

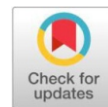
Review Article

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Use of Ornamentals in Landscaping: a review

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ABSTRACT

Landscaping comprises the beautification of different places. It involves softscape and hardscape. Softscape include the planting of trees, shrubs, climbers, bulbous plants, pot plants, grasses, cacti and succulents, whereas hardscapes include patio, benches, steps, water features, garden path and garden drive. Major design areas are: public area, outdoor living areas, service area, and private areas. To make a successful design we have to follow certain principles like unity, rhythm, balance, emphasis, scale and elements like line, form, texture, colour, and light. Different types of ornamental plants can be used for landscaping in combination with hardscape to create picturesque effect. In this review paper, I am going to discuss the plants that are suitable for landscaping.

Keywords: Ornamental plants, Landscaping, Elements and Principles of Landscaping.

Introduction

Landscaping is a segment of ornamental horticulture that focuses on the beautification of outdoor terrain and to some extent interior settings. Landscape architecture is defined as blend of science and art, relating to the systematic planning of land areas, design of outdoor places and spaces, conservation of our natural resources and thus the creation of a useful, safe and pleasant living environment [8]. In landscaping, we have to use different types of ornamentals to improve environment in addition to aesthetic value [12]. Different types of ornamental plants like trees, shrubs, climbers, annuals, cycas, palms, cacti and succulents are used for landscaping.

The first step in landscaping is to identify the areas that require attention or in which landscaping is to be done. That may be a residential area, or public and private areas. Public spaces, being accessible to everyone, offer opportunities for individuals who may not have private gardens to enjoy the beauty of plants and flowers. Street-side amenity plantings have great importance as an element of city landscape formation as they are required for aesthetic and psychological reasons [4]. The following are the areas for landscaping:

- Public places such as hospitals, banks, courts, post offices, schools, and colleges.
- National, state, district, block, and village roads
- Airports, railway tracks, bus stands, bus terminals, railway stations, railway junctions, highways
- Religious places
- Private hotels, shopping complexes

A good residential landscape design had four major design areas viz., Public area, Outdoor living area, Service area and Private living area.

1) Public area: is the portion of the property that is in full view of the public. It includes the area between the house and the road. It includes- Walks, driveways, parking area, tree and shrub planting, and lawn or ground areas. Goals that should keep in mind when designing a public area are:

- a) Soften the architectural lines of the house.
- b) Frame the house with trees.
- c) Maintain open lawn areas

2) Outdoor living area: is the area for family activities and for entertaining friends. The outdoor living area is designed with the family's gardening interests and entertaining activities taken into consideration. This area includes:

- a) **Enclosures-** including fences, walls, or plants create walls for the outdoor living room.
- b) **Surfaced areas-** such as walks, paths, sitting areas, patios, and decks comprise one element of the outdoor living area.
- c) **Plantings-** shrubs, trees, perennials, annuals, and ground covers enhance the appearance of the outdoor living area.
- d) **Garden accessories-** used to add interest include sculptures, pools, fountains, rocks, furniture, and lighting.

Outdoor living area is an extension of the indoor living space. The landscape is a room. Trees and the sky function as the ceiling. Plants and fences serve as the walls. The ground is the floor.

3) Service area: area to the rear or the side of the house set aside for strictly functional purposes make up the service area. Garbage cans, garden storage sheds, clotheslines, compost piles, and vegetable gardens are some activities that occur in a service area. Most service area activities are screened from view due to the nature of the activities.

4) Private living area: Area for family to sunbathe or relax in private. Therefore the view of this area is screened from public. For landscaping of a site we have to follow the elements and principles of landscaping.

Elements of landscaping are line, Form, Texture, Colour, and Light [12].

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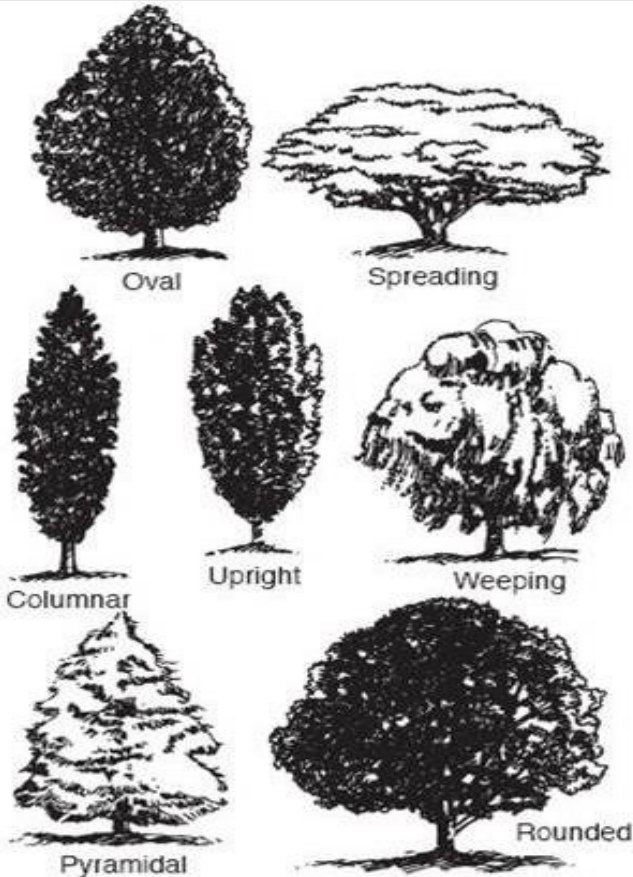
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a) Line: forms the skeleton of a garden. It can mostly be related to the way beds, walkways and entryways move and flow. This design element causes physical and visual movement. It may be used to draw attention to an object, divide a space, group related objects together, or separate unrelated objects in landscape design. Line can be considered in two ways. Straight lines are forceful and direct while curvy lines have more natural, gentle, flowing effect.



Straight line Curved line

b) Form: defines the shape and structure of an object.



Oval (Devils tree)



Columnar (Italian cypress)



Pyramidal (Deodar)



Rounded or globular (Molshri)



Rounded or globular (Horse chest nut)

c) Texture: is the surface quality of an object.

Fine texture:- *Delonix regia*

Medium texture:- *Cassia fistula*

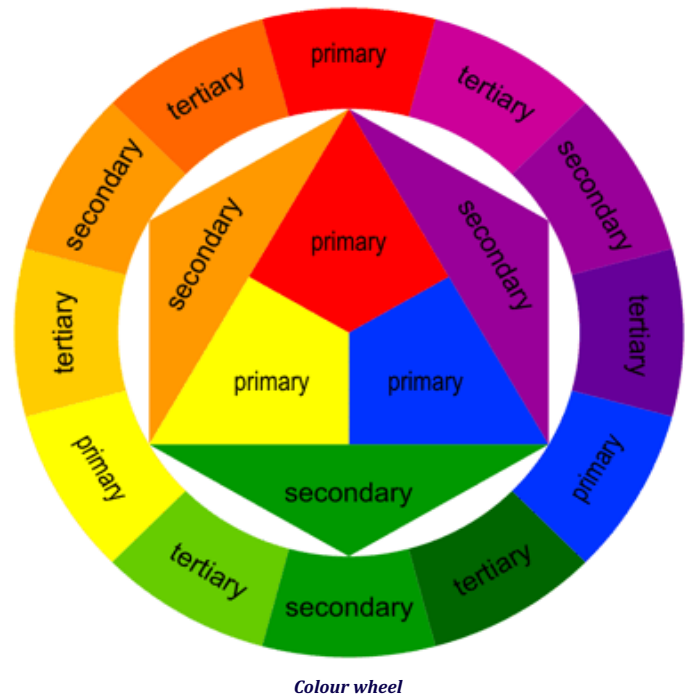
Coarse texture:- *Pterospermum acerifolium*, *Kiggeliapinnata*

d) Colour: is used to convey emotion and influences the mood and character of the overall landscape design or parts of the design.

Warm colour:- Red, Orange, Yellow

Cool colour:- Blue, Green

Neutral colour:- Gray, Black, White



Principles of landscaping are

a) Unity: in a garden is achieved when all parts of the design blend together to form a single idea. Also expressed as simplicity. A design should be simple by using a limited number of different plant species.



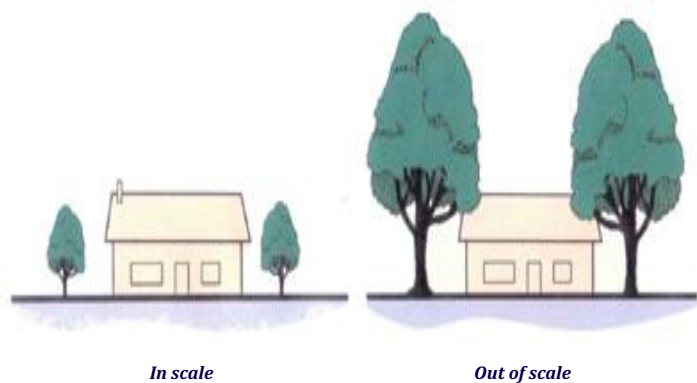
b) Rhythm: is the repetition of line, form, texture and colour of an object.



c) Balance: is of two types- Formal balance: is one in which planting materials on both side of the central axis are same, whereas informal balance is one in which planting materials on both side of axis are different.

d) Emphasis: is the point or area of landscape that attracts the viewer's eyes. Emphasis is created in the gardens to avoid monotonous view.

e) Scale: refers to the size of an object in relation to its surroundings. Scale in landscape design is inferred by the size relationship between adjacent objects.



In general, the area can be divided in the following proportion [6]:

- Lawn (25-30%)
- Paths (15-20%)
- Shrubbery (12-15%)
- Trees (15%)
- Herbaceous border (8-10%)
- Building (25-30%)

Landscape uses of trees:

- Specimen plant
- Shade tree
- Flowering tree
- Ornamental fruit tree
- Avenue tree

- Screening
- Wind breaks
- Checking air pollution [3]

Specimen plant: displays outstanding form, texture, colour. Because of its quality it can stand alone. When placed with other plants in grouping, it should be planted so it can be seen and enjoyed as an individual plant.

Examples: *Chorisia speciosa*, *Callistemon lanceolatus*, *Casuarina equisetifolia*, *Magnolia grandiflora* and *Araucaria columnaris*

Trees for Shade: Trees must be evergreen and have dense and large spreading canopy.

Examples: *Alstonia scholaris*, *Kigellia pinnata*, *Mimusops elengi*, *Pongamia pinnata* and *Azadirachta indica*

Trees for Wind break: The height of the tree for windbreak purpose should be tall and dense tree will be suitable.

Examples: *Eugenia jambolana*, *Pterospermum acerifolium* and *Tabebuia speciosa*

Trees for Avenue: Roadside plantation in India was Started by Emperor Ashoka and then afterward by Sher shah suri, who constructed Grand Trunk Road from Kolkata to Lahore.

Characteristics of any tree planting in avenues:

- Good ornamental value throughout year
- Medium size (10-15m)
- Straight trunk up to 5m
- Fast growing
- Branches non-drooping
- Non thorny

Examples: *Polyalthia longifolia*, *Delonix regia*, *Jacaranda mimosaeifolia*, *Peltophorum ferugineum* and *Grevillea robusta*

Trees with Ornamental fruit: Examples of trees are *Koelreutaria paniculata* have red capsules, *Aesculus indica* The fruit of the *Aesculus indica*, commonly known as the Indian horse chestnut, is a spiny, green capsule containing one or more nut-like seeds called conkers or horse chestnuts and *Kiggelia pinnta* produces large, sausage-like fruits.

Trees for screening: For screening purposes, trees should offer dense foliage, a reasonable height, and ideally, evergreen characteristics for year-round privacy. Examples: *Cupressus sempervirens*, *Putranjiva roxburghii* and *Polyalthia longifolia*.

Trees for checking air pollution: Gaseous pollutants found in the Atmospheric air are SO_2 , O_3 , Hydrogen fluoride and Oxides of nitrogen.

Examples: *Albizia lebbek*, *Alstonia scholaris*, *Azadirachta indica*, *Ficus religiosa*, *Polyalthia longifolia*, *Terminalia arjuna*, *Quercus palustris*.

Trees in sacred groves: Evidence of the earliest use of trees for landscaping could be found in the sacred groves of Kerala. Sacred groves represent the major effort to recognize and conserve biodiversity traditionally.

Examples: *Borassus flabellifer*, *Alstonia scholaris*, *Ficus religiosa*, *Azadirachta indica*, *Cassia fistula*, *Aegle marmelos*, *Terminalia paniculata*, *Mimusops elengi*.

Trees for Glare and reflection control: Trees can be effectively used to reduce glare in the landscape. Planting trees in the median strip of highways reduces glare from the oncoming headlights of vehicles. Plants can be used to reduce glare from sun or from stationary artificial light sources by locating plants of the proper height and density between source of light and area upon which the light shines, whether it is a bedroom or outside living area.

Examples: *Polyalthia longifolia*, *Terminalia arjuna*, *Grevillea robusta*, *Delonix regia*, *Saraca indica*, *Kigelia pinnata*

Trees for industrial areas and factories:

- *Albizialebbek*
- *Alstoniascholaris*
- *Azadirachta indica*
- *Ficus religiosa*
- *Juniperus sp.*
- *Pinus sp.*
- *Polyalthialongifolia*
- *Terminalia arjuna*

Trees for parks and other recreation places

Bauhinia purpurea, *Cassia fistula*, *Delonix regia*, *Jacaranda mimosaeifolia*, *Lagerstroemia speciosa*, *Saraca indica*, *Callistemon lanceolatus*, *Pongamia glabr and*, *Polyalthia longifolia* [12].

Landscape uses of shrubs

Specimen plant

- Shrubbery border
- Avenue planting
- Hedge
- Edge
- Rockeries
- Shrubs for pots
- Moonlit gardening
- Ornamental fruits [3]

Specimen shrubs: *Hibiscus sp.*, *Hamelia patens* and *Abelia grandiflora*.

Shrubs for avenue: *Murraya paniculata*, *Bougainvillea sp.*, *Thevetia peruviana* and *Nerium indicum*.

Tall ornamental hedges: *Thujaorientalis*, *Nyctanthesarbor-tristis* and *Murraya paniculata*.

Dwarf ornamental hedges: *Acalypha sp.* and *Ligustrum ovalifolium*.

Tall protective hedges: *Euphorbia splendens* and *Opuntia sp.*

Plants for edging: *Alternanthera*, *Iresine* and *Cuphea hyssopifolia*.

Shrubs for rockeries: *Euonymus japonica*, *Lantana sellowiana*, *Azalea*, *Thuja*, *Corssandra* and *Cuphea*.

Foundation plants: Shrubs placed around the Foundation of house to soften the edges of house and to tie the house with landscape.

Example: *Cuphea*, *Euphorbia splendens*, *Cotoneaster* and *Alternanthera*.

Shrubs for moonlit gardening:

Scientific name
<i>Jasminum auriculatum</i>
<i>Ervatamia coronaria</i>
<i>Jasminum sambac</i>
<i>Murraya exotica</i>
<i>Gardenia jasminoides</i>
<i>Nyctanthes arbor-tristis</i>

Shrubs with ornamental fruits:

Scientific name	Fruiting time
<i>Euonymus japonica</i>	Winters
<i>Viburnum cotinifolium</i>	April-June
<i>Duranta plumieri</i>	Oct-Nov
<i>Cotoneaster</i>	July-August

Climbers for screening walls:

Scientific name
<i>Vernoniaela eagnifolia</i>
<i>Ficus pumila</i>
<i>Bignonia venusta</i>

Pergolas: is one of the oldest architectural frame structures consisting of posts with a latticework roof normally flat, designed to support climbing plants (arbour or vine-supports) but below this the path is created for movement. Pergolas are made of wooden or bamboo poles or are more elaborate with pillars of stones, bricks, steel beams, angle iron or G.I. pipes with wooden or green painted iron rods as cross-members, the height being around 2.0-2.5m and width ranging from 2-3m but not less than 1m. Examples: *Quisqualis indica*, *Bougainvillea*, *Wisteria sinensis* and *Bignonia venusta* [10].

Climbers for covering slopes:

Scientific name
<i>Lonicera japonica</i>
<i>Passiflora edulis</i>
<i>Trachaelospermum jasminoides</i>

Landscape uses of annuals:

- Specimen plant
- Fragrant flowers
- Hanging basket plant
- Screening
- Bedding plant
- Edging
- Rockery
- Herbaceous border
- Border plant
- For shady areas
- Dry flowers [3]

Herbaceous border:

The planting of annuals in the border of a plot is called herbaceous border.

Herbaceous border can be of two types:

- Single face herbaceous border
- Double face herbaceous border

Single face herbaceous border: is made when border is situated on one side of plot and having some background like wall or shrubbery border.

Annuals are arranged in the border according to their height i.e. tall plants in back; medium in centre and dwarf in front line.

Double face herbaceous border: is more ideal when a border is to be made in between a big plot. In such border, there is no background and tall annuals are planted in the center; medium and dwarf on both sides in descending order so that beauty can be watched from both sides[1].

Colour scheme of the border:

Monochromatic colour scheme: Restricts the use of single colours. For example: if blue colour is to be used, annual like blue corn flower, blue larkspur, ageratum etc. can be used. For yellow colour Annuals like yellow antirrhinum, yellow dahlia, yellow annual chrysanthemum etc. can be used.

Analogous or harmonious colour scheme: In this type of colour scheme annuals are arranged according to the nearest wave length of colour. The arrangement follow the order as white, creamish yellow, light yellow and finally deep yellow which will follow the same but in descending order.

Contrast colour scheme: Opposite colours of colour wheel are used and plants of contrast colours are planted accordingly e.g. red dahlia against the background of green *Mollucella*.

Annuals for hanging basket:

- Portulaca
- Sweet alyssum
- Ice plant
- Nasturtium

Annuals for screening:

- *Ipomoea palmata*
- *Lathyrus odoratus*
- *Althea rosea*
- *Kochiascorpia*

Annuals for rockery:

- Nasturtium
- Ice plant
- Verbena

Landscape uses of bulbous plants/Geophytes:

- Flowering pot plants
- Foliage pot plants
- Fragrance
- Bedding and borders [3]

Flowering pot plants:

Scientific name	Flowering time
<i>Dahlia sp.</i>	Dec-Aug
<i>Zantedeschia sp.</i>	Feb-June
<i>Cyclamen persicum</i>	Dec-May
<i>Amaryllis sp.</i>	April-June
<i>Cliviaminiata</i>	Feb-April
<i>Begonia</i> × <i>tuberhybrida</i>	April-Aug

Bedding plants:

Scientific name	Flowering time
<i>Narcissus</i>	Dec-April
<i>Ranunculus</i>	June-Oct
<i>Iris</i>	Feb-Apr
<i>Crocus sativus</i>	Sep-Dec
<i>Canna indica</i>	throughout year
<i>Haemanthus</i>	May-Sep

Cycad and Palm: belongs to the family Palmaceae / Arecaceae have straight unbranched cylindrical or columnar trunks at the end of which there is a spreading canopy of huge pinnate leaves., Cycads consists of three families namely Cycadaceae, Stangeriaceae, and Zamiaceae. The key difference between cycads and palms is that the cycads are gymnosperms that are non-flowering plants, while the palms are angiosperms or the flowering palms cycads are dicotyledons but palms are monocotyledons.

Two types of palm:

1. Feather leaved palm:

Roystonea regia (Royal palm)
Roystonea oleracea (Cabbage palm)
Phoenix roebelinii (Pigmy date palm)
Caryota sp. (Fishtail palm)
Wodyetia bifurcata (Foxtail palm)

2. Fan leaved palm:

Chamaerops excelsa / *C. fortunei* (windmill palm/ Fortune palm)
Livistonachinensis (Chinese fan palm)
Rhapis excelsa (Ground Rattan palm/ Large lady palm)

Example of cycads are *Cycas revoluta* (Sago palm), *Macrozamia spiralis* and *Cycas circinalis* (Fern palm).

Cacti and succulent: These are group of plants that have special structures to store water in thick fleshy leaves or stems. They thrive best in sunny situations. They need little care. All the cacti are succulents on account of storing water but all the succulents are not cacti. Cactus is characterized by the presence of areoles, which often looks like woolly cushions carrying spines, hairs and the flowers arise from or near the areoles [10].

Cephalocereus (Old man cactus), *Mammillaria* (Bird's nest cactus), *Echinocactus* (Golden barrel) and *Pereskia grandifolia* (rose cactus) are example of some common cacti.

Adenium obesum (Desert rose), *Agave* (Century plant), *Sansevieria* (Snake plant), *Aloe-vera* and *Euphorbia splendens* (Crown of thorns) are some common succulents [2].

Grasses: Lawn is the heart of garden. A landscaping is incomplete without a lawn.

Common name	Scientific name	Regions
Kentucky blue grass	<i>Poa pratensis</i>	Cool season grass
Creeping bent grass	<i>Agrostis stolonifera</i>	
Perennial rye grass	<i>Lolium perenne</i>	
Bermuda grass	<i>Cynodon dactylon</i>	Warm season grass
Zoysia grass	<i>Zoysia japonica</i>	

(Decker and Decker, 1988)

Kumari and Choudhary [7] observed that the best varieties for lawn should have the following characters:

Climate conditions: Most grasses have a preference for specific climates such as humid, coastal, dry and cool.

Temperature tolerance: Each grass performs better or worse depending on the average temperature range during the growing season.

Drought resistance: Some grass species are better suited quickly recover after going dormant during extended drought conditions.

Maintenance required: Some grass species require more care than other.

Shade adaption: Grass species are classified by how or how little sunlight they need to maintain their health and vigour.

Wear tolerance: This is a measurement of how well a grass species can recover from foot traffic.

Best for shady areas:

- Fine leaf fescue
- Tall fescue

Best for drought resistance:

- Bahia grass
- Seashore paspalum
- Tall fescue
- Bermuda grass
- Zoysia grass

Best for low-maintenance requirements

- Buffalow grass
- Centipeds grass
- Fine-leaf fescue
- Tall fescue
- Bahia grass

Benefits of landscaping: The proper use of trees, shrubs, climbers, and man-made structures can modify the climate around homes and public buildings to reduce heat gains in summer and heat losses in winter [11]. There is as much as a 30% reduction in cooling and heating costs through careful landscape planning. Native ornamental species are best for landscaping of the same area and also have the ability to adapt to harsh environmental conditions of a particular area [5]. In general, landscaping has many benefits. Landscaping enhances environmental quality by improving air and water standards, reducing soil erosion, and boosting biodiversity. It also increases property value, lowers energy costs, and creates functional outdoor spaces. Additionally, it promotes mental well-being, fosters community engagement, and supports sustainable practices through native planting and water conservation.

Conclusion: Landscaping offers numerous benefits that enhance both the environment and human well-being. It improves air quality, reduces noise pollution, and contributes to energy efficiency by providing shade and wind protection. Additionally, landscaping can increase property values, with studies indicating that well-maintained landscapes can boost property value by up to 20%. The choice of grass species is crucial for optimal lawn performance. For temperate and sub-temperate regions, *Agrostis* species are recommended, while *Cynodon* species are better suited for tropical and sub-tropical climates. Furthermore, ongoing research in areas such as interior landscaping with terrariums, pollution control, and the stress tolerance of ornamental plants is essential to fully harness the potential of landscaping in improving our living environments. Incorporating thoughtful landscaping practices not only beautifies our surroundings but also contributes to a healthier, more sustainable, and economically viable future.

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