ)/
Member Secretary (Tree Authority)

F.No.8(193)/CF/TA/07-18/Part file/18-19/8473-80 Dated : 01/10/19

Copy to:

1. All DCFs for information
2. All DROs/ Forest Guards for information.
3. The Director (Hort) of all Civic Agencies viz. MCDs/ NDMC/ DDA/ PWD/ CPWD etc.
4. Notice Board
5. Programmer, Environment Department, GNCTD with a request to upload on the official web site of the Department.

Distribution:

1. Secretary to Hon'ble Minister (E&F), GNCTD for information.
2. PS to Principal Secretary (E&F), GNCTD for information.
3. PCCF/ HOD, GNCTD for information.

Deputy Conservator of Forests (HQ)/
Member Secretary (Tree Authority)

FORM 'B'

(See sub-rule (1) of rule 4)

The Tree Officer,

.....

.....

Sir,

I apply for grant of permission for felling tree/s located in the property situated in the village ..... and District ..... I furnish below the following details in support of my application:-

i. Applicant's name and address (In block letters).

ii. Name and address of the owner of the property (if different from applicant).

iii. Title of the applicant i.e., whether owner/occupant of the property, etc.

iv. Name of the village and khasra number of property.

v. Total area of the property with description of the boundaries.

vi. Total number of trees (specieswise) whose trunk or body is not less than 5cm in diameter at a height of 30cms from the ground and whose height is not less than one metre from the ground.

vii. The exact area (in sq. metres) from which felling of trees for which permit is sought (description of the boundaries).

viii. Total number of trees to be felled.

ix. Trees to be felled are numerically numbered in paint, their girth measured at a height of 1.35 metres from ground level and their details specieswise are.

Species	No.	Girth

x. Purpose for which the felling of trees are intended.

xi. Intended use of felled trees (e.g.) for sale, for domestic use, etc.

xii. Intended use of land after felling of trees.

xiii. Number and species of trees intended to be planted after felling (give details of arrangement for raising, planting and protecting trees).

xiv. Name /s and address/es of the owners/occupants adjoining property/ies.

2. I am enclosing an affidavit and below mentioned papers in support of my application.

CHAPTER - 22

DISPLAY OF FLORAL TABLEAU DURING REPUBLIC DAY CELEBRATIONS PREPARATION OF FLORAL TABLEAU

Republic day celebration is the responsibility of the Ministry of Defence, Government of India. Ministry of Defence circulates its letter for the preparation of different tableau to the various states and some of the Ministries for the Republic day celebrations in each year. Our Ministry receives this letter in the month of May then this work is assigned to CPWD, and till the month of June, it comes to the Directorate of Horticulture. Director of Horticulture assigns the duty of a particular division for the fabrication of the floral tableau. Normally, six sketches of themes are being submitted to the Ministry of Defence by the month of July as per there guidelines. Then discussion regarding, the theme of the floral tableau being discussed before the tableau expert committee. Expert committee suggests their view points regarding the theme, colour scheme and its suitability to the occasion. Then department has to make rectification in the theme, colour scheme, etc. as desired by the tableau expert committee. After they get satisfied with our proposal then we are being asked for the preparation of the model. Then again meeting takes place regarding the selection of model and expert committee suggests their view points regarding the model. After the model being selected by the tableau expert committee then the department is asked to submit music with relevant to the theme and model. Then again meeting takes place regarding the selection of music, if any suggestion comes then music is also modified as per the view points of expert committee. After the theme, model, music and colour scheme being cleared by the tableau expert committee then the department gets ready for the preparation of floral tableau for the Republic day celebrations.

Director of Horticulture selects the site for the preparation of floral tableau by taking concern of all the sensitivity and security angles of the Republic day celebrations. In the last week of December the department gets a new tractor along with a trailor from the Ministry of Defence (OSD, RR Camp), duly received by the Assistant Director Horticulture and Section Officer Horticulture in-charge of the floral tableau. The whole arena of the fabrication site is being taken by DCP (PM security), Delhi Police and the site is being monitored by CCTV round the clock as per the security norms. Director of Horticulture convenes a meeting of whole department and takes the view points of everyone regarding the availability of flowers and other suggestions regarding fabrication of floral tableau. Thereafter duties are being assigned to all the Horticulture Divisions situated at Delhi. In the first week of January skeleton work starts thereafter wire mess and mossing works starts. Mossing is done and it is being watered regularly for the conservation of moisture so that longevity of the flowers may be ensured. On 23rd onwards collection of flowers starts and the pining of the flowers starts on 25th morning and entire Horticulture department works during this occasion as per the duties already assigned to them and it completes around 11:00 PM in the night. A dinner is also being hosted by the Director of Horticulture for all those who are involved in the fabrication work during this occasion, all the senior officers of the CPWD including Director General and Secretary, Ministry of

Urban Development also grace the occasion with their presence. CPWD floral tableau is continuously winning special prize since year 2007 and in the year 2007 this floral tableau won four prizes i.e. Special prize, Best theme, Best colour scheme and Best presentation. Probably this floral tableau is one of the longest floral fabrication work where this much infrastructure, floral craftsmanship and skilled man power is involved.

CPWD TABLEAU- 2000

Theme : Basant

The theme of the Floral Tableau of the year 2000 is 'Basant' depicting Ideas of rejuvenation, renewal**,** regrowth. Basant festival is celebrated to mark the preliminary preparations for the arrival of spring. The beautiful Tableau shows the colour yellow represents good fortune, spirituality, the ripening of the spring crops and the recent harvest. Yellow flowers are used in abundance to decorate the places of worship.In the Tableau Garden adornments like Fountain and patio adding the beauty. This design and concept re beautiful depicted in this tableau.

The Tableau describes plants and animals compliment and supplement with each other and truely depict the quotes i.e. spending time in nature is energying.

Chrysanthemum, Carnation, Rose, Gladiolus and Marigold are blended on the Tableau in a way that perceives a natural landscape.

2000 (BASANT)

CPWD TABLEAU- 2001

Theme : Shanti Sandesh

The theme of the Floral Tableau of the year 2001 was “Shanti Sandesh” showing three monkies of Mahatma Gandhi’ depicting moral gestures-see no evil, speak no evil, and hear no evil.

The rear part of tableau shows the portrait of mahatma Gandhi decorated with beautiful white colour chrysanthemum flowers gives the message of peace and purity. The front portion of Tableau shows the Teen Bander of Mahatma Gandhi. These monkeys have come to resemble our actions or observation, listening, and speaking which depicts don’t see flaws in every one, don’t listen irrelevant things don’t speak any things that hurt others. Always look for the good in people and believe in truth.

The beautiful flowers of different varieties of Lily and Asparagus are used in the Tableau which gives message of renewal, growth, and hope.

2001 (SHANTI SANDESH)

CPWD TABLEAU- 2002

Theme : Ghar

The theme of the Floral Tableau of the year 2002 was 'Ghar' depicting Home, a place of happiness, peace and harmony happiness lies within individual but home environment also plays very erucial role this tableau depicts that happy home is one which is surrounded by aesthetic view**.** Money is not the secret of happiness.

Floral Tableau decorated with beautiful colours of Gerbera flowers. Yellow marigold usage on the Tableau representing passion and creativity. The trees all around the houses keeps the macro environment cool and brings happiness and positively.

2002 (GHAR)

CPWD TABLEAU- 2003

Theme : Chatur Khargosh

The theme of the Floral Tableau of the year 2003 was 'Chatur Khargosh' indicates popular story about clever Rabbit and foolish Lion. In this story a greedy lion started killing animals in the forest indiscriminately and to bring an end to this animals decided to sacrifice themselves by volunteering one animals every day. The wise rabbit let the lion towards the deep well and showed his reflection in water ass claimed as his competitor. Foolish lion in the well to attack his competitor and lost his life. Thus the wise rabbit saved the inhabitant of the forest. The story gives the moral 'Wit is superior to brute force'. The front part and the rear part of Tableau shows the Lion stands on the deep well waiting the animals.

On the Tableau the diversity of animals made from the flowers of various colours giving the look of forest whereas other things are given natural colour. All the decorations are made with fresh flowers.

2003 (CHATUR KHARGOSH)

CPWD TABLEAU- 2004

Theme : Teej

The theme of the floral tableau of the year 2004 is “Indian Festival Teej”, which showcases Indian Culture and Happiness**.** The very colourful festival of Teej is presented through tableau by CPWD. The Teej festival welcome mansoon season and monsoon and primarily dedicated to Goddess Parvati and her union with Lord Shiva. It is celebrated throughout the country.

The front trailer has a depiction of an elephant howdah, the throne where king (Maharaja) used to sit. Two peacocks placed at side of this trailer, representing monsoon season festival teej. The attached trailer shows a group of womens in traditional costumes, dancing on the folk music and welcoming monsoon.

Blemish- free flowers are selected to create the display, of the theme with floral rangoli two elephants on the sides of the trailer posing in welcome manner. Chrysanthemums, marigolds, gladioli, anthuriums, different varieties and many types of foliage plants are used to bring out this showcase of indian culture and happiness.

2004 (TEEJ)

CPWD TABLEAU- 2005

Theme : Chatur Bandar .

The theme of the floral tableau of the year 2005 is “Chatur Bandar”, Intellectual mind of monkey**.** It depicts the story of clever monkey and foolish crocodile which is believed to be featured in the Panchatantra, folk tales written by an Indian scholar Vishnu Sharma. The crocodile and monkey become friends after the later offers berries to the former. The crocodile’s wife gets jealous of this friendship and demands her husband to bring her the heart of monkey. Being persuaded by her, the crocodile tricks the monkey to come with him for dinner at his place. Once they reach the middle of river, the crocodile spills his plan.

At this point, the monkey stays calm and thinks wisely. He devises a plan, and tells the crocodile that he keeps his heart safe on tree. The crocodile falls for this scheme and takes the monkey back to his tree, for retrieving the heart. Once home, the monkey flees to the top of the tree and bids farewell to crocodile and his friendship.

Different scenes of this story are depicted on the tableau, Blemish- free flowers are selected to create the whole scenery, also shown floral rangoli. Chrysanthemums, marigolds, gladioli, ferns and berry trees are used to bring out the story of ancient wisdom.

2005 (CHATUR BANDAR)

CPWD TABLEAU- 2006

Theme : Sagar Sampada

The theme of the floral tableau of the year 2006 is "Sagar Sampada". The Indian Ocean is the largest which surrounds India from three sides. These ocean has conserved many natural including shall resources coral reefs, fungi, and mineral resources. Ocean provides marine life to abundant aquatic organisms and supports livelihood to millions of people. But due to climate change and global warming , ecosystem of marine life is in danger. Lots of marine species are being extict due to water. This tableau giving the message to save the wealth of marine ecosystem.

The front part of tableau showed octopus crafted with flowers. The mid,rear and side portion of trailer showed different types of marine fishes, sharks, coral reef, turtles, marine mammals and many more benthos and planktons. Ocean is depicted by using blue coloured flowers and other marine organisms are beautifully crafted with different types of flowers and foliages.

2006 (SAGAR SAMPADA)

CPWD TABLEAU- 2007

Theme : Nanhi Duniya

The Tableau depicts children in moods and is intended to get them identified with the Republic Day Celebration.

Placed on the tractor are a happy boy and a girl with a pet rabbit in the background. A number of slides, swings and children in playful moods have been shown scattered all over the trailor.

On the both side panels of the trolley has been fascinated by showing the famous Panchtantro story. The story is based of the theme "Slow and Study win the race" In which a rabbit following a tortoise which is leading the race. Other than rest of the animals watching the race.

Natural flowers will be lavishly used to create an eye pleasing experience. Children and Parents characters are live, while the cartoon characters and other things are created out of floral designs.

2007 (NANHI DUNIYA)

CPWD TABLEAU- 2008

Theme : 60th years of Independences

This Floral Tableau is depicting patriotism unique cultural heritage made up to colourful and fresh flowers. This Floral Tableau also won special prize among the Tableau which paraded in the Republic Day Celebration 2008. Natural flowers had been lavishly used to create and eye caching experience.

2008 (60th YEARS OF INDEPENDENCES)

CPWD TABLEAU- 2009

Theme : Toy and Games

This year CPWD Floral Tableau is depicting Toys and games.

The Tableau leads with first Indus valley Toys. Indus Valley people seem to have loved toys.

They made many toys, such as toy Bird, toy monkeys that could slide down ropes.

On the trailer part has been shown different type of toys like wooden toy, terracotta toys, and chess, modern Bat and ball kite. Middle part of the trailer shows the children's playing and enjoy with toys.

The tableau would be crafted in flowers in their natural colours.

2009 (TOY AND GAMES)

CPWD TABLEAU- 2010

Theme : Global Warming

This year CPWD Floral Tableau is depicting effect and solutions of Global Warming. These days hardly a day goes by without a news story reporting an aspect of global warming. The Tableau leads the reasons of global warming. Hence burning earth has been shown on the front part of the Tableau. Deforestation, industrial and traffic pollution, the land pollution by throwing garbage is shown on the side part of the tractor. On the trailer part has been shown plant new trees and preserves existing trees. Middle part of the trailer shows the activities, a teacher educating children to grow more trees to keep the environment clean. We educate children to be eco- friendly and to protect our environment. Back part of the trailer show the lovely glaciers where young children are enjoying the nature's beauty. On the side panel it has been shown that animals are moving freely around the protected environment. The tableau would be crafted in flowers in their natural colours.

WHEN WE HEAL THE EARTH, WE HEAL OURSELVES.

2010 (GLOBAL WARMING)

CPWD TABLEAU- 2011

Theme : Save The Tiger, Save Earth

These days hardly a day goes by without a news story reporting an aspect of save tigers. India has been home to Tigers for a very long time. Tigers were found all over India and still as many as 16 States of India are home to the Tigers. The latest census report released on 12th. February, 2008 by the Government of India reports that there are ***only 1411 tigers left.***

The population of the Tiger has been reduced by nearly 50% and that too in a period of 6 to 7 years. It is time that emergency and drastic steps are taken to save the pride of jungle and pride of India from becoming extinct. Agriculture, industrialization and degradation and fragmentation of natural habitats, forests and natural grasslands are one of the main reasons for the decrease of Tiger population and for that matter all wildlife in India. The immediate effect of this is lack of natural food and habitat causes the wild animals to come out of the forest area.

If we make sure tigers live, we will have to make sure that deer, antelope and all other animals that the tiger eats or its prey base live. To make sure that these herbivores live, we must make sure that all the trees, grass and other plants that these prey animals need for food are protected. In short, in this way the whole forest gets saved! Saving the tiger means indirectly saving the forests and in turn saving the environment that is reeling under global warming due to massive deforestation. Not only is tiger a beautiful animal but it is also the indicator of the forest's health. Saving the tiger means we save the forest since tiger cannot live in places where trees have vanished and in turn secure food and water for all. This year CPWD Floral Tableau is depicting the save tigers. The Tableau leads tiger kids playing and enjoying the natural habitats, forest and natural grassland. Shown at the front part of the trailor.The rear part of the trailor the pear of tiger setting on rock in its full wild majesty its natural beauty. The tableau would be crafted in flowers in their natural colour.

2011 (SAVE THE TIGER, SAVE EARTH)

CPWD TABLEAU- 2012

Theme : Snow Valley

This year CPWD Floral Tableau is depicting SNOW VALLEY a beautiful landscape of north India. These days hardly a day goes by without a news story reporting an aspect of global warming. There is no doubt that global warming is felt in many ways now and this will worsen. Effects are, and will, be increasingly noticeable in these areas.

We educate children and tourist to be eco-friendly and to protect our environment. All the activities show the people are having fun and enjoying in fresh nature. On an average snowfall patterns have changed across the glaciers are melting rapidly. To stop deforestation and to protect our environment.

The trailer shows the lovely glaciers where young children are enjoying the nature's beauty. The tableau would be crafted in flowers in their natural colours. The tableau is intended to make an extremely eye pleasing experience by using natural flowers lavishly.

2012 (SNOW VALLEY)

CPWD TABLEAU- 2013

Theme : Seasons (Ritus)

C.P.W.D. Floral Tableau is depicting the cycle of seasons (Ritus). Front portion of the Tableau displays "Vasant Ritu" (Spring season), Shown by dancing boy and girl. The front part of the trailor is showing "Grishma Ritu" (Summer season). Middle part of the trailor is showing "Varsaha Ritu" (Monsoon season) depicted as dancing peacock and water fall, after that deciduous tree is shown in "Sharad Ritu" (Autumn season), followed by bonfire by the live characters under "Hemant Ritu" (Pre-winter) and snowy mountain under "Sisir Ritu" (Winter season). The whole Tableau is crafted by beautiful and vibrant colorful fresh flowers.

2013 (SEASONS - RITU)

CPWD FLORAL TABLEAU -2014

Theme : Rajpath

The theme of the floral tableau of the year 2014 is “Rajpath” illustrating the landscape beauty of Rajpath. Rajpath which means the Royal Path**.** It is a ceremonial venue located in the heart of New Delhi, the capital of India. Rajpath runs from the Rashtrapati Bhawan on Raisina Hills on one end to the National Stadium on the other end and passes through Vijay Chowk and Inda Gate. Rajpath is also popularly referred as “The Rajpath”. Rajpath is surrounded by beautiful and lush green lawns, rows of trees and canals on the both sides.

The Front part of the tableau illustrating the India Gate made up of different flowers and leaves. The flower which is used in front tableau are: orange and yellow (marigold), white and pink (anthurium), pink (carnation), orange (French marigold) and green asparagus. Middle tableau shows the running water in the form of fountain covered with blend of flowers in all around. Boy, girl, man, women, couples are shown in middle of tableau close to fountain to make a picturesque image of Rajpath. On the background the parliament is designed with the use of orange and yellow colour marigold flowers and ferns and green plants on its side. The whole picture of the floral Tableau is a masterpiece.

2014 (RAJPATH)

CPWD FLORAL TABLEAU -2015

Theme : Maa Ganga

The theme of the floral tableau of the year 2015 was of “Maa Ganga”. The Ganga is the most sacred and longest and river of India. This river originate from Gangotri, and passes through across country and falls into Bay of Bengal. It is lifeline of millions people who live along its course. Govt has launched Namami Ganga programme to clean the Holy Ganga.

The front part of tableau symbolizes kalash decorated with beautiful flowers depicts the Holy Ganga Jal. Middle of trailer showing the peoples enjoying on the bank of river. The rear part of tableau is designed like beautiful Gangotri glacier of Himalayas from which holy river emerges and also Kedarnath temples. The whole tableau were crafted with green foliage and flowers to give picturesque view.

2015 (MAA GANGA)

CPWD FLORAL TABLEAU -2017

Theme : Clean India Green India

The theme of the floral tableau of the year 2017 was of "Clean India Green India". During 2014, Hon'ble Prime Minister launched the Swachh Bharat campaign which is the largest cleaniness drive in the history of India aims to achieve the vision of a 'Clean India ' by 2nd October 2019. As a part of Swachha Bharat Abhiyan, Clean India , green India, initiated. cleanliness is a clean habit which is very necessary for all of us. This is also habit of keeping ourselves physically and mentally clean including our home, pets, surroundings, environment, office, school etc.

The rear part of tableau showed a hermit was doing meditation near mountains area that promotes healthy minds are developed in clean environment. The whole tableau were crafted with green foliage symbolizes to promote the greenery that leads to cleaner and pure air.

2017 (CLEAN INDIA GREEN INDIA)

CPWD FLORAL TABLEAU -2018

Theme : Diwali

The theme of the floral tableau of the year 2018 is of "Festival of Diwali portraying lighting festivity" depicting the message of Peace and Happiness. Diwali is the festival of victory of light over darkness, good over evil, joy and happiness. It has been celebrated for welcoming Lord Rama return to his kingdom Ayodhya after staying in exile for fourteen years. To mark the occasion, people lighted lamps and decorated whole Ayodhya with diyas.the ideas behind lighting diyas and fireworks on the day of Diwali is to spread the light of posivity in the world, despite the darkness of negativity.

The trailer part of tableau symbolizes temple decorated with beautiful flowers lightened with diyas.The middle part symbolizes people were greeting each other with happiness, joy and sweets. the back part of tableau represents Kingdom Ayodhya, decorated with flowers and lightned with diya. Whole tableau beautifully represents peace and happiness. Side of tableau were decorated with blends of different colours of flowers.

2018 (DIWALI)

CPWD FLORAL TABLEAU -2019

Theme : Dandi March

The year 2019 is being celebrated as 150th birth anniversary of Father of Nation. Therefore the theme of the Floral Tableau of year the 2019 is "Dandi March" movement started by Mahatma Gandhi and Title is ***"VANDE MATARAM".*** In this floral tableau different varieties of flowers, foliage and ground covers have been used. Different flowers like chrysanthemum, marigold, lilium, gerbera, china aster and many more have been fixed up by the skilled men to make JHANKI a perfect masterpiece.

Marigold and Chrysanthemum are used to frame the Gandhi Ji figurine which spread the message of "Unity in Diversity" and "Non-violence" during Dandi March (1930). The middle part of tableau is our national flag "Pride of Nation" beautifully decorated with flowers and foligae. The Back Part of tableau is symbolized by Pigeon decorated with white chrysanthemum over the globe, spread the message of peace across the world. The "charkha" was beautifully decorated by marigold represents the Gandhi jis idealogy.

2019 (DANDI MARCH)

CPWD FLORAL TABLEAU -2020

Theme : KASHMIR SE KANYAKUMARI

Sare jahan se accha, Hindostan hamara hum bulbulen hain is ki , yeh gulsitan hamara.

Indian has different religion, different language, different culture but known for unity ¼vusdrk esa ,drk½- This year the CPWD Horticulture tableau is depicting the nation "KASHMIR SE KANYAKUMARI" and different parts of country are shown at floral decorated tractor and trolly.

On the trailer it represent natural landscape of Kashmir valley, dull lake where tourists are enjoying on "Shikara" which is part of tourist attraction.

On the front part of the trailer represents **Sanchi Stupa,** which is one of the oldest stone structures in Sanchi at Madhya Pradesh. Spreading the message of peace and love.

The tractor enhances the southernmost point i.e. Kanyakumari surrounded by the sea, a memorial of Swami Vivekananda.

Besides their other part of country lake Rajasthan represents the western part of the subcontinent holds up the side panel of the tractor and binding all these elements with Jahaj of desert.

Apart from this the ground artists will showcase different religion representing unity and integrity.

The tableau crafted with their identical places in flowers in their natural colours.

2020 (KASHMIR SE KANYAKUMARI)

CHAPTER - 23

WINTER SEASONAL FLOWERS

The winter season in India starts from the month of October and continue till the month of March. This is the season when the flowering plants bloom and fill the dull landscape with their vibrant and eye soothing colours. It is up to the choice of the gardener, what variety he wants to grow. Definitely he should be aware that the variety that he chooses should be suitable with his land conditions for a perfect bloom. The conditions required for a great bloom may involve different light requirement depending on their variety, i.e. full, semi shaded or shade, most winter annual flowers require full sun and water throughout.

The characteristic feature of every winter flowering plant would be their striking appearances and a colourful display of flowers. Annual flowers and plants live their complete lifecycle in one season and once they start to flowering they continue blooming, some just until they have produced seed other until the weather is incompatible for their growth/ survival. You should intend filling the colourless places in the garden with colourful flowering plants. Winter can be dull if we have not prepared for it with the grey skies and so many plants dormant. Winter annual flowers can be a fantastic way of filling gap in the time between dormancy and spring with sparky colours. Fortunately, North India offers a very rich variety of winter annuals to choose and to arrange them in order to create a colourful display in the garden. There are two ways to grow them, firstly from seedlings which grow in seed pans secondly by directly showing seeds in beds or pots.

No joy in this world would match the level of joy to gaze upon the seedling sown by you, break first into a bud and then blossom into a riot of colours, an unsurpassed beauty that only Mother Nature can bestow on mankind. Sheer aesthetics apart, growing plants would take care of your contribution towards conserving our environment. This in turn would help save the fast depleting green cover on earth. So go out and plant now. Happy gardening!

Herewith are a few examples of winter annuals which are easy to grow in Indian conditions, easy to maintain and bloom into absolutely stunning flowers.

1. Aster (Callistephus chinensis)

Asters get their name from the Latin word for “star,” and their flowers are indeed the superstars of the garden. Some the height of the plants varies from 30 cm to 75 cm according to verities Aster has most cheerful different colours . It requires full sun for growth. The flowers attracts butterflies and drought tolerance plant and very easy to grow during winter in India.

2. Sweet William (Dianthus barbatus)

The quintessential cottage flower, pinks are treasured for their grass like green foliage and abundant starry flowers, which are often spicily fragrant. Depending on the verities of pink, red and other colours flowers appear in late winter and continue till spring. This is used as cut flower in flower vases . Plants height varies from 10 cm to 75 cm approx. The flowers attract the humming bird, butterflies.

3. Petunia (Petunia hybrida)

Petunias are fail proof favourites for gardeners everywhere. They are vigorous growers and prolific bloomers from mid spring through late fall. Colour choices are nearly limitless, with some sporting beautiful veining and intriguing colours. Many varieties are sweetly fragrant (sniff blooms in the garden centre to be sure.) Some also tout themselves as "weatherproof," which means that the flowers don't close up when water is splashed on them. Height of the plant varies from 15 cm to 45 cm according to verities . It is more useful in pots and border of the lawn.

4. African marigold (*Tagetes erecta)*

There's nothing subtle about an African marigold, and thank goodness for that! It's a big, flamboyant, colourful punch of colour for the sunny bed, border, or pots. Mostly it founds in orange, yellow, cream and white. Plants height varies from 30 cm to 90 cm according to different varities The foliage of the plants dark green fresh and tidy. It require full sun and a common man flower in India.

5. Marigold French (Tagetes patula)

Shorter and not as upright as African Marigolds, French Marigolds form mounds that are often wider than they are tall. These aromatic annuals are easy to grow and brighten the garden with their cheerful shades of yellow, orange and red. They grow roughly 8-12 inches high with a chic, neat, little growth habit and elegant dark green foliage. They do best in full sun with moist, well-drained soil and will flower all summer long. They may reseed, coming back year after year, in spots where they're happy.

6. Phlox (Phlox drummondii)

Annual phlox is good choice for gardeners in India because it's easy to grow and puts on such a great display for beginning gardeners who have to tackle a hot, dry spot. Remove the flower clusters as they fade to encourage more blooms and pinch the plants back in summer if they start to get leggy. Plant is grown easily in beds, pots and border etc. Height of the plants varies from 10 cm to 45 cm and has the wider choice of colour white, pink, red, blue, violet, lavender etc.

7. Statice (Limonium sinuatum)

Old-fashioned annual statice is found more often dried in crafts stores than growing in gardens. But this easy-to-grow plant is a great pick for containers or the middle of a border, especially if you want to harvest it for everlasting bouquets indoors.

The plant is also very drought-tolerant, so you can enjoy its blooms even if you forget to water it from time to time. In fact, statice thrives in hot, sunny spots with well-drained soil. The plants to be planted middle of the border and height goes to 30 cm to 60 cm. This is a wider choice of floweriest because the flowers to be used for cut flowers and dry flower.

8. Begonia (Begonia valvata)

Annual begonia is about as easy as it gets. It does well in a variety of conditions, but to keep it its most luxuriant best, give it light shade; rich, well-drained soil; and ample water. It also loves plenty of fertilizer, so be generous. The plant can be grown in semi shade or shaded area. The plant height varies from 15 cm to 45 cm according to the varities It is specially use in container, border as well as hillock also.

9. Black-eyed Susan (Rudbeckia occidentalis)

Add a pool of sunshine to the garden with a massed planting of black-eyed Susan. From midsummer, these tough native plants bloom their golden heads off in sun or light shade and mix well with other perennials, annuals, and shrubs. Tall varieties look especially appropriate among shrubs, which in turn provide support. Add black-eyed Susans to wildflower meadows or native plant gardens for a naturalized look. Average soil is sufficient for black-eyed Susans, but it should be able to hold moisture fairly well. The Plant ht. 60-300 cm tall, 3-11 plants, Width: 1-1/2 to 3 feet, Depending on variety flowr color: Yellow or Orange Flower, Depending on variety Bloom, Time: Bloom midsummer into fall.

10. Calendula (Calendula officinalis)

The Calendula is a most common winter annuals after the African Marigold in India. Sometimes grown as an herb, cheerful calendulas look good in every garden. The cream, yellow, apricot, or orange flowers are edible, adding bright colour and tang to soups and salads. And they're great cut flowers, adding a burst of sunshine to bouquets. Cool-season annuals, these plants do best in early flowering.

They like a variety of soils but need good drainage and moderate water. Deadhead them regularly to prolong bloom. Calendula will reseed in ideal conditions. The plant requires full sun it can be easy to grow and uses for cut flowers, border plant and pot plants. Height of the plant varies from 20 cm to 75 cm according to different varieties.

11. California poppy (Eschscholzia californica)

California poppy, a native wildflower, adds an easy going dose of color hot, dry sites. Beautiful, satiny flowers in sunset colors wave above ferny, blue-green foliage. They like poor soils, especially sandy soils. If soil is too rich and moist, they won't bloom well. California poppies are a cool-season annual, which means they offer great color early in the growing season but fade once the heat of summer hits. The Plant ht. 30 cm tall , width: 1 foot wideLandscape, Easy to Grow. California poppies will reseed easily; for more plants next year, allow some flowers to ripen to seed on the plant and scatter when you tear up those plants. Replant in fall if you like, especially in warmer-climate areas.

12. Hollyhock (Alcea rosea)

The ultimate cottage garden choice, hollyhock sends up tall spires that cover themselves in flowers in beautiful colors. They're easy to grow from seed -- in fact, that's usually the only way they are found in garden centers. Most hollyhocks are biennials, that is, they grow only foliage the first year, flower the second, and die that fall. However, if you establish a stand of hollyhocks, they'll reseed each year so there will always be plenty blooming. Interestingly, the flowers open from the bottom to the top of the spike throughout the summer. These tall (up to 8 feet) beauties are ideal against fences or buildings where they can get natural support. Red forms are especially attractive to hummingbirds and butterflies. The plant ht. 90-240 cm, width. 30-90 cm, colour available. Red, Pink, apricot, yellow, levender, purple amd near black, Easy to Grow.

13. Cosmos (Cosmos bipinnatus)

The simple, daisy like flowers appear in cheery shades on tall stems that are great for cutting. The lacy foliage makes a great backdrop for shorter plants, as well. Cosmos often self-seeds in the garden, so you may only have to plant it once, though the colors can appear muddy or odd in the reseeders. The plant ht. 60-150 cm tall, 2-11 plants, width: 30-60 cm wide landscape, Easy to Grow Plant cosmos from seed directly in the ground in spring. Or start from established seedlings. This flower doesn't like fertilizing or conditions that are too rich, which causes the foliage to be large and lush but with fewer blooms.

14. Flowering kale (Brassica oleracea)

Thank goodness for kale. It's one of the few plants available to add a fresh burst of color and life to the fall landscape! Its leaves come with beautiful variegations in pinks, purples, and reds that blend beautifully with changing autumn foliage. Plant it in spring or in the fall after you tear out tired or frost-damaged annuals such as marigolds and impatiens. It likes rich, well-drained but moist soil. The flower ht. 12-18 inches tall, width: 12-18 inches wide landscape, Easy to Grow.

15. Gazania (Gazania linearis)

This tough plant endures poor soil, baked conditions, and drought beautifully and still produces bold-color, daisy like flowers from summer to frost. A perennial in Zones 9-11 -- the hottest parts of the country -- gazania is grown as an annual elsewhere and blooms from mid-summer to frost. A summer plant often grown as an annual, gazania bears boldly colored daisy-shaped flowers from

summer to frost. The flowers appear over toothed dark green or silver leaves between varieties). Plant established seedlings outdoors after all danger of frost has passed. Do not fertilize, and keep soil on the dry side. The plant ht. 30 cm, width: 30 cm, 8-10 plant, Easy to Grow.

16. Geranium (Geranium oreganum)

Geraniums have been a gardener's favorite for well over a century. The old-fashioned standard for beds, borders, and containers, geranium is still one of the most popular plants today. Traditional bedding types love hot weather and hold up well to dry conditions; many offer colorful foliage. Regal, also called Martha Washington, geraniums are more delicate-looking and do better in the cool conditions of spring and fall. Though most geraniums are grown as annuals, they are perennials in Zones 10-11. Bring them indoors to overwinter, if you like, then replant outdoors in spring. Or they can bloom indoors all year long if they get enough light. The plant ht. 60 cm & width. 60 cm, Easy to Grow.

17. Gerbera (Gerbera jamesonii)

Gerbera daisies are so perfect they hardly look real. They bloom in nearly every color (except true blues and purples) and produce fantastically large flowers on long, thick, sturdy stems. They last for a week or more in the vase, making them a favorite of flower arrangers. This tender perennial will last the winter in only the warmest parts of the country, Zones 9-11. In the rest of the country, it is grown as an annual. It does well in average soil; it likes soil kept evenly moist but not overly wet. Fertilize lightly. The plant ht. 30 cm, width. 60 cm, 10-11 plants, Easy to Grow.

18. Brachycome (Brachycome iberidifolia)

Easy, always fresh, and always eye-catching, Shasta daisy is a longtime favorite. All cultivars produce white daisy flowers in various degrees of doubleness and size. The sturdy stems and long vase life make the flowers unbeatable for cutting. Shasta daisy thrives in well-drained, not overly rich soil. Taller sorts may need staking. The plant ht. 60-150 cm tall, width. 30-60 cm wide landscape, 5-8 plants, Easy to Grow.

19. Godetia (Clarkia amoena)

This under-appreciated annual bears the most beautiful, satiny pink or white flowers for weeks in summer. It also goes by the charming name farewell-to-spring, perhaps because it blooms just as spring temperatures are rising. Plant it once and you won't want to go a growing season without it.

Native to areas of North America, this plant does best in areas with cool summers and in moist, well-drained soil. It's a great cut flower, too. Although you can sometimes find it as established seedlings, most gardeners will need to start it from seed. Plant directly in the ground in early spring; it dislikes transplanting. Don't fertilize. If it has too many nutrients, it will have lots of foliage and few flowers. The plant ht. 30-150 cm tall, width 30 cm wide landscape

20. Larkspur (Delphinium ajacis)

Larkspur is basically an annual version of delphinium, an all-time favorite perennial. Larkspur produces lovely spikes of blue, purple, pink, or white flowers in spring and summer. They look best clustered in small patches.

Like many cool-season annuals, it's a good winter-blooming plant for the Deep South.

Larkspur is so easy to grow that it often self seeds in the garden, coming back year after year. Plant larkspur from seed directly in the garden in early spring. Larkspur doesn't like to be transplanted. It prefers rich, well-drained soil and ample water. The plant ht. 60-120 cm, width. 6-12 inches, Easy to Grow.

21. Shirley Poppy (Papaver rhoeas)

The Shirley poppy was created from 1880 onwards by the Reverend William Wilks, vicar of the parish of Shirley in England. Wilks found in a corner of his garden where it adjoined arable fields, a variant of the field poppy that had a narrow white border around the petals. By careful selection and hybridization over many years he obtained a strain of poppies ranging in colour from white and pale lilac to pink and red, and unlike the wild poppies these had no dark blotches at the base of the petals. Further selection has given rise to semi-double and double forms, as well as flowers with a ring of contrasting colour around the edge: the picotee form.

22. Nasturtium (Tropaeolum majus)

Nasturtiums are so versatile. They grow easily from seed sown directly in your garden's poorest soil and blooms all season until frost and are never greedy about food or fertilizer. Nasturtiums are available in either spreading or climbing types. Plant spreading types in large containers to spill over the sides. Plant them alongside wide paths to soften the sides for a romantic look. Use nasturtium to brighten a rock garden or between paving stones. Plant them at the edges of beds and borders to fill in between other plants and add soft, flowing color. Train climbing types up trellises or alongside fences. The leaves and flowers are edible; use them as a showy plate garnish or to jazz up salads. The plant ht. Mouding varieties from 9-16 inches, width. 12-18 inches depending on type landscape, Easy to Grow.

23. Mesembryanthemum (Mesembryanthemum crystallinum)

Mesembryanthemum is a member of the family Aizoaceae; like many members of this family, it is characterized by long-lasting flower heads. Flowers of Mesembryanthemum protect their gametes from night-time dews or frosts but open in sunlight. There is an obvious evolutionary advantage to doing this; where sun, dew, frost, wind or predators are likely to damage exposed reproductive organs, closing may be advantageous during times when flowers are unlikely to attractpollinators.

24. Paper Flower (Helichrysum petiolare)

This plant is attractive to bees, butterflies and/or birds, Average Water Needs; Water regularly; do not overwater Self-sows freely; deadhead if you do not want volunteer seedlings next season.This plant is resistant to deer Flowers are good for drying and preserving Suitable for growing in containers Height: 6-12 in. (15-30 cm) Width. 12-18 in. (30-45 cm)

25. Corn Flower (Centaurea cyanus)

The annual blue cornflower is a slender plant of great charm. Its rich shades of blue are much sought after, both for garden decoration and for flower arrangements. Garden varieties have added red, pink, lilac and white to the colour range, and even bright yellow is available in the closely related sweet sultan Amberboa moschatus. The wiry plants may need some discreet support, and deadheading helps to prolong the flowering season, as does autumn sowing, an option that will produce larger, earlier-flowering plants. This fully hardy plant requires a sunny site, growing in most well-drained soil types, even poor soil. The plant Height: 90cm, Spread: 30cm, Time to plant seeds: March to May.

26. Salvia (Salvia splendens)

“Annual” salvia is a tender tropical perennial that is typcally grown as a warm weather annual bedding plant. It has long been a garden standard, reliably blooming over an extended period. Ever more varieties are being developed, giving a wide range of colors, including white, salmon and purple, as well as the traditional bright red, and heights from about 8 in (20 cm) to nearly 3 ft (0.9 m).

Leaves are bright to dark green, elliptical and toothed. Flowers grow on spikes and are two-lipped, with a flat lower lip and helmet-shaped upper lip.

27. Cineraria (Cineraria longipes)

These are herbaceous perennials that are often grown as annuals. There are three basic types: the large-flowered; the stellata or Star-flowered; the intermediate, with flowers similar to the stellata and having the compact growth of the large-flowered; and the dwarf intermediate strain, growing 1-foot tall and having a compact, free-flowering growth. They all come in a wide range of colors. There are two main types of the tall, small-flowered Cinerarias. The most popular is the Star-flowered, which produces an abundance of small flowers in blue, pink, salmon, white and other hues. The large-flowered Cinerarias come in a brilliant array of colors. Mixed seeds of a good strain will provide flowers in blue, purple, rose, pink and other gorgeous colors, many having noticeable white sections.

28. Pansy (Viola tricolor)

The pansies are a large group of hybrid plants cultivated as garden flowers. Pansies are hardy annuals whose flowers have “faces.” These plants offer colorful flowers for any season in your garden. They have one of the widest ranges of colors and are good for containers, borders, and ground covers.

29. Verbena (Verbena brasiliensis)

Verbena is a spreading plant ideal for cascading over retaining walls, pots, baskets, and window boxes. As log as the soil is extremely well drained, verbena will reward gardeners with countless clusters of small

blooms all season. It's fairly drought-tolerant, making it a great choice for hanging baskets, rock gardens, planting in cracks between stones, and other tight places. The plant ht. From 9 to 18 inches tall, Width: From 12 to 20 inches Landscape, 7-9 Plant.

30. Nemesia (Nemesia violiflora)

Nemesia is a charming cool-season annual with pretty little snapdragon-shape flowers -- often fragrant -- that bloom in a wide range of colors. It does best in spring and fall (winter in mild-winter climates), though some varieties have better heat-tolerance than others. In cool-summer areas, such as the Pacific Northwest, nemesia will continue to bloom right through the summer into fall. Nemesia prefers moist, well-drained soil that's rich in organic matter. The plant ht. 60 cm, Width: 60 cm blooms best in spring and fall Landscape.

31. Candy Tuft (Iberis gibraltarica)

Sparkling white candytuft, with its cool evergreen foliage, brightens any rock garden or wall for several weeks in spring. At bloom time, plants are covered with umbels of pure white flowers that fade to pink. Compact selections are now available. Where happy, this plant will spread. Supply good drainage, and cut back spent flowers to keep plants neat. The plant ht. 30 cm, width 8-16 inches, 5-9 Plants, Easy to Grow.

32. Antirrhinum (Antirrhinum majus)

Season Winter Name Antirrhinum Common Name Snapdragon, dwarf Description These are bright, jolly flowers and look great in the garden or in big flower pots. If you look at their flowers carefully they look like a dragon's mouth! They like a sunny position in any garden soil. Seeds can be sown from January to March.

33. Tulip (Tulipa tarda)

The tulip is one of the most popular garden flowers. Tulips are hardy and require little care. Some types of tulips bloom for years, once established. Tulips generally are divided into 15 different classes, which vary in appearance and season of bloom. The early bloomers include single early, double early, kaufmanniana, and fosterana tulips.

34. Carnation (Dainthus caryophyllus)

The old-fashioned carnation name pinks comes from the serrated flower edges, which look as if cut with pinking shears. And the name of the color pink is said to come from these perennials, which have been popular in gardens for hundreds of years. The many dianthus species and hybrids come in red, white, orange, purple, cranberry, and of course, many shades of pink. Flower size ranges from less than an inch to several inches wide, and height ranges from just a few inches to several feet tall. How to grow: Dianthus prefers average to rich well-drained soil in full or nearly full sun. Refresh older plantings by dividing and resetting plants every few years.

35. Alyssum (Lobularia maritima)

Sweet alyssum, with its dainty, fragrant flowers, is often used in containers and hanging baskets to spill over the edges,

creating a soft, frothy look. It's also a great edging plant because of its tidy, compact habit. Regardless of how you use it, sweet alyssum does best in spring and fall's cool conditions (or use it for winter color in very warm climates). In cool-summer conditions, such as the northern third of the United States, sweet alyssum will bloom steadily through the summer. It halts bloom in summer in warmer areas. The plant ht. 8 inches tall, width 30 cm, Easy to Grow.

36. Stock (Matthiola incana)

Stock is best known for its spicy, sweet fragrance and as an excellent choice for flowerbeds and cut flower arrangements. Depending on the variety, stock can grow from about a foot tall to almost three feet, making it a versatile choice for any garden bed. Use taller varieties towards the back of a design to add height, or smaller ones towards the front so you can better admire their scent and their wide range of colors; stock is available in shades of white, yellow, purple, pink, peach, and red. While many varieties are single, meaning that they have four petals per flower, some are double, giving them a softer, more ruffled and romantic appearance.

37. Primrose (Primula malacoides)

Take a walk down the primrose path and you'll never look back! Primroses are a classic cottage flower and are popular with collectors. They covet the hundreds of different primroses available, especially some of the tiny rare alpine types. Many are staples of cottage gardens and rock gardens, while others provide spring color to damp places, rain gardens, and bog gardens. Their basal rosettes of oval leaves are often puckered or are very smooth. The colorful flowers may be borne singly or rise in tiered clusters, or even spikes. Provide humus-high soil that retains moisture and some shade for best results. The plant ht. 2 inches, width 4 inches, colour whites, pink, lavender, purple red, yellows, orange and green, 2-8 plant, Easy to Grow.

38. Dianthus (Dianthus caryophyllus)

The species are mostly herbaceous perennials, a few are annual or biennial, and some are low subshrubs with woody basal stems. The leaves are opposite, simple, mostly linear and often strongly glaucous grey-green to blue-green. The flowers have five petals, typically with a frilled or *pinked* margin, and are (in almost all species) pale to dark pink. One species, *D. knappii*, has yellow flowers with a purple centre. Some species, particularly the perennial pinks, are noted for their strong spicy fragrance.

39. Daisy (Bellis perennis)

Easy, always fresh, and always eye-catching, Shasta daisy is a longtime favorite. All cultivars produce white daisy flowers in various degrees of doubleness and size. The sturdy stems and long vase life make the flowers unbeatable for cutting. Shasta daisy thrives in well-drained, not overly rich soil. Taller sorts may need staking.

Light: Sun, Part Sun Zones: 5-8 Plant Type: Perennial Plant Height: 20-30 cm tall Plant Width: 1-2 feet wide Landscape Uses: Containers, Beds & Borders Special Features: Flowers, Attractive Foliage, Cut Flowers, Dried Flowers, Attracts Butterflies, Drought Tolerant, Easy to Grow.

40. Asiatic Lilies (Lilium chalcedonicum)

Asiatic lilies are one of the most beautiful flowers that you can grow. I love to walk in the garden and see the new blooms and my garden just wouldn't be complete without them. These are my favorite flowers next to daylilies which aren't really lilies at all. Here you will find all the information you need to grow asiatic lilies.

Once you plant liliy bulbs or plants they will give you pleasure for years to come and multiply and become even more beautiful. They are grown form a hardy bulb that multiplies quickly and takes little care. They come in many sizes, heights and shapes. Lilies are called bulbs but are really tubers with fleshy scales that never go into

dormancy like other bulbs that you might be familiar with.

41. Gladiolus (Gladiolus angustus)

Gladiolus is a perennial favored for its beautiful, showy flowers. Its flowers grow on tall spikes and are often found in cutting gardens or in the back along the border (because they are tall). Gladioli have many different colored flowers, and grow between 60 to 180 cm in height. It's good for cut flowers.

42. Hyacinths (Hyacinths orientalis)

Hyacinth bulbs are planted in the fall and borne in spring. The Victorians revered hyacinths for their sweet, lingering fragrance, and carefully massed them in low beds, planting in rows of one color each. The loose to dense racemes of strongly fragrant flowers are closely packed with tubular-bell-shaped, single or double flowers. As well as growing in the ground, colorful hyacinths are excellent for forcing in containers and some are available for early flowering indoors.

43. Dahlia (Dahlia variabilis)

Planting dahlias in a spot that gets at least eight hours of direct sunlight a day. In dry, hot-summer climates, choose a spot that provides direct sun from the morning into midday, offering shade or filtered shade by the hottest part of the late afternoon.

Like potatoes, dahlias grow from tubers so good soil preparation is key to best performance. Loosen or dig soil to a depth of about 10 inches. Your soil should be easily worked and offer superb drainage. If you have heavy soil, amend with peat moss, compost, or aged cow manure.

Planting is a good time to incorporate an organic fertilizer with an N-P-K ratio of 5-10-15 or 5-10-10, 10-20-20, or 0-20-20. The higher middle number -- phosphorous -- assists with bloom production. The third number -- potash or potassium -- helps root development. Any fertilizer recommended for vegetables can be used for dahlias.

Although you can start dahlias from seeds, it's easiest to begin with tubers. After the soil is prepared, dig a hole 4-6 inches deep, lay the tuber horizontally, and cover with soil. If you're planting several dahlias, grow the smaller varieties 9-12 inches apart. Taller dahlias can be spaced 2-3 feet apart, or half their final height (some can grow taller than 6 feet, so be prepared!).

Except in hot climates, don't water the tubers until the first shoots and leaves appear. Because the surface of the ground needs to stay warm (at least 60 degrees F) for the tubers to sprout, avoid mulching until the plants are actively growing.

Once the plants are established, add mulch to conserve moisture and prevent weeds. Because dahlia roots are shallow, pulling large weeds can easily disrupt the roots, so pull weeds only by hand when they are still small. Avoid using chemical weed controls and weeding instruments like hoes because they kill dahlia roots.

A - Flowering Winter Season Annual

Sowing time : October - Novemebr except those marked with asterisks

All raised by seed - Other methods used are mentioned in column 9)

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
1	2	3	4	5	6	7	8	9
1	Acroclinum	Acraclinum album A roseum (Compositae)	Both	Situ	7.5-15	30-60	White, rose colour	Flowers may be single or double, keeping colour and form even dry.
2	Agreratum	Ageratum houstonianum (Curciferae)	Both	Transplanted	20-25	30-45	White and Blue	Good for edging and massing in beds. Good as cut flower. Well suited for rockery
3	Alyssum (Madwort)	Lobularia maritima Sym Alyssum maritimum (Curciferae	Both	Transplanted	05-10	15-25	White, yellow and pink	Sweet scented flower as of candytuft. Suits well a long the edge of a flower-bed or a rockey. Suitable for hanging baskets.
4	Anchusa	Anchusa capensis (Boraginaceae)	Both	Transplanted	15-20	45-60	Blue	Good for edging and massing in beds. Good as cut flower. Well suited for rockery
5	Antirrhinum (Snap dragon)	Antirrhrinum majus (Scrophulariaceae)	Both	Transplanted	15-30	30-90	Pink, Yellow, rose, orange, crimson, white and mauve	Three distinct strain (a) Tall, (b) Intermediate, (c) Dwarf. Good for mixed borders. Good as a cut-flower.
6	Arctotis	Arctotis grandis (Compositae)	Both	Transplanted	10-15	30-60	Pink	Can alsoe be multiplied by division. Cut-flowers have long keeping quality.
7	* Aster	Calilstephus chinesis (Compositae)	Both	Transplanted	20-25	30-75	Expect yellow all colours are met	Important groups, (a) Giant asters (b) Comet, (c) Branching aster, (d) Imbricated pampon. All are very good for pots and borders.

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
8	Brachycome (Swan Daisy)	Broerhycome iberidifolia (Compositae)	Both	Situ	10-15	20-35	White , blue, rose	Seed should be sown in August-September.
9	Calendula (Pot-Marigold)	Calendula afficinalis (Compositae)	Both	Transplanted	20-30	30-45	Yellow or orange	Flower may be single or double. It is good cut-flower
10	Candytuft	Iberis umbillata (Crucifere) l. amara	Both	Transplanted	15-20	24-36	Pure white, rose, purple	Flower may be single or double. Plants have medicinal value.
11	*Carnation	Dianthus spp. (Carpophyllaceae)	Pot	Transplanted	-	30-60	Rose white, pink and spoted	Cuttings. layerings are also possible, flowers are sweet scented.
12	Chrysanthemum (Annual)	Chrysanthemum spp. (Compsitae)	Both	Transplanted	15-30	30-60	Colour depends upon species	Very goof annual for borders. Grows well in poor soil.
13	Calleopsis (Coreopsis)	Calleopsis tinctoria (Compositae)	Bed	Transplanted	15-20	45-60	Golden yellow orange and bronze	Flowers are single or double. Good for pots as well for beds.
14	*Cineraria	Cinceraria spp. (Compositae)	Pots	Transplanted	-	20-46.25	All possible colour and combinations	Very good for pet—sown in July-Aug. Single and double flowers are common. Does better in cool and shady places.
15	Clarkia	Clarkia elegans (Onagraceae)	Both	Transplanted	20-30	30-45	Pink, white, red	Flowers are borne in long spikes, very good for cut flower.
16	Dianthus (indian Pink)	Dianthus nobilis (Caryophylaceae)	Both	Transplanted	15-20	20-30	Pink, white in various other combinations	Flowers are single as well as double.
17	Dimprphotheca (Capemarigold)	Dimporphotheca pluvialis (Compositae)	Both	Transplanted	-	30-45	Orange, white golden yellow	A good pot annual. Flowers open in bright sunlight. Prefers a sunny situation.
18	Eschscholtizia (Californian poppy)	Eschscholtiza Californica (Papaveraceae)	Both	Situ	-	30-45	Orange light yellow and white	Flowers open in bright sunlight.

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
19	Gaillardia (Blanket flower)	Gaillardia drummondii (Compositae)	Both	Transplanted	15-20	30-45	Combination of orange purple yellow and crimson	Flowers may be single or double, some are perennial.
20	Godetia	Godetia grandiflora (Onagraceae)	Both	Transplanted	20-30	30-45	Pure white, rose and red	May be single or double. Does well in partiable shade
21	Heliotrope	Heliotrope Sp. (Borangenaceae)	Both	Transplanted	20-30	20-45	White, blue and purple	Flowers are sweet scented, and are borne in clusters
22	Helichrysum (Everlasting, or straw flower)	Helichrysum bracteatum (Compositae)	Both	Transplanted	20-30	30-60	White, pink, yellow and gold	Very good as cut flowers. Does well in any garden soil.
23	Larkspur	Delphinium spp. (Compositae)	Bed	Situ	15-20	45-60	Purple, white and Blue pink	Single or double flowers are produced in spikes. Requires thinning.
24	Leptosyne	Leptosyne meritema (Compsitae)	Both	Both	20-30	45-60	Yellow	Good for borders and pots. Flowers are borne singly.
25	Linaria (Toadflax)	Linaria bipartite (Scrophulariaceae)	Both	Transplanted	10-15	20-30	Blue, pink and Mauve	Flower spike look like miniature antirrhinum prefers a suny situation.
26	Linum (Flax)	Linum grandiflorum (Linaceae)	Both	Situ	15-20	,,	Scarlet	Good for beddings, flowers are five petalled.
27	Lobelia	Lobelia erinus (Campanulaceae)	Pot	Transplanted or Situ	10-15	,,	Blue, scarlet	Good for hanging baskets; makes excellent edging.
28	Lupin	Lupinus hartwegii (Leguminosae)	Both	Situ	15-20	30-45	White, yellow and Mauve	Flowers are produced in long spikes.
29	Nasturtium	Tropaeolum majus, T.minor (Geraniaceae)	Bed	Situ	10-15	20-25	Orange and Yellow	Thinning of foliage is essential; good for hanging basket.

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
30	Nemesia	Nemesia strumosa (Scrophulariaceae)	Both	Transplanted	5-10	15-20	Yellow with brown stripes	Good for mass effect.
31	Pansy	Viola tricolor (Violaceae)	Both	Transplanted	5-10	15-20	Flowers of different shades and combinations	Single and double kinds are excellent for borders, rockery and for pots.
32	Petunia	Petunia hybrid (Solanaceae)	Both	Transplanted	20-30	30-45	Except yellow all colours with stripes	Can be used for hanging baskets. Produces flowers even in summer months. Very good for mass effect. Double flowering varieties are also available.
33	Phlox	Phlox diummondi (Polemoniaceae)	Both	Transplanted	20-30	15-30	All colours and bicolours	One of the best annuals for beds and pots. Requires well-drained soils and sunny situation for good results.
34	*Salvia (Scarlet Sage)	Schizanthus wisetonensis (Solanaceae)	Both	Transplanted	20-30	30-45	Red, blue, white and yellow	Flower spikes are 15-30 cm. long; good as cut-flower. Seed should be sown in July—August.
35	Schizanthus	Schizanthus wisetonsis (Solanceae)	Both	Transplanted	20-30	45-60	White with pink shade	Seeds take long time for germination. Good for pots.
36	Stock	Mathiola incana (Cruciferae)	Both	Transplanted	20-25	20-30	Pink and white	Flowers are either single or double, and are scented. Flowers are borne on spikes.
37	Verbena	Verbena hybrid (Verbenaceae)	Both	Transplanted	15-20	20-30	Pink, pale yellow, blue white	One of the best annuals for pots and beds. Good for rockery and edging.
38	Vendedium	Venedium fastuosum (Compositae)	Both	Transplanted	20-30	20-30	Orange and yellow	Flowers are fairly large which are daisy like yellow.

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
39	Walflower (Gilli flowers)	Cherianthus cherrii (Crucifrae)	Both	Transplanted	15-20	20-30	Orange and yellow	Flowers are borne in long spikes, good as cut-flowers.
40	*Dahlia	Dahlia varibilis (Copositae)	Beds	Transplanted	30-45	60-1.20	All possible colours and combinations	Varieties true to type, are multiplied by cutting or tubers. The eyes are present on stalk attached with tuber. One of the best winter-annuals. The seeds as well as the tuber should be planted in August - September. Thinning of the flowers buds to 1-2 gives flower of larger size. Requires heavy feeding.

B - Rainy Season Annual (Sowing Time : June - July)

All raised by seed - Flowering Time : September - November

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
1	Amaranthus	Amarnathus tricolor (Amarantaceae)	Both	Transplanted	15-20	31-90	Crimson and red	Leaves are also very attractive as they are coloured. Good for edging and mixed border.
2	Balsam	Imatiens balsamina (Balsaminaceae)	Beds	Transplanted	15-75	30-45	Red, crimson, white, pink scarlet and purple.	Flowers are single as well double, should be trained to clean sterm.
3	Celosia (Cockscomb)	Celosia crestala, C. plumose C. chidsi (Amarantaceae)	Beds	Transplanted	20-30	30-45	Yellow, crimson, purple and red	Large compact velvety head of flowers of large size 30 cm x 25 cm. are borne well above the foliage.

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
4	Cosmos (Mexican Aster)	Cosmos bipinata (Compositae)	Beds	Transplanted	25-5	90-120	White, crimson, rose purple and orange	Pinching the short is desirable to encourage the branching.
5	Gaillardia (Blanket flower)	Gaillardia grandiflora (Compositae)	Both	Transplanted	20-30	45-60	Orange, purple yellow and crimson	Both single and double kinds of flowers are met.
6	Gomphrena (Bachelor's Button)	Gomphena globasa (Amarantaceae)	Both	Transplanted	15-20	20-30	Red, crimson and white	Plants in pot are good for verandah and indoor decoration.
7	Helianthus (Sunflower)	Helianthus Sp. (Compositae)	Bed	Transplanted	2.5-5	150-210	Orange and yellow	Flowers are single or double.
8	Marigold	Tegetes Sp. (Compositae)	Bed	Transplanted	20-30	60-90	Orange and yellow	Flowers are single or double, can continue to flower up to winter.
9	Mina lobata	Mina lobata (Convolvulaceae)	Pot	Transplanted	Creeper	-	Red and creamy	Good for training on arches and arbors.
10	Torenia	Totenia spec osa (Compositae)	Both	Transplanted	10-15	20-25	Blue with white spots	Good for beds and rockeries and verandah decoration.
11	Vinca	Vinca rosea (Apocynaceae)	Both	Transplanted	20-25	30-45	Red and white red with white eye	Plant can also be multiplied by cuttings.
12	Zinnia	Zinnia elegans (Compositae	Bed	Transplanted	20-30	45-60	White, red orange, scarlet, yellow and pink.	Pompon, Cupid Tom Thomb, California gaint are important groups of Zinnia. Linearis produces single bright yellow flowers. Excellent for edging and beds.

C - Summer Season (Sowing Time - February - March)

All raised by seed - Flowering Time : September - November

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
1	Cosmos	Same as given above			20-30	20-30		Cultivated for green leaves, can be trimmed to any desired shape.
2	Kochia (Mock Cypress)	Kochia scoparia var. trichophylla (Chenopodiaceae)	Both	Transplanted	20-25	10-15	Red, white, crimson, yellow and scarlet	The flowers are rose in shape and are single and double, can also be multiplied by cuttings. Flowers open only in the mornings.
3	Portulaca	Portulaca grandiflora (Portulaceae)	Bed	Transplanted	20-30	45-60	White, red orange, scarlet, yellow and pink.	Pompon, Cupid Tom Thomb, California gaint are important groups of Zinnia. Linearis produces single bright yellow flowers. Excellent for edging and beds.
4	Zinnia	Zinnia elegans (Compositae)	Bed	Transplanted	20-30	45-60	White, red orange, scarlet, yellow and pink.	Pompon, Cupid Tom Thomb, California gaint are important groups of Zinnia. Linearis produces single bright yellow flowers. Excellent for edging and beds.

D-Classification of Winter Annuals		
I. White	**II. Purple and Mauve**	**III. Pink and Light Red**
Antirrhinum	Ageratum	Acroclinum
Aster	Antirrhinum	Antirrhinum
Daisy	Cornflower	Asters
Candytuft	Phlox	Daisy
Gypsoyhilla	Heliotrope	Candytuft
Phlox	Larkspur	Clarkia
Stock	Sweetpea	Cosmos
Petunia	Lobelia	Godetia
Sweet alysum	Negella	Larkspur
Verbena	Pansy	Lupin
Dahlia	Pentunia	Petunia
Larkspur	Salvia	Phlox
Dimorphoteca	Stock	Poppy
Eschacholtzia	Torenia	Verbena
	Verbena	
	Viola	
	Aster	
	Anchusa	
	Lupin	
	Sweet Williams	

E-Classification of Winter Annuals		
Dwarf		**Medium**
(Upto 30 cm)		(Up to 60 Cm)
Gamolepsis	Stock	Antirrhinum
Lobillia	Sweet alyssum	Aster
Linum	Torenia	Ageratum
Mimulus	Viola	Anchusa
Nemesia		Acroclinum
Nasturtium		Cornflower
Nigella		Candytuft
Phlox		Calendula
Pansy		Daisy
		Gillardia
		Heliotrope

According to their colour		
IV. Crimson and Scarlet		**V. Orange and Yellow**
Argemone		Antirrhinum
Antirrhinum		Calendula
Aster Candytuft		Calliopsis
Celosia		Dimorphoteca
Salvia		Leptosyne
Phlox		Eschscholtiza
Stock		Marigold
Petunia		Nasturtium
Linum		Pansy
Dianthus		Sunflower
Cosmos		Phlox, Chrysanthemum (annual)
Salvia		Cosmos
Verbena		Minulus
Marigold		
According to their height		
	Tall	
	(Above 60 Cm)	
Larkspur	Antirrhinum	Leptosyne
Petunia	Chrysanthemum	Marigold
Salvia	Clarkia	Sunflower
Wallflower	Calliopsis	Schizanthus
	Cosmos	Sweetpea
	Eshscholtiza	
	Dahalia	
	Dimorphoteca	
	Gypsohila	

CHAPTER - 24

SUMMER AND RAINY SEASON FLOWERS

The summer season start in India from the month of April and continues till the month of June, from July to September the season is rainy. In summer the temperature rise up to 45 c and winds are dry all around. After the sparky spring, where various choice of flowers are available, in summer season there are very limited variety available because of adverse weather conditions, which the gardener can grow for adding color and flowers in his garden. The way of planting are by grow seedlings and planting them in beds or pots, secondly showing the seed directly in the beds or pots. During propagation for summer flower gardener should keep in mind to add the compost and sand in mixture to maintain the moisture during dry summer before planting seedling or seeds. The gardener should also keep in mind about the availability of irrigation water. Here, we are suggesting some popular summer and rainy season flowers for gardeners to choose from them.

1. Portulaca (Portulaca oleracea)

Portulaca also known as Moss roses, they are excellent flowers to have if you live in a dry climate, since they can store water well, and also provide lots of low lying color for your garden. They also are very easy to take care of after you get started. Moss rose is the gardener's choice for the hottest, driest, most problematic spots in the garden. This succulent plant thrives in heat, drought, and lousy soil, rewarding gardeners with nonstop color. Coming in sunny warm reds, oranges, magentas, and yellows, moss rose looks at home in a sun-drenched area. There's also a whole pastel color palette for moss rose -- creamy white, pink, and peach varieties. It often happily reseeds, coming back every year with gusto. The plant ht. 7-20 cm, width. 30 cm, Easy to Grow.

2. Cosmos (Cosmos bipinnatus)

Cosmos are annuals, grown for their showy flowers. The flower heads may be bowl– or open cup–shaped and are atop of long stems. Cosmos are easy to grow and make good border or container plants. The cosmos plants are able to flower from early summer and long lasting up to winter season. They make for good decorations in flower arrangements and also attract birds, bees, and butterflies to your garden. The height of the plants should be very from 15 cm to 45 cm according to the variety. Its commonly available in dark orange to yellow colour. It is easy to grow.

3. Vinca Flowers (Cartharanthus roseus)

Annual vincas aren't new or flashy flowers on the gardening scene, but recent cultivar developments warrant a new examination of this common bedding plant. Horticulturists have been hard at work bringing us new colors in plants with showier flowers that are easier to start from seed. The height of the plants varies from 15 cm to 45 cm according to variety, the common Vinca plants have only two colours white and dark pink. Now a days various colours in hybrid varieties are available in single colour or contrast. But the hybrid varieties are very susceptible to the water logging and they can not be prolonged during rainy season.

4. Sunflower (Helianthus annuus)

Sunflower is an annual plant, growing up to 4.6 m tall. It has large, rough and hairy leaves, oval to cordate in shape. Flower heads are also large, growing about 20-30 cm in diameter. It consists of numerous, densely arranged florets. Sterile ray florets on the outer side vary in color- they can be yellow, red or orange. The disc florets inside the circular head produce seeds. The florets inside the circular head are called disc florets, which mature into seeds. The florets inside the sunflower's cluster are spirally arranged, which is a most efficient packing of seeds within the flower head. **Parts used:** Seeds, leaves, root.

5. Sunflower dwarf (Helianthus annuus)

These dwarf sunflowers are free of pollen, making them perfect as indoor gift plants. They are also tolerant of mildew to perform well in the garden. Miss Sunshine flowers uniformly about 7 to 10 days earlier than Ballad. It is shorter, and flowers are 25% smaller than Ballad's 4 to 5-in.(10 to 13-cm) blooms. Miss Sunshine displays warm golden flowers, and produces secondary blooms more quickly. For larger flowers and bright yellow color, Ballad excels.

6. Zinnia (Zinnia acerosa)

Zinnias are one of the easiest **annuals** to grow, grow quickly, and bloom heavily. They make a massive burst of color in your garden. Zinnias have bright, solitary, daisy-like flowerheads on a single, erect stem. The most common zinnia is "dahlia-flowered" and grows up to three feet. Other types are "cactus-flowered." Use in an annual or mixed border. Smaller zinnias are suitable for edging, windowboxes or other containers. The narrow-leaf zinnia also works well in hanging baskets. Zinnias are very popular for cut flowers.

7. Gaillardia (Gaillardia aristata)

Gaillardia, or Blanket Flower, is a group of about 30 species that include both annuals and perennials. With bright and colorful daisy-like flowers it is no wonder this native wildflower has earned a spot on the heart of gardeners everywhere. The most common species for garden use is Gaillardia grandiflora. It is this perennial, and some of its most unique cultivars that we will discuss here. Hardy, sun-loving and easy to keep it deserves a place in every garden.

8. Gomphrena (Gomphrena globosa)

Gomphrena easily grown in average, well-drained soils in full sun. Although mature plants exhibit good drought resistance, plants grow best with regular moisture throughout the growing season. Extremely good heat tolerance. Sow seed directly in the garden. Use ample amounts of seed since germination rate can be quite low. Set seedlings or purchased plants out. Pinch young plants to promote more foliage and flowering. The plants ht. 30 to 60 cm. The plant is hardy nature and easy to grow.

9. Cladium (Cladium californicum)

Cladiumis a very popular bulbus plant for rainy and summer season. It can be grown easily from April to September in north India plane. On onset the winter the plants leaves dried and bulb can be collected for the next season and they can be stored in cold storage during dormancy. The Cladium have very decorative leaves of different colours and shapes. It can be easily planted in semi shaded beds or pots. The lower dry leaves should be eradicated regularly for new shoots / leaves. The height of plants very from 15 cm to 40 cm mainly leaves of the Cladium is a combination of red, white and green colour. According to the variety.

10. Balsam (Impatiens balsamina)

Balsam is a very favorite rainy season flower this old-fashioned annual adds an exotic, almost gaudy touch to the garden. It offers interesting, trumpet-shape blooms, mostly in shades of pink. Many selections have bicolor flowers. Balsam often self-seeds in the garden and is very easy to grow. Plant established plants outdoors in spring after all danger of frost has passed. Balsam needs rich, well-drained soil to do best, so work in plenty of compost. (It's ideal in containers as long as you don't let the plants dry out for even a second.) Fertilize lightly but regularly. The plant ht. 30-90 cm tall, width 30-60 cm wide and easy to grow.

CHAPTER - 25

FLOWER BEDS

Plants which flower profusely, when planted in groups to give a mass effect are termed as flower beds. They may be perennial (living for more than two years), biennials (living for two years) and annuals or seasonal (living for one season or for one year). They enhance the outdoor surroundings and are a good source of cut flowers. They are a good source for attracting pollinators, such as bees and butterflies.

Perennial plants are plants that lives for more than two years. The term is often used to differentiate a plant from shorter-lived annuals and biennials. The term is also widely used to distinguish plants with little or no woody growth from trees and shrubs, which are also technically perennials.

The most popular type of flowers in gardens are annuals which are raised from seed. They grow, bloom, seed and exhaust them selves during a season. It has the advantage of a tremendous variety of colour, size and form and occupies garden space for less time and can be easily replaced. The seasonal flowers allow the gardener to see all the stages of growth in the shortest possible period. This satisfies the “Growth Instinct” of gardener more than any other type.

Seasonal and perennial flower beds in various shapes and sizes can be designed. Flowers of all rainbow colours are available.

Perennials offer a lot of color without a lot of work. Among seasonal flowers, some species are specific to winter; summer and rainy season and some can be grown throughout the year.

Laying of Flower Beds:

1. Dig Trenches of 1’- 6” depth of required shape and size.
2. Remove weeds and other unwanted materials.
3. Fill up trenches with dug out soft soil by adding 3 kg compost or 1kg vermi-compost + 0.5 kg neem cake +
4. + 0.25 kg super phosphate per cft. + 25 gms of folidol dust.
5. Water the beds and refill the trench to cover up the shrinkage and form a bund around the bed to form a basin.
6. Plants seedlings at 6’-9” spacing after clipping lower 1/3rd leaves.
7. Water gently with a rose can.
8. Regular weeding, mulching and watering are required.
9. Clipping of primary buds to promote bushy growth and better flowering should be done.

(a) Seasonal Flower Beds

S. No.	Plant Name	Ht.	RWS	S	Plant Name	Ht.	RWS	S	Plant Name	Ht.	RWS
1.	Plant Name Antirrhinum	M	W	12	Dianthus	L	W	23	Pancy	L	W
2.	Aster	L	AYR	13	Gaillardia	L	AYR	24	Petunia	L	AYR
3.	Balsum	M	AYR	14	Gamphrena	L	AYR	25	Phlox	L	W
4.	Callendula	L	W	15	Galdiolus	M	AYR	26	Poppy	L	W
5.	Candytuft	L	W	16	Hollyhock	T	AYR	27	Portulaca	L	AYR
6.	Carnation	M	W	17	Kochia	M	w	28	Salvia	M	W
7.	Chrysanthemum	L	W	18	Lady's Lace	T	w	29	Sunflower	T	AYR
8.	Coreopsis	T	AYR	19	Larkspur	M	w	30	Verbena	L	AYR
9.	Celosia	MT	AYR	20	Marigold- tall	M	AYR	31	Zinnia	M	AYR
10.	Cosmos	T	AYR	21	Marigold-dwarf	L	AYR	32	Zinnia linearis	M	AYR
11.	Dahlia	T	w	22	Nasturtium	L	w				

(b) Perennial Flower Beds:

S. No	Plants Name	S. No	Plants Name	S. No	Plants Name	S. No	Plants Name
1	Balsam impatiens	5	Gazania	9	Lantanas	13	Tuberose
2	Beloperone guttata	6	Geranium	10	Portulaca	14	Verbena- Perennial
3	Cannas	7	Gerbera	11	Russalia	15	Azalea
4	Daisy	8	Lilies	12	Roses-Miniature	16	Lobelia

(c) Biennial Flower Beds:

S. No.	Plant Name	S. No.	Plant Name
1.	Onion	5.	Sweet William
2.	Parsley	6.	Colic weed
3.	Lunaria	7.	Carrot
4.	Silverbeet	8.	Hollyhock (some varieties)

H = Height, T = Tall, M = Medium, L = Low

W= Winter Season, AYRV = All year Round

CHAPTER - 26

POTTED PLANTS

Potted plants are displayed both indoors and outdoors, as groups or singles, on plane areas or steps, on ground or pot stands. Hanging pots are also used extensively. Pots in a group give very good effect.

Plants grown in pots are called pot plants. When open spaces are not available, as in the case of apartments, residences and offices, pot plants can be effectively used. Pot plants have the advantage of mobility. For indoor locations and rooftop gardens pot plants can be both indoor and outdoor. Most of the plants can be potted and used as pot plants.

Pot plants are used as indoor plants and also as outdoor plants on terraces, balconies, in driveways & also as decorative plants for display during special functions, conferences and other events. Pot plants comprise of Seasonal plants Flower, Foliage, Fruits, and Specimen plants.

Lot of plants can be grown as pot plants. When a plant is selected for planting in a pot, care should be taken that the nutritional requirements of the plant is fulfilled, as the media in a pot is restricted to the size of the pot. If the nutritional requirement of the plant is high, we have to replenish the same by periodical application of fertilizer and manure

Depending on the growth potential of the plant species, the container or pot size is selected. Plants which are used as ground covers or which like to droop are planted in hanging baskets (such plants have shallow root system). Plants which grown up to a certain height, and which require less area for spreading can be used in small and medium containers and species which have a tendency to grow big and tall are used in big pots. Generally fruit plants and trees are planted in bigger containers, or in planter boxes.

Whatever the size of the container are size of the plant, pot plants require regular application of manures and fertilizers and post control measures taken to keep them healthy. It is recommended to apply fertilizers and pesticides at regular intervals of 15 days 30 days, by loosening the top soil. Repotting of plants is recommended once in a year. Whenever repotting is done, it is advised to go in for a bigger pot than the existing pot, for a healthy growth. It is advisable to prune some of the roots at the time of repotting as it allows the plants to develop new roots which help in absorbing the nutrients better. Some plants like Cycads, Adeniums and Beau-carneas etc. Have to be repotted once in 2 to 4 years.

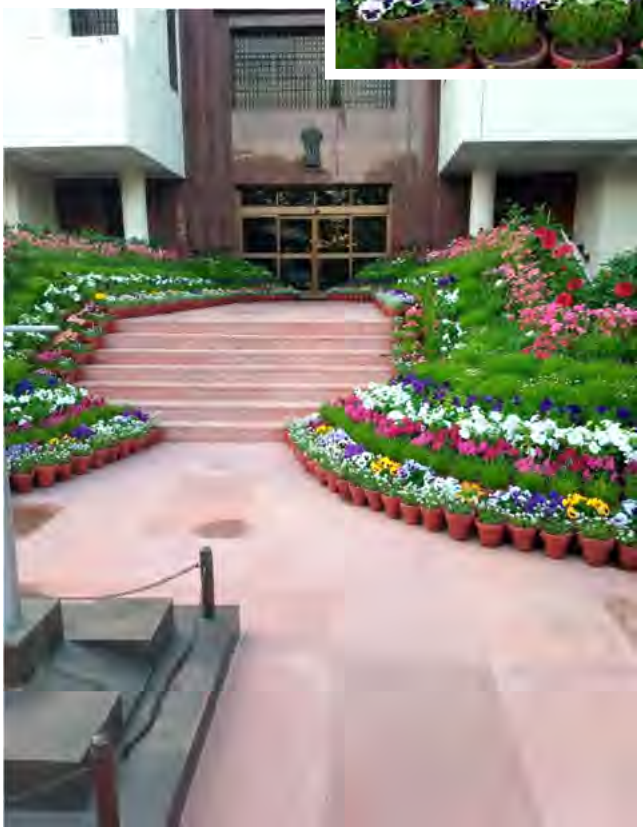
The media for potting should be porous and rich. For making the media porous Cockpit and perlite are used. For making it rich, use Vermicompost. Sand or broken clay pieces are added to media to improve the drainage, before repotting the plant, as improper drainage kills the plant due water logging.

Watering of potted plants should be regulated with care, as excess/ shortage of water can damage the plant. Generally in ground plantation, a plant can tolerate irregularity in watering because of sub-soil moisture which is not possible in pot plants.

POTTING MEDIA

1. Soil Media or Pot Mixture is prepared for plants grown in containers.
2. Media normally means, soil mixed with other ingredients in a particular proportion as required by a specific group of plants. Presently soil media is available which allows better growth, good moisture retention, thereby preventing diseases and weeds. It contains Vermiculite, Perlite, Sterilized Coco peat etc.
3. Different types of Soil media are available which contain materials like soil, sand, compost, vermicompost, wood Ash, Coco peat, Leaf Mould, Charcoal, Brick Bats, Neem Cake, Bio Fertilizers and Bone Meal etc. which are mixed in different proportions as per plant requirement.
4. Small quantities of fertilizers including micro nutrients and pesticides are also mixed in pot mixture
5. Basic criteria for selection of ingredients are aeration, moisture retention, and availability of nutrients.
6. Soil should neither be alkaline nor acidic; it should be neutral with PH value ranging from 6 to 7.5
7. The media should neither be very sticky due to excess clay content, which causes drainage problem, nor very sandy, which does not allow moisture retention to the required extent.
8. Function of the media is to hold the plant upright, holding moisture for a good period and nutrients for a long period and gradually supply to the plant.
9. For aeration of roots and conservation of moisture in media its top layer of about 4 - 5 cms should always be kept loose by periodic mulching.
10. Media should be changed or enriched once or twice a year for better nourishment and maintain physical condition of the soil media.

S. No.	Plant Name	S. No.	Plant Name
1.	Aechmea chantinii	16.	Asparagus desnsiflorus sprengeri
2.	Aglaonema colour	17.	Asparagus plumosus
3.	Aglaonema commutatum elegens	18.	Asparagus setaceus pyramidalis
4.	Aglaonema commutatum maculatum	19.	Aspidistra elatior variegate
5.	Aglaonema commutatum	20.	Begonia rex
6.	Alocasia amazonica	21.	Begonia semperflorens red pearl
7.	Alocasia korthalsii	22.	Brome lia balansae
8.	Alocasia macrorrhiza variegate	23.	Caladium hortulanum conbidum
9.	Alocasia macrorrhiza	24.	Caladium hortulanum attala
10.	Alpinia sanderae	25.	Calathea insignis
11.	Alpinia zerumbet	26.	Calathea rufibarba
12.	Anthurium andraeanum	27.	Codiaeum variegatum gold dust
13.	Aphelendra squarrosa	28.	Codiaeum variegatum mammy
14.	Asparagus densiflorus myers	29.	Codiaeum variegatum petra
15	Asparagus densiflorus myriocladus	30.	Codiaeum variegatum



CHAPTER - 27

CACTUS & SUCCULENTS

Variegated Sempervivum

Sempervivum Grape Tone

Sempervivum Cobweb

Sempervivum Red Lion

Sempervivum Calcareum

Sempervivum Ciliosum

Powder Puff

Powder Puff

Red Thorn

Britton & Rose

Corn Cob

Blue Candle

Paper Spine

Joseph's Coat

Domino

Bishop's Cap

Golden Barrel

Latispinus

Peanut

Pine Cone

Angel Wing

Thimble

Golden Ball

Peruvian Old Man

Pincushion

Albiflora

SEDUM

Major

Minor

White Diamond

Dragon Blood

Little Gem

Cape Blanco

Little Missy

Tricolor

Hispanicum

Sieboldii

Fire Storm

Lime Zinger

Fuzzy Wuzzy

Sunsparkler

Green Jelly Bean

SENECIO & SEMPERVIVUM

Ruby Necklace

Red Lion

Citriformis

Mahogany

Vertical Leaf

COTELYDON & KALANCHOE

Key Lime Pie

Bear Paw

Orbiculata

Mother of Millions

Chocolate Soldier

String of Pearls

Purple Heart

Donkey's Tail

Calico Kitten

Ruby Necklace

Sedum Sieboldii

Baby Necklace

String of Hearts

Little Missy

String of Bananas

ECHEVERIA

Black Prince

Blue Rose

Violet Queen

Cubic Frost

Culibra

Topsy Turvy

Lipstick

Painted Lady

Crinoline Ruffles

Gray Curl

Minima

Atlantis

White Rose

Raindrops

Blue Fairy

CRASSULA

Devil's Horns

Tiger Jade

Red Pagoda

Gollum Jade

Campfire

Springtime

Baby Necklace

Hummel's Sunset

Brevifolia

Ruffle Jade

Giant Watch Chain

Mesembryanthemoides

Pagoda Village

Devil's Horns

Tiger Jade

Ovata f. variegata

Red Pagoda

Colico kitten

Campfire

Ruffle Jade

Baby Necklace

Silver Springtime

Tiger's Jaw

Ivory Towers

Springtime

Cotyledonis

Moonglow

Green Pagoda

Rubricaullis Candy Cane

Rupestris High Voltage

Gollum Jade

Falcata Propeller

Tom Thumb

Orbicularis

Giant Watch Chain

Nudicaulis var. herrel

Pagoda Village

Window

Venosa

Cooperi

Cuspidata

African Pearls

Batesiana

Silver

Zebra Plant

Panda Plant

Flapjacks

Panamensis

Chocolate Soldier

Mother of Thousands

Mother of Millions

CACTUS

Powder Puff

Thimble

Hedgehog

Bishop Cap

Paper Spine

Corn Cob

Pine cone

Joseph's Coat

Golden Barrel

Angel Wing

Dwarf Chin

Echinopsis

Sunburst

Mardi Gras

Lily Pad

Black Rose

Suncup

Kiwi

Luteovariegatum

Sedum cuspidatum

Senecio rowleyanus

phedimus

crassula ovata

crasula ovata ‘gollum’

crassula ovata ‘hobbit’

graptosedum bronze

sedum luteoviride

kalanchoe rombophilosa

crassula wolkensii

cyanotis somaliensis

kalanchoe hougthonii

kalanchoe blossfeldiana

portulaca gilliesii

lenophyillum

sedum rubrotinctum

echinopsis

sedum diffusum

pachyveria ‘powder puff’

echeveria palida

tradescantia sillamontana

pachyphytum oviferum

sedum sediforme

crassula capitella ‘campfire’

Echeveria black prince

sedum golden glow

crassula capitella thyrsiflora

scilla pauciflora

sedum hernandezii

sedum pachyphytum

echinopsis chamaecereus silvestrii

Kalanchoe laetivirens

aeonium haworthii

portulacaria afra

echeveria

crassula perforata

crassula lycopodioides

kalanchoe fedtschenkoi

kalanchoe beharensis

crassula rogersii

orostachys

sedum morganianum

crassula fragilis

kalanchoe tomentosa

anacampseros

aeonium decorum

stapelia variegata

plectranthus australis

callisia repens

callisia fragans

haworthia rigida

graptoveria opalina

haworthia cymbiformis

graptosodum francesco baldi

sempervivum

crassula sarmentosa variegada

sedum lineare variegatum

tradescantia pallida ‘purple heart’

graptoveria titubans

graptoveria douglas huth

Pink Blush

Aloe Brevifolia

Window

Cuspidata

White Fox

Debbie

Silver Haworthia

Fred Ives

Little Jewel

Ghost Plant

Zebra

Variegated Butterfly

Gasteria Flow

Coral Aloe

Agave Butterfly

Lavender Pebbles

Ice Plant

Concrete Leaf

Lobster Flower

Pink Ice Plant

Variegated Ghost

Ruby Necklace

Citriformis

Brevicaule

Superbum

Royal Flush

Pachyphyllum

Split Rock

Variegated Aloe

AEONIUM

Sunburst

Mardi Gras

Lily Pad

Kiwi

Crested Sunburst

Suncup

Green Platters

Black Rose

Dinner Plate

Luteovariegatum

CACTUS

Golden Ball

Powder Puff

Thimble

Hedgehog

Bishop Cap

Britton & Rose

Paper Spine

Corn Cob

Pine cone

Joseph's Coat

Old Man

Golden Barrel

Angel Wing

Dwarf Chin

Echinopsis

Lady Finger

Mammillaria Albiflora

Devil's Tongue

CHAPTER - 28

ESSENTAL ELEMENTS AND THEIR SOURCES

MAJOR			MINOR
Essential elements used in relatively large amounts			Essential elements used in relatively small amounts
Mostly from Air and water	From Soil		
Carbon (C)	Calcium - (Ca)	Copper	- (Cu)
Hydrogen (H)	Magnesium - (Mg)	Manganesc	- (Mn)
Oxygen (O)	Sulphur - (S)	Zinc	- (Zn)
	Nitrogen - (N)	Molybednum	- (Mo)
	Phosphorus - (P)	Cobalt	- (Co)
	Potassium - (K)	Boron	- (Bo)
	Iron - (Fe)		

ROLE OF PLANT NUTRIENTS			
Group I	Energy Exchanges		Hydrogen and Oxygen
Group II	Energy Storers		Carbon, Nitrogen, Phosphorus, Sulphur
Group III	Translocation Regulators		Potassium, Sodium, Calcium and Magnesium
Group IV	Oxidation-Reduction Regulators		Iron, Manganese, Zinc, Copper, Boron and
			Molybednum

C-Deficiency Symptoms of Major and Minor Elements

Major (Micronutrients) Elements

S. No.	Element		Symptoms Major (Macronutrients) Elements
1	Nitrogen	1	Older or lower leaves of plant mostly affected; effects localized or generalized.
		2	Effects mostly generalized over whole plant ; more or less drying or firing of lower leaves ; plant light or dark green.
		3	Plant light green ; lower leaves yellow, drying to light brown colour; stalks short and slender if element is deficient in later stages of growth.

S. No.	Element		Symptoms Major (Macronutrients) Elements
2	Magnesium	1	Effects mostly localized ; mottling or chlorosis with or without spots of dead tissue on lower leaves ; little or no drying up of lower leaves.
		2	Mottled or chlorotic leaves, typically low ridden, as with cotton, sometimes with dead spots ; tips and margins turned or capped upwards stalks slender.
3	Phosphorus		Plant dark green, often developing red and purple coulurs, lower leaves sometimes yellow, drying to greenish brown or black colour, stalk short and slender if element is deficient in later stages of growth.
4	Potassium	1	Mottled or chlorotic leaves with large or small spots of dead tissues.
		2	Spots of dead tissue small, usually at tips and between veins, more marked at margins of leaves, stalk slender.
5	Calcium	1	New or bud leaves affected, symptoms localized.
		2	Terminal bud dies, following appearance of distorts on at tips or bases of young leaves.
		3	Young leaves of terminal bud at first typically hooked, finally dying back at tips and margins, so that later growth characterized by cut-out appearance at these points, stalk finally dies at terminal buds.
6	Sulphur	1	Dead spots not commonly present, chlorosis may or may not involve veins, making them light or dark green in colour.
		2	Dead spots not commonly present, chlorosis may or may not involve veins, making them light or dark green in colour.
7	Zinc		Spots generalized, rapidly enlarging, generally involving areas between veins and eventually involving secondary and even primary veins; leaves thick ; stalks with shortened internodes.
8	Boron		Young leaves of terminal buds becoming light green at bases, with final breakdown here, in later growth; leaves becomes twisted, stalk finally dies back at terminal bud.
9	Copper	1	Terminal buds commonly remain alive, wilting or chlorosis of younger or bud leaves with or without spots of dead tissue, veins light or dark green.
		2	Young leaves permanently wilted (wither-tip effect) without spotting or marked chlorosis; twig or stalk just below tip and seed head often unable to stand erect in later stages when shortage is acute.
10	Manganese	1	Young leaves not wilted, chlorosis present with or without spots of dead tissue scattered over the leaf.
		2	Spots of dead tissue scattered over the leaf, smallest veins tend to remain green, producing a checkered or reticulating effect.
11	Iron		Young leaves chlorotic, principal veins typically green, stalks short and slender.

CHAPTER - 29

IMPORTANT FERTILIZERS

The fertilizers and their uses in addition to the percentage of elements contained in them

S. No.	Name of the fertilizer	Chemical formula	Percentage of the elements	Equivalent		Remarks
				Acidity/ basicity		
Nitrogenous Fertilizers						
1	Sodium Nitrate	Na No4	16.0	-	29	Produces alkalinity in the soil. No accumulation in light soil suitable for use in acid soils. Soils not used in larger amounts.
2	Ammonium Sulphate	(NH4)2 SO4	20.5	110	-	Mostly used in present days. Acid forming fertilizer. Higher doses are harmful. It does not leach easily. Easy to handle.
3	Ammonium Nitrate	NH4 NO3	33.5	60	-	Best for dry land crops. It is completely used. More effective on heavier soils, because leaching is not very pronounced. In heavy rain-fall area, nitrate is completely leached out.
4	Ammonium Chloride	NH4 CL	25.0	128	-	Can be applied to light as well as heavy soils without loss of nitrogen. Nitrogen is absorbed by soil particles. Should not be used in acidic soils.
5	Ammonium Phosphate	(NH3)2 HPO4	21.0	55-77	-	They are primarily used on leguminous crops including pulses. They can be applied to any type of soil. Loamy, neutral soils are best, because phosphate and nitrogen both will be available.
6	Ammonium Sulphate Nitrate	-	26.0	93	-	It has the same effect as ammonium sulphate. Where leaching occurs on heavier soils, it is better. Transplanted paddy responds better to this fertilizer. It is safe to apply on highly acid soils than ammonium sulphate.

S. No.	Name of the fertilizer	Chemical formula	Percentage of the elements	Equivalent Acidity/ basicity		Remarks
7	Urea	$CO(NH_2)_2$	46.0	80	-	Well aerated soil helps in the decomposition of urea which is converted into ammonical nitrogen. Applied in dry land. Being less acidic, hence can be used on wider range of soils. Anaerobic condition may cause loss of nitrogen from urea. Very good for foliar application.
8	Calcium Cyanamide	$Ca\ CN_2$	22.0	63	-	It is highly based producing fertilizer, well aerated soil condition may help in the reduction of nitrogen in acid soils. It take longer time to release nitrogen for crops.
9	Calcium Ammonium Nitrate	-	20.5	-	-	This neutralizes the acidity of the soil due to the presence of lime. It should be used in those soils, where leaching is not heavy. For light soils it should be given in smaller doses.
10	Calcium Nitrate (Calnitro)	$Ca(NO_3)_2$	15.0	-	-	It is suitable for acidic soils more prominently than for calcareous or saline alkaline lands. Should not be used under wet conditions as nitrate is likely to leach out in the soil.
11	Potassium Nitrate	KNO_3	13.0	-	29	It is a basic salt and is more for the supplying of potas-sium rather than nitrogen. It leaches out very quickly in wet soils.
Phosphatic Fertilizers						
			P_2O_5 Content	Acidic or Alkaline		
1	Single Super-phosphate	16.0-20.0	neutral	90		Suitable for all types of soil. The effect of it on heavy soils more than on lighter soils because of low level of other nutrients.
2	Triple Super-Phosphate	48.0-50.0	Acidic	95		Alluvial soil of North India responds very much to this fertilizer. Both are water soluble.

S. No.	Name of the fertilizer	Chemical formula	Percentage of the elements	Equivalent Acidity/ basicity		Remarks
3	Basic Slag	3.4 Indian	alkaline			It reacts on acidic soils. The availability is more under water soils, which contain high contents of organic matter. It is not soluble in water. It is applied much earlier than it is required for the crops.
4	Rock Phos-Phate	Ca (Po_4With impirities	20.0-25.0	acidic	-	It is much more effective on acidic soils than alkaline soils. Insoluble in water. It does dissolve in soil water in the presence of organic matter or green manure. Highly effective on heavily leached soils. Its effectiveness increases if it is mixed with super-phosphate.
5	Bonemeal	$Ca_3(PO_4)_2$	25-28 and 1.2% N	alkaline	70	As already stated, it is not water solube fertilizer. It takes time to get dissolved in the soils. The efficiency of this fertilizer increases in the presence of organic matter in large quantities. Suited for acidic soils. The availability of phosphorus from bone meal is higher in water soil conditions than in drylands.
6	Ammonium Phosphate	$NH_4H_2PO_4$ and $(NH_4)_2PO_4$	48-54 And 11-21% N	acidic	100	Most suitable fertilizer for Indian soils. Ammo. phos. is liked on account of 20 : 20 percentage P and N with water solubility Can be used on light medium and heavy soils. Its response is most pronounced on medium and heavy soils than on lighter ones. It is equally effective in wet as well as dry lands,

S. No.	Name of the fertilizer	Chemical formula	Percentage of the elements	Equivalent Acidity/ basicity		Remarks
Potassic Fertilizers						
1	Potassium Sulphate	K_2SO_4	47-52			Response to this has been obtained on all soils in India where it is deficient. Soils of high calcium content retain the sulphate ions than low content ones Suitable for application on calcareous and alkaline soils. Not suited on heavy soils. In highly leached acid soils sulphur deficiency is actually observed. It contains 38 — 49% Sulphur.
2	Potasium Chloride (Muriate of potash)	KCl	60-62			It is imported in large amounts due to high percen-tage of K_2O. In acidic soils it has greater response than potassium sulphate. Cl ions are not retained by soils of heavy type hence can be used on such soils. In alka-line soils C1 ions prove toxic for crops.

CHAPTER - 30

MEDICINAL PLANTS

Common Name : Ghrita Kumari
Botanical Name : Aloe vera
Family Name : Asphodelaceae

MEDICINAL PROPERTIES / USES

Aloe Vera is very popular and also called as "Ghrita Kumari". Aloe is commonly used can be grown in various climatic conditions. It is sensitive to water logged conditions and also cold climate is not favourable for this plant.

Medicinal Uses: Detoxifies the body, hydrates skin, lowers high cholesterol, stabilizes blood sugar, prevents kidney stone, reduces high blood pressure, supports immune system, and helps in inflammation, wounds, burns and eczema, etc.

Other Uses: Aloe Vera has been widely used for cosmetic use such as for making lotions, facial creams, etc. The commonly used element is leaf juice and leaf gel.

Common Name : Ashwagandha
Botanical Name : Withania somnifera
Family Name : Solanaceae

MEDICINAL PROPERTIES / USES

Ashwagandha Withania somnifera is also known as Poison gooseberry. It is a short shrub herb of 35 to 75 cm with a single stem with branches extend radially. The flowers are small and green while ripe fruit is orange red and has milk coagulating properties. The plants long, brown roots are used for medicinal purpose.

Medicinal Use: In Ayurveda, the leaves and fruit of ashwagandha are applied to tumours, tubercular glands and ulcers. It has capability of improving arthritis symptoms, helps in reducing symptoms of anxiety, reduces cholesterol level and can improve attention and impulse control in children with ADHD (Attention deficit hyperactivity disorder).

Side Effects & Safety: Higher dose of ashwagandha might cause stomach upset, diarrhoea and vomiting and can irritate the gastro intestinal tract. So the patient having stomach disease are advised not use ashwagandha.

Common Name : Brahmi
Botanical Name : Bacopa monnieri
Family Name : Scrophulariaceae

MEDICINAL PROPERTIES / USES

Brahmi (Bacopa monnieri) is one of the most valuable medicinal plants in Ayurveda and has been used traditionally from several years. This is well known as “Brahmi” in Ayurveda and considered as “Medhya Rasayana” i.e. Brain Tonic. This herbal plant is also known as Thyme leaved gratiola. It is a small prostrate herb with fleshy leaves which can be propagated by cuttings. Brahmi can be grown in rich soil with regular and heavy watering up to 2 to 3 times a day and should permanently be kept in moist.

Medicinal Uses: It is extensively used as neurotonic in traditional Indian Medicine. Brahmi is also used for treating mental and nervous disorders. It is also beneficial for the patient of Alzheimer’s disease and of Liver cancer. It is also used as herbal supplement in epilepsy, anxiety and depression.

Common Name : Chirata
Botanical Name : Swertia chiraytia
Family Name : Gentianaceae

MEDICINAL PROPERTIES / USES

Chirata is an annual herb mostly found in temperate region. The part used in the medicine is that which grow above the ground. It is also known as Indian gentian.

Medicinal Uses: Chirata is a powerful anti-inflammatory agent which is good for rheumatoid arthritis, for joint diseases, swelling, pain and redness. It is a ayurvedic therapeutic plant and used for fever, constipation, upset stomach, loss of appetite, intestinal worms, skin diseases and cancer. It is often called as a “Bitter tonic”. In India it is used for malaria.

Side Effects & Safety: Diabetes patient are not allowed to use chirata in their diet as it might lower the blood pressure. Pregnant and Breast feeding ladies should stay on safe side and avoid use.

Common Name : Giloy
Botanical Name : Tinospora cordiflora
Family Name : Menispermaceae

MEDICINAL PROPERTIES / USES

Giloy is also known as Guluchi, is a famous ayurvedic perennial climber herb found in India. It has a significant heart shaped leaves, yellow flowers and ripe berry fruit of red colour. Guluchi is an excellent rasayana for the treatment of various diseases. Though it is used broadly these days but it has the reference in Ramayana and Durga Saptashati. The roots, stems, leaves and fruits are used in the treatment of various diseases.

Medicinal Uses: The benefits of giloy are countless. It is used in increasing immunity of the body, its fight against infecting organisms. The leaves of the plant in juice cure psychological disorder. Even leaves are also used in swine flu treatment; it is also used for the treatment of fever due to infection. Giloy is a remedy for diabetes. The traditional use of the leaves is to cure urine infection and stomach ulcer. Its helps in purifying blood and helps in controlling level of Blood Pressure. It is also used in curing rheumatic pain. When leaves of giloy are mixed with cow milk it helps in curing leucorrhoea. The leaf extract also used in curing jaundice and anaemia. It also removes the toxins from the brain. It adds strength and vigour to the body and removes the weakness.

It is considered a most divine herb because of its various ayurvedic uses. Therefore, it is also called as “Amruta” for its divine healing nature.

Common Name : Gurmar
Botanical Name : Gymnema sylvestre
Family Name : Asclepiadaceae

MEDICINAL PROPERTIES / USES

Gurmar is also known as Madhunashini. It is a vulnerable species, slow in growing, perennial, medicinal woody climber which has much therapeutic application in Ayurveda. Leaves of Gurmar in India are well known for their sweet taste suppressing activity.

Medicinal Uses: Since India is becoming the diabetic capital of the world, here is the hope called as Gurmar. It is used for reducing blood sugar level since centuries; the paste of the root is used for the treatment of snake bites or wounds. It also brings down a high cholesterol level. Leaf juice is helpful in avoiding constipation and also helps in regulating the weight of the body. The plant extract is used as a liver tonic and is used to refresh the cardiac activities by improving circulation of blood. Traditionally, it is used for the treatment of gastric troubles. The leaf extracts also cures eye problem and root bark is useful for the treatment of piles. It’s give comfort in colic pain and dropsy.

Common Name : Holy Basil
Botanical Name : Ocimum basilium
Family Name : Lamiaceae

MEDICINAL PROPERTIES / USES

Holy Basil is commonly known as “Tulsi” which is a common herb grown in many households with wide range of therapeutic properties. Tulsi is an erect much branched sub shrub of 30 to 60 cm tall with green or purple leaves that are strongly scented and hairy at stem. Generally two varieties of Tulsi are found Rama Tulsi and Krishna Tulsi.

Medicinal Uses: Tulsi has a beneficial effect in cardiac disease and reduces the level of blood cholesterol. The juice of Tulsi is beneficial in the treatment of ringworms, leucoderma and other skin diseases. Tulsi leaves have strengthening effect on the renal stone. It is rich in antioxidant properties and can reduce stress, enhance stamina, promote healthy metabolism and is a natural immune-modulator. Its oil is also used against the insects and bacteria. The Rama Tulsi is the effective remedy for the severe acute Respiratory Syndrome. Juice of its leaves gives relief in cold, fever, bronchitis and cough. Tulsi oil is also used as the ear drop. Tulsi helps in curing malaria. It is very effective against indigestion, headache, hysteria, insomnia and cholera. The fresh leaves of Tulsi are taken by the people every day. Due to its remarkable healing properties it is also known as “Queen of Herbs”

Common Name : Sarpagandha
Botanical Name : Rauvolfia serpentina
Family Name : Apocynaceae

MEDICINAL PROPERTIES / USES

Sarpagandha is also known as “Indian Snake Root” is an evergreen plant which has been in use since years in Indian Medicines. It is an erect under shrub with spear shaped leaves and with white and red flower. It is a useful herb in Ayurveda and Homoeopathy treatments.

Medicinal Uses: It is used for the treatment of high blood sugar, it cures hysteria and hypertension. It is also useful for in the treatment of cataract. It also cures plague and fever. Sarpagandha is used for the treatment of Schizophrenia. In different countries it is used as a sedative. It is also used against irregular heart action in old ages. It can also cure rheumatism, edema and intestinal diseases. It is also used against constipation and dizziness.

Common Name : Thyme
Botanical Name : Thymus vulgaris
Family Name : Lamiaceae

MEDICINAL PROPERTIES / USES

Thyme is a small perennial shrub with lots of branches and light purple to pink flowers. It grows in hot and sunny locations. The parts which are used for medicinal purposes are flowers, leaves and oil.

Medicinal Uses: Thyme is used for curing bronchitis, whooping cough, sore throat, colic, arthritis, upset stomach, gastritis, diarrhoea, a movement disorder in children (dyspraxia), parasitic worm infection and skin disorders. It is also used to increase urine flow, to disinfect the urine and as an appetite stimulant. Thyme oil is used as a germ killer in mouthwashes. It is also applied to the scalp to treat baldness and to the ears to fight bacterial and fungal infections.

Common Name : Calihari
Botanical Name : Gloriosa superba
Family Name : Colchicaceae

MEDICINAL PROPERTIES / USES

Gloriosa superba is composed of two words “Gloriosa” means full of glory and “superba” means superb is a perennial herb and grown as a climber. It is also known as Glory Lily because of its eye catching and multi-coloured glorious flowers. The tendrils which are present in the leaves help the plant to grow with the support of other plants in order to get sunlight. The flowers are red, orange, yellow and multi-coloured. It is the state flower of Tamil Nadu. The height of plant is about 3.5 m to 6 m. This medicinal plant is having underground V shaped tubers.

Medicinal Uses: The plant Gloriosa superba gives ease from the neuralgic pain. It helps in curing skin disease and itching in the skin. It also kills worm in the body. It gives comfort from abdominal pain and used in the treatment of piles and chronic ulcer. The extract from the root is used as a tonic that can add vigour to the body. Since, this plant is rich in colchicine’s, so the seeds are used in the treatment of rheumatism and gout. The tubers of glory lily are used against snake bite and the extract is used to kill lice. The tubers of this plant are also used for the treatment of kidney problem. Due to its laxative nature, it can be used as a home remedy for constipation. It also cures haemorrhoids disease and also helpful for the treatment of small pox.

Common Name : Isabgol
Botanical Name : Plantago ovata
Family Name : Plantaginacea

MEDICINAL PROPERTIES / USES

It is called as “Psyllium”. Isabgol is a stem less annual herb. The part used in medicinal property is husk and seed. Husk of Isabgol is having absorbing and retaining property. Isabgol requires light soil and well irrigation. It can grow in cool climate and dry weather. It is propagated by seeds.

Medicinal Uses: It is beneficial in chronic dysenteries and for treating constipation and intestinal disorders. It work as calorie free fibre food and promotes regular bowel movement. The seeds of isabgol are having cooling effect as is used in ayurvedic, unani and allopathic medicines. The seed and husk cures inflammation of the mucous membranes of gastro intestinal and urinary tracts, piles and gonorrhoea. It can treat diarrhoea, can lower blood sugar levels and also lowers cholesterol levels and is good for heart.

Common Name : Neem
Botanical Name : Azadirachta indica
Family Name : Meliaceae

MEDICINAL PROPERTIES / USES

It is also called as “Margosa” in English. Azadirachta indica is derived from words Azad means Free, Dirakht means Tree and Indica means Indian Origin which literally means “The Free Tree of India” or “Noble Tree”. It is commonly called as Indian Lilac and is very fast growing, evergreen tree which reaches the height of 15 to 20 meters. Its fruits and seeds are the source of neem oil.

Medicinal Uses: All parts of neem tree are anti-fungal, anti-diabetic, antibacterial, antiviral and sedative in nature. The neem oil obtained from the seeds is used as a medicine. Neem gum is used as a bulking agent and for the preparation of special purpose food (for diabetics). The neem leaf paste is applied to the skin to treat acne and also used against pox viruses in India. People who are affected with pox viruses are generally made to lie in bed of neem leaves and branches. The flower produces nectar that can be used as a sweetener. Roots of neem are used in relieving fever. Neem is also helpful in the treatment of cough, asthma, ulcers, piles, intestinal worm, and urinary diseases.

Common Name : Kalmegh

Botanical Name : Andrographis paniculata

Family Name : Acanthaceae

MEDICINAL PROPERTIES / USES

Kalmegh is commonly called as “King of Bitters” and the part used in medicinal properties is leaves. This medicinal plant grows up to the height 110 cm. The seeds are yellowish brown and small white flowers with rose purple spots are borne in this plant. All plant parts are extremely bitter in taste.

Medicinal Uses: Kalmegh is an antioxidant and anti-inflammatory in nature. It is used for the treatment of cancer and HIV. The regular use of Kalmegh is helpful to cure cough, cold, sinus and body pain. It is also used as a blood purifier and enhances immunity. It protects the liver and used as a liver tonic. Traditionally, Kalmegh is used in the treatment of leprosy and Cholera. The tonic made by kalmegh is used against weakness to add strength and vigour to the body. The extract of Kalmegh is used in the treatment of slow digestion, bowel irritation and irregular menstrual syndrome. The syrup of kalmegh is used against fever and malaria. It is also used against the respiratory infection and juice of kalmegh is used to cure ulcer. The bitter extract of the leaves is useful in killing worms in the stomach. The entire plant is very useful in the treatment of snake and scorpion bite. It is also used against heart disease and helps in reducing high blood sugar.

Side effects and Safety: The plant is strongly avoided during pregnancy because of its anti-fertility property.

Common Name : Mandukparni

Botanical Name : Centella asiatica

Family Name : Apiaceae

MEDICINAL PROPERTIES / USES

It is commonly called as “Indian Pennywort”. Mandukparni is known since the ancient times to enhance intellect and wisdom. Its leaves resembles with human brain, thus this medicinal plant is treated as brain food.

Medicinal Uses: It is used as a nerve tonic, cardic tonic, sedative, laxative and blood purifier. It also help in curing skin diseases like eczema and prevents from leprotic ulcers. It is good for healthy hair. It also act as a mood elevator from the conditions like stree, anxiety, tension, depression, etc. Respiratory conditions like asthma, bronchitis, hiccups, etc may be treated with the help of mandukarni. It is beneficial in case of epilesy. It is also recommended to the patients ho have low red blood cell count.

Common Name : Jawarnkush
Botanical Name : Cymbopogon jwarancusa
Family Name : Poaceae

MEDICINAL PROPERTIES / USES

It is an important perennial medicinal herb found as a weed throughout India. Roots and shoots are the important parts which are used medicinally. Traditionally, the species name has been derived from two sanskrit words “Jwar” and “Ankusha” meaning “Fever” and “Breaker”.

Medicinal Uses: This medicinal plant is used against different disaeses like vomiting, abdominal tumors, unconsciousness, blood impurities, skin problems, etc. It is used in the treatment of gout, rheumatism and fever.

Common Name : Sadabahar
Botanical Name : Catharanthus roseus
Family Name : Apocynaceae

MEDICINAL PROPERTIES / USES

It is commonly called as “Periwinkle” and “Nityakalyani”. It is a very commonly grown plant in India. It is a evergreen shrub that grows to about 90 cm in height having smooth, glossy and dark green leaves and flowers throughout the year.

Medicinal Uses: This medicinal shrub helps in treating gastritis, cystitis, diarrohea and daibetes. The leaves and stem are a source of alkaloids that have anti-tumor and anti-cancer properties. Sadabhar controls nosebleeds, bleeding gums, mouth ulcers and sore throats. It also helps in increasing blood circulation in the brain, support barin metabolism, prevents memory and concentration problems, prevents early agening of brain cells. Prewinkle also helps in cough, lung congestion, eye irritaion and skin infections.

Common Name : Shatavari
Botanical Name : Asparagus racemosus
Family Name : Asparagaceae

MEDICINAL PROPERTIES / USES

Shatavari is considered one of the most beneficial ayurvedic herbs for health issues to women. It is perennial climbing plant extending to a height of 1 to 2 meters. The flowers having fragrance are white in colour with small spikes. Roots are white tuberous, radish in shaped and found in clusters.

Medicinal Uses: The root powder of this herb supports female reproductive system, promotes fertility, strengthens female reproductive system, strengthens the uterus, helps in removing pathogen and other toxins, help in digestion, boosts the immune system, helps in regulating menstrual cycle, helps in treating PMS and relieves menstrual pain. It also helps in ease for menopausal symptoms. Support healthy milk production in lactating mothers and also helps in maintain normal hormone levels. It also supports normal oestrogen (hormone) production and utilization. Shatavari can enhance the level of white blood cell count and has properties to fight against cholera, typhoid fever and dysentery.

Common Name : Gudhal
Botanical Name : Hibiscus rosasinensis
Family Name : Malvaceae

MEDICINAL PROPERTIES / USES

It is an annual growing shrub grows up to the height of 2.5m. The leaves are simple and dark green in colour. The flowers are long, trumpet shaped with five petals in the shades of white to pink, red, purple or yellow with size of 4 to 15 cm.

Medicinal Uses: It is used in kidney stone remedy and helps in reducing blood pressure. This medicinal plant also helps in liver protection and is having anti-oxidant and anti-cancerous properties. It also helps in wounds, boils and in scalp treatment. It reliefs from headache and from upset stomach. Hibiscus also lowers the cholesterol and helps in managing blood pressure. It has anti-ageing and anti- depressant properties.

Common Name : Mahuwa
Botanical Name : Madhuca indica
Family Name : Sapotaceae

MEDICINAL PROPERTIES / USES

The bark of this tree is grey to dark brown in colour, leaves are dark green and flowers are small pale yellow which grow in dense clusters. The Part used in medicinal properties is seeds, bark, flowers, and fruits, oils of seeds, leaves and bark.

Medicinal Uses: Various parts of mahuwa are used for the treatment of a variety of diseases. The bark of trees is used for rheumatism, chronic bronchitis, diabetes mellitus, bleeding, spongy gums, diarrhoea and in curing scabies and other skin diseases. The fruits are also edible and used to treat ulcer and chronic tonsillitis and pharyngitis. The edible flowers are nutritive and used as tonic, analgesic, diuretic, cooling agent, in treatment of helminths, bronchitis, etc. The leaves of Mahuwa are used in the treatment of eczema and the roots of the tree can be applied on ulcers.

Common Name : Bauhinia
Botanical Name : Bauhinia variegata
Family Name : Fabaceae

MEDICINAL PROPERTIES / USES

It is commonly called as “Kachnar”. It is a deciduous medicinal plant whose height is moderate. Its bark is greyish brown with irregular dark patches. The flowers are pink in colour.

Medicinal Uses: Kachnar is very useful in various glandular diseases. Flowers are laxative in nature and flower buds are helpful in piles, cough. It is also beneficial in case of obesity, osteoporosis, swelling glands and in menstrual cycle. It helps in healing up the wounds and also helpful in providing relieve due to burning sensation in the body.

Common Name : Dhak
Botanical Name : Butea monosperma
Family Name : Fabaceae

MEDICINAL PROPERTIES / USES

It is commonly called as “Dhak” or “Palaash” and is found throughout India. It is deciduous medicinal tree with terminal flowers which are red in colour giving tree an appearance of fire flame. Due to this reason it is also called as “Flame of Forest”. The part which is used in medicinal properties is seeds, leaves and flowers.

Medicinal Uses: It is useful in treating inflammation, swelling conditions related to bones. The seeds of Palaash are also laxative in nature and are often used to treat worm infection. The gum of Butea monosperma is used to treat dysentery and diarrhoea. Dried flowers are used to cure skin rashes and infection in summers. Paste of flowers is also applied externally to cure joint pain, swelling, sprain injury and arthritis. The bark of the tree also helps in blood purification. Roots of Palaash tree are useful to cure night blindness.

Common Name : Papaya
Botanical Name : Carica papaya
Family Name : Caricaceae

MEDICINAL PROPERTIES / USES

It is commonly known as “Papaya” or “Tree melon”. It is an evergreen herb having tree like appearance which is 2 to 10 m tall. It contains white latex with green colour leaves of 25 to 75 cm in diameter. Flowers are yellow and tiny funnel shaped. Fruit of papaya is large with fleshy orange pulp when ripe skin is thin yellow in colour.

Medicinal Uses: Papaya is a fruit which is highly helpful for weight loss. Its provides approximately 39 Kcal per 100 gm. Papaya is helpful in preventing atherosclerosis and other heart diseases, diabetes as it’s an excellent source of vitamin C as well as a good source of Vitamin E and Vitamin A. Due to its antioxidant properties papaya prevents the oxidation of cholesterol. It is also rich in fibre content so helpful in lowering the bad cholesterol level. The nutrients present in papaya are found to be helpful in the prevention of colon cancer. Papaya contains protein digesting enzyme namely papain which are responsible to lower inflammation and improves healing from burns. Papaya is found to be beneficial for the immune system and helps in preventing from cold, infections and flu. It is also responsible in providing protection against inflammatory polyarthritis. Taking papaya regularly in diet is helpful in reducing the risk of prostate cancer.

Common Name : Dhania
Botanical Name : Coriandrum sativum
Family Name : Apiaceae

MEDICINAL PROPERTIES / USES

Coriander commonly known as “Dhania” in India is an herb that is extensively used around the world as a condiments, garnish or decoration on culinary dishes. Its leaves and fruits have a pleasant aroma and are commonly used raw or dried for culinary applications. The part used in medicinal property is leaves and seeds.

Medicinal Uses: Coriander oil is used as stimulant for gastric secretion. It has benefits as a carminative, digestive, wormicidal, diuretic. It is also found beneficial for brain development and can be used as tonic for various neurological disorders. It is helpful in reducing cholesterol level, blood pressure. It acts in diarrhoea treatment by helping in smooth digestion and regular functioning of liver. Coriander is rich in iron that can directly give positive effects in anaemic conditions. It also helps in treating mouth ulcers, menstrual problems and in getting remedy from eye problems as it is rich source of Vitamin A, Vitamin C and Minerals like Phosphorus which are beneficial for eye problems. Coriander leaves and seeds are also beneficial in health problems like small pox, conjunctivitis and diabetes. It can also cure ulcers and inflammations.

Common Name : Haldi
Botanical Name : Curcuma longa
Family Name : Zingiberaceae

MEDICINAL PROPERTIES / USES

Turmeric is commonly called as ‘Haldi’. It is used in India, as food substances as well as medicine. It can be used both internally & externally. It is found in rhizome with oval, long and thick roots. It is bitter in taste, pungent with warm effects.

Medicinal Uses: It is anti-septic, useful in ulcers, wounds, antimicrobial, antibacterial, Anti-viral treatment, cold, cough, bronchitis, conjunctivitis, liver diseases, sprain, and painful oedema. It is helpful in improving digestion, in relieving from arthritis, prevents cancer. Boost up the immune system. Haldi is found beneficial for weight management and also is reducing cholesterol level. It is also helps in preventing Alzheimer’s disease. Turmeric is also such in Iron so helpful for anaemic person. It is used in the treatment of all skin disorders, discoloration of skin, anomalies of urine and of blood. Turmeric is very effective in eosinophilia. Effective medication in all nature of allergies.

Common Name : Long pepper
Botanical Name : Piper longrum
Family Name : Piperaceae

MEDICINAL PROPERTIES / USES

It is commonly called as 'Pippali' cultivated for its fruit which is usually dried. It is a slender, aromatic climber with perennial woody roots creeping and jointed stems, fleshy fruits embedded in the spikes. Long piper leaves are memerous, dark green, shinning above and pale & dull beneath. Fruit is long and attains red colour when it ripens and when it dries it turn into black.

Medicinal Uses: Long pepper has a wide range of application in medicines. It is used as a "Rasayana" in the treatment of respiratory disorders and also an important constituent in digestive formulations. It treats stomach-ache, heartburn, indigestion, intestinal gas, diarrhoea and cholera; it is also used for lung problem including asthma, bronchitis & cough. Other uses include treatment of headache, toothache epilepsy, fever, and stroke, trouble sleeping (insomnia), leprosy, extreme tiredness, enlarged spleen, muscle pain, nasal discharge, paralysis, snakebites, tetanus, thirst, tuberculosis and tumours. It is also used in treating menstrual cramps infertility.

Common Name : Baheda
Botanical Name : Terminalia bellerica
Family Name : Combretaceae

MEDICINAL PROPERTIES / USES

Terminalia bellerica is also known as "Baheda". The plant grows up to 60-80 feet in height. The trunk is straight and dark brown in colour. The leaves are broad, oval and 4 to 8 inches long. The flowers grow in both upper and lower part. When fruit dries it looks like a pentagon and is fibrous. In Sanskrit it is called as "VIBHEETA" which means the one which takes away the fear of diseases.

Medicinal Uses: It is rejuvenating, presents ageing and adds longevity. It is also cures vomiting and excessive thirst. The plant is useful for improving mental disorder. It cures lose of appetite and also proved anti-diarrheal because of its astringent property. Baheda is useful for piles and curing intestinal worms. The fruit is useful for curing eye related problems such as immature cataract or nay kind of infection. It is used to lower the blood pressure and levelling the cholesterol. Terminalia bellerica promotes hair growth, adds nutrition's and useful against greying. The fruit chewed is believed to cure cough, cold, asthma and hoarse voice. It is also helpful in stopping bleeding, in curing bronchitis, and in curing digestive problem. It is also helpful for ear pain. It has been proved beneficial against jaundice, leprosy and anaemia. Baheda is useful against cardiac problems, diabetes & urinary disorders. The tonic is good for brain and stomach.

Common Name : Vacha
Botanical Name : Acorus calamus
Family Name : Acoraceae

MEDICINAL PROPERTIES / USES

Acorus calamus is commonly known as “Sweet flag” or “Sweet Root”. It is a perennial, erect, aromatic herb common on river banks and marshes. The medicinal purpose the roots of the plant are used. It has aromatic leaves and rhizomes.

Medicinal Uses: The rhizome of vacha has stomachic, carminative and nervine properties. It is used in the treatment of diseases of the body and mind. It is given to improve memory and functioning of brain. Vacha is also used in the treatment of paralysis, cholera, headache, joint pain, fever, cough, diarrhoea epilepsy, and retention of urine, intestinal worms, cough, bronchitis, diarrhoea, gas, hair loos, indigestion, vocal problems and various skin disorders. It can also be useful in syphilis, boils, wounds for acne, etc.

Common Name : Bael
Botanical Name : Aegle marmelos
Family Name : Rutaceae

MEDICINAL PROPERTIES / USES

Bael is the most ancient sacred tree in India. Mostly it is planted near the temple and used as a dedication to Gods. The use of this plant is seen in scripture like Vedas and Mahabharata. The plant act as a climate purifier by absorbing poisonous gas from the atmosphere.

Medicinal Uses: The juice of the fruit gives comfort from constipation and dyspepsia. The fruits are use against viral and intestinal parasites. It is also used for the treatment of tuberculosis and gynaecological disorders. It can also be used against the urinary complaint. The fruits are also used to increase appetite. Due to bitter and pungent taste of fresh fruit, it can be used to decrease the Blood Sugar. The fruit is also used in intestinal disorder. It is also used in the treatment of diarrhoea, dysentery and irritation in the elementary canal. The juice can be used as brain and heart tonic. The leaves are used for a diabetic person and can be used against peptic ulcers. Leaves are also useful for the treatment of jaundice, leucorrhoea, wounds, deafness; conjunctivitis raw leaves can be used to cure gastric problems and irritation in the bowel. Flowers of Bael is use to prepare tonic for curing epilepsy and the extract can be used for the treatment of dysentery and diabetics.

Common Name : Motha
Botanical Name : Cyperus rotundus
Family Name : Cyperacea

MEDICINAL PROPERTIES / USES

Cyperus rotundus is commonly called as "Motha" which can be seen growing as weed in garden, lawn, fields and waste lands. It looks like grass and have tuberous roots underground. It is a perennial plant. Its blacklists lustrous roots have distinct small due to the presence of essential oil. These rhizomes roots are rich in medicinal properties and are used for the treatment of diseases since time immemorial. They are used fresh and dried.

Medicinal Uses: Motha is used in the treatment of a variety of diseases. It is one of the best herbs for treating many female disorders like yeast, candida and premenstrual syndrome. It is also used for menopause, menstrual disorders and breast tumours. It is used for treating digestive disorders and breast tumours. It is used for treating digestive disorders pain in abdomen, low appetite, digestive weakness, indigestion, diarrhoea and bleeding dysentery.

Common Name : Amla
Botanical Name : Emblica officinalis
Family Name : Phyllanthaceae

MEDICINAL PROPERTIES / USES

Emblica officinalis is also known as "Amla" (Indian gooseberry). It is a medium sized plant that grows not more than 18m in height. The trunk is slightly curved and the branches are scattered around. The bark of amla plant is grey with hard reddish wood. It has a yellowish green or pinkest colour flower and the fruit is pale yellow in colour round in shape. The leaves are lighter in weight, long in shape and smalls like lemon.

Medicinal Uses: The Vitamin C content in Amla helps in improving the digestive system, rejuvenates the body, cures stomach constipation, helps in blood purification, reduces cough and asthmatic problems and improves eyesight, Along with these amla improves immunity and also improves physical strength. It is used for scalp treatment as it is having carotene and iron; Amla ensures proper absorption of calcium that directly or indirectly is beneficial for bones, teeth and nails. Amla is good for weight loss and helps in preventing eye related problems such as cataract, vision improvement. The presence of vitamin A and carotene over comes many problem related with eyes. It is also used for healthy heard by reducing the level of cholesterol. It also relieves from asthma, bronchitis respiratory congestion, chronic cough and cold.

Common Name : Amaltas
Botanical Name : Cassia fistula
Family Name : Fabaceae

MEDICINAL PROPERTIES / USES

Cassia fistula commonly called as 'Amaltas' is a medium sized tree with brilliant yellow flowers growing at roadside and garden long cylindrical pods are used in medicinal property seeds are shiny black in colour for medicinal purpose, all parts of the tree viz. roots, bark leaves, fruits are used.

Medicinal Uses: Amaltas is very effective laxative. This herb is used to treat fever, heart disoders, bleeding disorders, abdominal distension, and abdominal pain. Fruit are used to treat leprosy and are best anti-pyretic and purgative in nature. It is also used in skin disorders and in protecting liver. Cassia is also used in the treatment of rheumatism, gout the fruit pulp is a medicine for curing constipation the leaves are rubbed on skin in case of severe itching. It is also used in treating fever, inflammation and legatorial infections.

Common Name : Ashok
Botanical Name : Saraca indica
Family Name : Caesalpiniaceae

MEDICINAL PROPERTIES / USES

Ashok tree is one of the most legendary and sacred trees of India. It is an evergreen tree 15-20 meter high. The leaves are 15cm long and of oblong shape. The flowers are yellowish orange and scarlet. All parts of the tree such as bark, leaves, flowers and seeds are used medicinally. Due to its medicinal value, it is known as a universal plant.

Medicinal Uses: Ashok tree is popularly used in the treatment of gynaecological problems and menstrual disorders in women. The Ashok herb can naturally improve the skin's complexion. The bark is used to cure bacterial and fungal infections. Ashok helps in treating irritations and burning sensation in the skin. It also helps in curing diarrhoea and purification of blood. Ashok is also used for curing of piles and bleeding caused due to piles. Powder made from Ashok seed cures kidney stones and act as a memory enhancer, helps in urine retention. Saraca indica is also used for heart diseases and tumours.

Common Name : Ginger
Botanical Name : Zingiber officinale
Family Name : Zingiberaceae

MEDICINAL PROPERTIES / USES

Ginger is also known as 'Adarak' is a flowering plant whose rhizome/root is widely used for medicine. It is an herbaceous perennial which grows through pseudo stems about a meter tall bearing narrow leaf blades.

Medicinal Uses: It is carminative, analgesic, antiviral, and anti-inflammatory in nature. Ginger can treat many forms of Nausea like nausea caused by cancer treatment by HIV/AIDS, reduces muscle pain and soreness. Due to anti-inflammatory in nature it can help with Osteoarthritis. Ginger is commonly used for various types of "stomach problem" including motion sickness. Other uses include pain relief from rheumatoid arthritis menstrual pain. The oil made from ginger is sometimes applied to the skin to relieve pain.

Common Name : Elaichi
Botanical Name : Elettaria cardamomum
Family Name : Zingiberaceae

MEDICINAL PROPERTIES / USES

Elettaria cardamom, commonly known as "Green or True Cardamom", is an herbaceous perennial plant. It is also been called as Queen of Spices." It grows about 2 to 4 m in height. The leaves are alternate about 40-60 cm along with long pointed tip.

Medicinal Uses: Cardamom is a stimulant and carminative which is used for indigestion and flatulence. In India, is broadly used to treat infections in teeth and gums. It is used to prevent and treat throat troubles, congestion of the lungs and pulmonary tuberculosis. It is also used in inflammation of eyelids and also digestive disorders. It is also used as an antidote for both snake and scorpion venom. Cardamom is used as a breath- freshener and is use to thin the blood.

Common Name : Yastmadhu / Mulethi
Botanical Name : Glycyrrhiza glabra
Family Name : Fabaceae

MEDICINAL PROPERTIES / USES

It is commonly called as “Mulethi” or “Licorice”. It is a hardly leguminous undershrub attaining the height of about 3 meters with compressed pods. The roots are sweet in tastes and used in medicinal property. The flowers of mulethi is whitest purple in colour with green colour leaves.

Medicinal Uses: It is conventionally used in the treatment of respiratory and digestive disorders. Mulethi is specifically use in the treatment of chronic acidity, ulcers and chronic bronchial conditions. It is also used in reducing stress, depression and anxiety. Mulethi is also effective remedy for lowering the level of bad cholesterol in the body. The root of mulethi is beneficial in boosting the immune system of body which helps in giving body strength to fight against various harmful diseases. It also keeps liver healthy and is extremely beneficial for skin against eczema and dryness. The root of Licorice is considered to be extremely effective remedy for weight loss. Mulethi is also beneficial for treating sore throat and cough. It reduces the infections such as bronchitis and asthma

---

Common Name : Pudina
Botanical Name : Mentha spp.
Family Name : Labiatae

MEDICINAL PROPERTIES / USES

It is commonly called as “Mint” and is a popular branching; perennial grows up to 60-80cm in height. It is propagated mainly by its stolons. Leaves are sharply toothed, green in colour. Flowers are abundant in number and purplish in colour. This plant does not produce seeds.

Medicinal Uses: Pudina is helpful in promoting digestion, it can help in weight loss, it is a good treatment for irritable bowel syndrome and colic spasms. It can also treats nausea and headache. Pudina is an effective relief for respiratory disorders and cough. It fights against depression and fatigue. It is also helps in improving memory and can promote oral health. It is also helpful in preventing cancer and is good for skin health. It alleviates allergies, hay fever and protects against radiation induced DNA damage. Mint is also useful from getting relief from muscle pain and from sinus disorder. It also reduces risk of cancer and Alzheimer’s disease. It is beneficial in treating arthritis and ulcerative colitis.

Common Name : Cinnamon
Botanical Name : Cinnamomum zeylanicum
Family Name : Lauraceae

MEDICINAL PROPERTIES / USES

Cinnamon is commonly called as “Dalchini”. It is evergreen tree which grows from 20 to 30 feet. The plant has strong branches and thick scabrous bark which is smooth and yellowish. Leaves are dark green on top and lighter green underneath. It has small yellowish-white flowers which bears dark purple berries (Fruit). Bark of cinnamon is used in medicinal property.

Medicinal Uses: The Bark of cinnamon is carminative, astringent, stimulant, antiseptic in action. The essential oil which is extracted from cinnamon is a potent antibacterial, anti-fungal and uterine stimulant. It stops vomiting, relieves flatulence and is useful in diarrhoea and haemorrhage of the womb. It is also useful in reducing blood sugar and cholesterol level. Dalchini is also useful in prevention of acne, pimple, cough, cold. It is also helpful in arthritis pain in improving memory and in insomnia.

Common Name : Garlic
Botanical Name : Allium sativum
Family Name : Amaryllidaceae

MEDICINAL PROPERTIES / USES

Garlic is one of the most widely used medicinal plants since ancient times. It is commonly called as “Lahsun”. Allium sativum is an herbaceous, annual, bulbous plant grown for its pungent and edible bulb. The bulb is up to 7cm in diameter and is made up of 1 to 15 cloves. The flowers are spherical in shape initially enclosed in a cluster of papery bracts which splits and open into a green white or pinkish flower.

Medicinal Uses: Garlic is used to treat cough, contains allicin, which reduces blood pressure and improves circulation. It is goof for rheumatism, arthritis, gout, fluid retention and obesity. Garlic is also useful in strengthening the immune system. It has vitamin B6 which helps in boosting up the mood. It is also helpful in regulating blood sugar, in treating fever, cough & stomach ache. It may prevent cancer of the prostate colon and stomach. It is applied to skin for fungal infections. Garlic cures from urinary tract, kidney infection and yeast infections. It is also helpful in weight control & weight loss. It also helps in preventing heart attack and atherosclerosis.

Common Name : Drumstick
Botanical Name : Moringa oleifera
Family Name : Moringaceae

MEDICINAL PROPERTIES / USES

Moringa oleifera is commonly called as "Senjana" fast growing, deciduous tree. It can reach a height of 10-12m. The Bark has a whitish grey colour. The flowers are fragrant with yellowish while petals.

Medicinal Uses: Moringa is used for anaemia, arthritis, rheumatism, asthma, cancer, constipation, diabetes, diarrhoea, epilepsy, stomach pain, stomach and intestinal ulcers, intestinal spasms, headache, heart problem, high blood pressure, thyroid disorders, fluid retention and bacterial, fungal, viral and parasitic infections. It is also use in reducing swelling, boosting immune system and helps in increasing breast milk production. Drumstick is helpful in protecting and nourishing skin and hair. It also helps in treating edema and protects the liver. Moringa contains Calcium and Phosphorous which helps in making bones healthier. It is also helpful in treating depression, anxiety and fatigue.

Common Name : Parsley
Botanical Name : Petroselinum crispum
Family Name : Apiaceae

MEDICINAL PROPERTIES / USES

Parsley is a biennial herb grows up to 80 cm long with thin stem and triangular outline leaves. The part used in medicinal property is the entire plant: leaves, fruits and roots.

Medicinal Uses: Parsley has been used as a source of certain vitamins and minerals. The seeds of parsley have been traditionally as a carminative to decrease flatulence and colic pain. The root of parsley is use as a diuretic and the juice to treat kidney ailments. The oil of parsley is been use to regulate menstrual flow in the treatment of amenorrhea. Leaves are been used to treat tumours, insect bites, lice, skin parasites. It also helps in the treatment of diseases of the prostate cancer. It is also been use as a scalp lotion to stimulate the growth of hair. Parsley is also helpful in stimulating the appetite, improving digestion and increasing urine production.

Common Name : Arjun
Botanical Name : Terminalia arjuna
Family Name : Combretaceae

MEDICINAL PROPERTIES / USES

Terminalia arjuna is commonly called as "Arjun" is an evergreen large tree, grows up to 20-25 meters in height. Bark is smooth and grey. Leaves are simple, hard and around 10-20 cm long. Flowers are yellowish while and blooms in March – June. Fruiting in Arjun takes place in September- November.

Medicinal Uses: The Bark of Arjun has been used from ages for the treatment of heart and blood vessels disorders. It helps in relieving chest pain, high blood pressure and high cholesterol. It is also used for urinary tract diseases. Arjun is helpful in protecting liver and to treat respiratory conditions including respiratory tract infections, cough and sore throat. It is also used for dysentery. The wine of Arjun bark is very useful in treating bleeding piles and leucorrhoea. The paste of the bark is applied over the fractures helps in promoting the early healing. The herb contains a substance called casuarinin that seems to prevent breast cancer. Arjun helps in promoting normal blood flow and reduces the symptoms of giddiness, headache and insomnia.

Common Name : Tejpatta
Botanical Name : Cinnamomum tamala
Family Name : Lauraceae

MEDICINAL PROPERTIES / USES

It is commonly called as "Talisha Pattri" or "Tejpatta" and is a medium sized evergreen tree of about 2 to 10 m tall. Its mature leave are dried and commonly known as bay leaves are used in medicinal properties.

Medicinal Uses: Cinnamomum tamala leaves and bark have aromatic, astringent, stimulant and carminative qualities. It is used in rheumatism, colic, diarrhoea, nausea and vomiting. Tejpatta is also used in the treatment of cold, cough, allergy and headache. It can also be used for scalp infection, for lice in hairs. Abdominal pain, abdominal gas, indigestion can be cured by Tejpatta. Regular intake of bay leave can prevents stone formation in kidney. Heart diseases, uneasiness and uterus infection can also be prevented by the use of Tejpatta. Arthritis, joint pain, gout are also cured by the application of bay leaves at the affected area.

Common Name : Fenugreek / Methi
Botanical Name : Trigonella foenum-graecum
Family Name : Fabaceae

MEDICINAL PROPERTIES / USES

Fenugreek also known "Methi" is an herbaceous annual plant that stands around 2-3 feet (60-90cm) tall. It has green leaves, small white flower and pods that contain small, golden-brown seeds. The plant has an erect growth habit and have strong, sweet aroma.

Medicinal Uses: Fenugreek is helpful in digestive problem such as loss of appetite, upset stomach, constipation, gastritis. It is also used for diabetes, painful menstruation, polycystic ovary syndrome, atherosclerosis and for high cholesterol. Fenugreek is helpful in kidney aliments, mouth ulcers, boils, bronchitis, cellulitis, tuberculosis, baldness, cancer and Parkinson's disease. Methi is also used for hernia, male infertility and in women's methi promotes milk flow after child birth and reduces menstrual cramps.

Common Name : Lemon Grass
Botanical Name : Cymbopogon citratus
Family Name : Poaceae

MEDICINAL PROPERTIES / USES

It is commonly called as "Lemon grass" and is a perennial grass grown for it fragrant leaves and stalk which is used as a flavouring agent. Lemongrass is also referred to as Ginger grass or citronella grass.

Medicinal Uses: Lemon grass is useful in relieving anxiety, lowering cholesterol, preventing infection, boosting oral health, relieving pain, boosting red blood cell level and relieving bloating. It also helps in reducing fever, blood sugar level and stimulates the uterus and menstrual flow.

Common Name : Beetroot
Botanical Name : Beta vulgaris
Family Name : Chenopodiaceae

MEDICINAL PROPERTIES / USES

Beets are herbaceous biennial root vegetable. The plant is usually erect with long main root and purple green leaves growing on stems. The beets are propagated by seeds.

Medicinal Uses: Beet is commonly used in the treatment of liver diseases and fatty liver. They are also useful in reducing the levels of triglycerides (a type of fat) in the blood, blood pressure and muscle soreness. Beet root also helps in preventing cancer of breast and prostate. It help is boosting up the energy level fight against inflammation. It promotes brain health by preventing Alzheimer's disease. It controls blood sugar, aid digestion, helps in the treatment of Anaemia. Beets are the great source of carotenoids which reduce the risk of cataract formation. It also promotes stronger bones and teeth as they are good source of calcium.

Common Name : Ajwain
Botanical Name : Trachyspermum ammi
Family Name : Apiaceae

MEDICINAL PROPERTIES / USES

Trachyspermum ammi is also known as ajwain or bishops weed is an annual herb. Both the leaves and the seed like fruit of the plant are consumed for medicinal properties. The leaves are green in colour and flowers are of white colour. The height of plants is approximately 60-90 cm.

Medicinal Uses: Ajwain helps in providing instant relief from acidity and indigestion. It also helps in treating common cold, provides relief from migraine headache. Ajwain is also useful for ear tooth ache. A component called thymol in ajwain seed act as a strong germicide. Thus ajwain seeds can be crushed and applied on the skin to treat injection or cuts. Ajwain seeds help in halting pre-nature greying of hairs. It also eases the pain due to arthritis and helps in cleaning the skin by lightening acne scars.

Common Name : Clove
Botanical Name : Syzygium aromaticum
Family Name : Myrtaceae

MEDICINAL PROPERTIES / USES

Cloves are the aromatic dried flower buds. The tree of clove is an evergreen that grows to a height ranging from 8 to 12m, having large leaves with blood red colour flowers which are numerous in groups.

Medicinal Uses: Clove is most commonly applied directly to the gum for toothache, pain control during dental work and other dental related issues. Cloves are applied to minor cuts for healing purposes. Tea of clove is a popular warm beverage to relieve congestion. Oil of clove is helpful in relieving headache, flatulence as well as reduces stretch marks clove is used as a carminative and also use for boasting the immune system by purifying the blood and help to fight against various diseases. Cloves are good expectorants that promote the discharge of mucous and secretions in the respiratory passage. Clove oil stimulates blood flow and circulation making useful for the people having cold extremities. It is also helpful for preventing the breakdown in retina of the eye and also enhances memory retention. Clove is also beneficial for diabetic patients by controlling the blood glucose levels. Eugenol found in clove is powerful enough for preventing blood clots. Sucking of clove bud reduces the desire of alcohol. Clove oil is very effective in curing foot and nail fungus.

Common Name : Fennel
Botanical Name : Foeniculum vulgare
Family Name : Apiaceae

MEDICINAL PROPERTIES / USES

Fennel is an aromatic perennial herb grown for it edible shoots leaves and seeds. The height of plant is about 1 meter (3 feet) tall and has stalks with finely divided leaves. The flowers are small yellow in colour and fruits are small dry greenish brown to yellowish brown. The dried ripe seeds and oil are used to make medicine.

Medicinal Uses: There are many health benefit of fennel which includes relief from anaemia, indigestion, flatulence, constipation, colic, diarrhoea, respiratory disorders and menstrual disorders. It also aids in eye care. It is having anti-cancer properties and reduces heart diseases. It also helps in regulating blood pressure and improves brain function. Fennel helps in boosting immunity and regulates menstruation. It also protects against harmful effect of radiation during cancer treatment.

Common Name : Rosemary
Botanical Name : Rosemarius officinalis
Family Name : Lamiaceae

MEDICINAL PROPERTIES / USES

Rosemary has a strong fragrance. It is used in oil, perfumes and cooking. The leaves are evergreen 2-4cm (0.8-0.16 in) long and 2-5mm broad, green above and white below with dense short woolly hair. It is considered easy to grow for beginner gardeners. It grows all year round and strong healthy plants flower in summer with pale to deep blue colour flowers.

Medicinal Uses: Rosemary improves memory, helps in reducing blood sugar, body weight, helps in preventing cataracts, protects the body's cell and DNA from radical free damage, simulates liver enzyme which help inactivating estrogen hormones which can cause breast cancer. Rosemary also helps in preventing age related skin damage, encourages enzymes which flush harmful toxins out of the liver and body. Rosemary also helps in improving kidney function and increases urine flow. It act as a stimulant for hair growth, boost mental activity, relieve respiratory problems and pain due to menstrual cramps, prevents from peptic ulcers, leukaemia and kidney stone.

Common Name : Aak
Botanical Name : Calotropis procera
Family Name : Asclepiadaceae

MEDICINAL PROPERTIES / USES

Aak is commonly called as "Madar". It is a perennial shrub growing 2.5 m high with various branches and sub branches. Leaves are simple. It has bunch of waxy flowers that are white or lavender in colour and in shape of crown. The name of this plant is synonymous with Sun as the herb is very strong and astringent in action same as powerful rays of sun.

Medicinal Uses: Whole plant is used to treat common diseases such as fever, rheumatism, indigestion, cold, and eczema, diarrhoea for the treatment of boils and for the treatment of jaundice. Root is use for the treatment of elephantiasis, asthma, cough and leprosy. Stem of madar is use for the treatment of skin diseases, intestinal worms, and leprosy and cure leucoderma. The leaves and latex of Aak are used as an antidote for snake poison. It also improves appetite thereby fighting anorexia and also helps in healthy working of the respiratory system.

California Poppy
Flowers

CENTRAL PUBLIC WORKS DEPARTMENT

Ministry of Housing and Urban Affairs

Printed and Published by Directorate General CPWD, Nirman Bhawan. New Delhi. Printed by Arti Printers, New Delhi.