

## Bougainvillea: An ideal ornamental plant for landscaping and pollution control

**Bougainvilleas have drawn interest of amateurs and garden plant lovers alike. High degree of variability and diverse uses has made them a plant of choice for landscape architects. It has also proven to be an ideal plant for green buildings and greening of wastelands, highways, etc. where landscaping needs to be promoted for minimizing different types of pollution and greening of extreme drought prone and marginal areas.**

**B**OUGAINVILLEA is an ornamental perennial shrub belonging to the family Nyctigenaceae and native of dry tropical region of South America. It was first introduced in India from Europe in 1860 and is a versatile plant, which grows very well under the tropical and sub-tropical conditions. This crop requires minimum water, nutrition and maintenance for its vegetative growth and flowering. This plant grows well in saline and alkaline soils too, and is drought and pollutant resistant. The quality of hardiness, tolerance to drought, heat, sunshine, soil and water pollution, etc. has led to its great demand among landscape architects, horticulturists and garden lovers for development of home gardens (indoor and outdoor), factory gardens, airport surroundings, roadside and dividers, newly built township gardens, etc. Like rose, no garden is complete without bougainvillea, since it is very easy to maintain.

The genus *Bougainvillea* comprises about 18 species of semi-deciduous Central and South American shrubs or woody vines with thorny stem and persistent, spine-like inflorescence stalks. Majorly, three species are grown throughout the warm regions of the world and all the popular varieties available in the garden/ research institutes/ nurseries have evolved from the species like *B. spectabilis*, *B. glabra* and *B. peruviana*. The magnificent showy bract is the modification of leaves. *B. glabra* is

known as paper flower because of its bract, which are thin and papery, and thus it is the most common and widely cultivated. Accordingly, on the basis of bract type, the bougainvillea is divided into two groups, i.e. single bracted and double/ multi-bracted.

**Single bracted:** It has bracts in single layer enclosing inconspicuous flowers. Cultivars such as Mary Palmer, Dr B.P. Pal, Shubhra, Partha, etc. are the most popular single bracted varieties.

**Double/Multi-bracted:** These varieties have number of bracts in a cluster of 20-40. Cultivars such as Cherry Blossom, Los Banos Beauty, Mahara, Roseville's Delight etc. are the popular double bracted types.

### Global varietal wealth

One of the most important hybrids in bougainvillea was discovered by Mrs Butt and named after her, *Bougainvillea* × *buttiana*. Mrs Butt's bougainvillea is an accidental garden hybrid between the Brazilian species *B. glabra* and the northern Andean species *B. peruviana*. Later, complex hybrids among the cultivated species, together with natural mutations and variegation, lead to evolution of several varieties. Planned hybridization has also led to evolution of host of bract colours ranging from red, orange and yellow through purple to white. Presently,



A.P.J. Abdul Kalam Variegated



Bougainvillea collection at CPWD Govt Mehrauli nursery



Cascading view of bougainvillea



Dr H.C. Buck



Dr H.B. Singh



Lady Hudson

distinctive magenta-coloured bracts of some bougainvillea genotypes have also been evolved and several of them have been patented.

### National varietal wealth

India has over 100 varieties being maintained at different research institutions and gardens. The Bougainvillea Garden at Indian Agricultural Research Institute, New Delhi has the highest number of bougainvillea germplasm. Based on the bract colour, some of the popular varieties are listed hereunder.

*Pink to deep pink:* Pixie, Louise Wathen, Thimma, Kalyani.

*Mauve:* Trinidad, Refulgens, Sachidananda.

*Purple:* Sanderiana, Mahara, Los Banos Beauty, Cypheri.

*White:* Shubhra (Highly proliferous), Dr B.P. Pal, Snow Queen, Snow White, Buddhadas.

*Orange:* Roseville's Delight, Golden Glow.

*Yellow:* Lady May Baring, Enid Lancaster, etc.

*Bicolour:* Mary Palmer Special (White and Magenta), Partha (Orange to Purple). Lateritia (Poppy Red to Orange), Begam Sikander (Magenta and White), Cherry Blossom Purple (White and Mallow).

*Miniature and Compact type:* Pixie

*Variegated white and green leaf:* Glabra variegata, Marieta, Dr. Rao, Scarlet Queen variegata, Los Banos Variegata.

*Variegated yellow and green leaf :* Thimma, L.N. Birla, Spectabilis variegata, Dr A.P.J. Abdul Kalam, Archana, Louise Wathen Variegated.

### Climate requirements

Bougainvilleas grow best in full sun. High light intensity and warm temperature are required for good flowering. Bougainvillea remains in vegetative growth under low light and shady places. It is very drought

hardy and grows well in low soil moisture and nutrition conditions.

### Propagation

It is most successfully and commercially propagated from 10-15 cm long hardwood cuttings having 2-3 nodes during July-September. The cuttings are treated with rooting hormone of Rootex™ powder having IBA to promote better and uniform rooting. The cuttings should be inserted in well drained coarse medium made as raised bed. Only one cutting may be inserted in polybag of size 20 cm × 10 cm filled with sand and soil mix. Cocopeat and vermiculite (4:1) can also be used for better rooting when using polybags. After 30-45 days, leaves emerge and it should remain in polythene bags. However, rooting takes about 4-6 weeks. About 30-45 cm long plants with good foliage and well spread branches are transplanted in 8-10 cm pot after 8-12 months. The best time for planting hardwood cuttings is during February-March and July-August. Difficult to root varieties of *Bougainvillea* are also propagated by air-layering. Budding is also followed in some varieties for their propagation.

### Cultural requirements

Bougainvillea grows well in rich, well drained, and slightly acidic (pH 5.5–6.0) soil. It does not thrive in soil that is constantly wet. Proper soil pH is essential for the availability of mineral elements. A soil pH above 6.0 increases the possibility of micronutrient deficiencies, particularly iron, zinc, etc. Bougainvillea is a drought tolerant, salt tolerant, and also wind resistant plant.

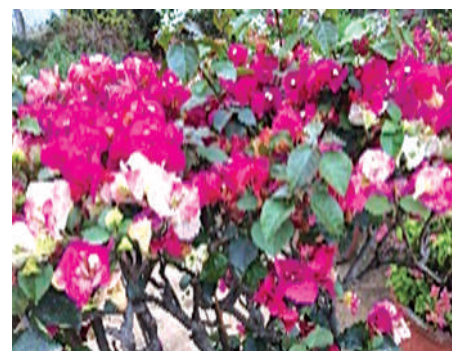
For best results, organic based slow release fertilizers are applied. At the time of planting, phosphate fertilizer should be applied. Too much fertilizer application



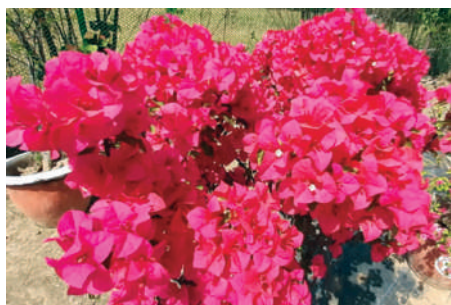
Lady Mary Baring



Mahara



Mary Palmer Special



Perfusion



Pixie Variegata



Potted bougainvillea

will promote vegetative growth and inhibit blooming. Bougainvillea needs regular fertilizing with formulations having NPK ratios of 1:1:1 or 2:1:2. Applications of soluble minor elements help prevent leaf chlorosis. For reclaiming alkaline and saline soils, mixing of gypsum ( $1.0 \text{ kg/m}^2$ ) is desired. To avoid termite attack, addition of 100 g neem cake powder in polypots is required. In plots, soil is drenched with Chlorpyrifos @ 2 ml/l during dry period and repeated after a fortnight.

### Pruning

Bougainvillea responds very well to pruning. If it is left unpruned, the plant grows wild and becomes climber initially and later become self-stemmed liana. To give proper canopy shape, stature and form to the plants, pruning is necessary. One has to prune the laterals and old shoots back within two or three buds of the main stems. This will encourage the formation of new flowers and colourful bracts. In Northern India, pruning is done during May-June.

Regular pruning is necessary to shape the plant and direct its growth because the shoots often grow vigorously. This plant is also suited for making topiary and gateways. Flowers are borne on new vegetative growth, hence pinching back and pruning are necessary to induce new growth. Pruning should be done after flowering is over (end of May-June), as this encourages the new growth on which the next flush of flowers will occur. For making bushy and thick bougainvillea in pot, soft pinching may be done. Pinching off the tips of the new vines that are growing from the main branch is done. The vine would give several new side shoots from the leaf bud close to the pinch point.

### Use in landscaping

Bougainvillea's growth habit, beautiful ornamental bracts and its attractive foliage make it the most loved plant for landscaping. In peak summer, bougainvillea becomes one of the best choices for landscapers due to its strong architect and multi-dimensional uses, because of its good hardiness and floriferous nature. Hardly few flower plants come to bloom in summer, when this versatile plant blooms in different range of colour of bracts. There is a lot of fascinating variations in leaves that add to the beauty of the plants. This crop is maximum planted in stretch on wall/ fence of road side with different bloom of bracts to avoid the monotonous effect of dry wall. It can be trained into different shapes and growth habits, as long as proper

support is given. It is used in mass planting, as shrubs or bushes, hedge and as ground cover on banks as well as for slope coverings. Bougainvillea provides hedges, barriers, and slope coverings. For large, difficult-to-maintain areas, bougainvillea is an excellent ground cover. It can cover an entire hillside and thus would suppress weed growth. Dwarf cultivars make colourful ground covers. Bougainvillea can be trained as a 'standard', a small flowering tree with a single trunk, over arbors, into espaliers, onto walls, or to cascade down a slope. Bougainvillea is used as an accent plant, a specimen plant, in hanging baskets, in containers, and for bonsai. This sparkling bougainvillea is used as one of landscape elements in the garden as focal points and as avenue trees to create different types of vistas. This makes it ideal for year round cultivation. Variegated cultivars such as Bhabha, L.N. Birla, Thimma and Rao having attractive foliage of cream and green colour bracts serves as suitable and hardy plant in garden and roadside plantation too.

### Role of Bougainvillea in Pollution control

Bougainvillea has been identified as one of best drought hardy plants for roadside and divider planting to reduce sound, air and heavy metal toxicity. It has been recommended as pollution tolerant plant and can help in the mitigation of air pollution (greenhouse gases), soil and water pollution, and also noise pollution. On the basis of previous research, it has been proven that bougainvillea has dust mitigation properties and it can also adsorb the pollutants from the environment where it grows. The main pollutants released by the vehicles include carbon monoxide, nitric oxide, sulphur dioxides, hydrocarbons, lead (Pb), arsenic (As), mercury (Hg), etc. in addition to the suspended particulate matter (SPM), which have deleterious effects on the human health. Therefore, it is highly recommended for plantation in urban and industrial areas, where suspended particulate matter is a problem. For estimating Air Pollution Tolerance Index, *Bougainvillea glabra* plants have been recommended in urban landscaping. Studies have shown that bougainvillea can be effectively utilized to reduce heavy metal pollution through absorption and adsorption in soil and air, respectively. Hence, it can thrive well in varied conditions of environment and soil. It can grow in most well-drained soils, and even in small pockets of soil in between rocks. Its roots grow deep into the ground, become self-supporting, and require very little care and attention. Bougainvillea is thus a pollution tolerant plant and can help in the mitigation of air and soil pollution besides its immense ornamental value.

## Uses of Bougainvillea plants

### **Potted bougainvillea:**

There is a big demand of different coloured bougainvilleas grown in different sizes of earthen and cement pots during the months of April to June. This is the only flower which is in bloom to tolerate scorching sun and hot wind. For potted bougainvillea, planting can be done in the months of July to August. Potted plants require more irrigation and it should be stopped 10 days prior to blooming. However, irrigation should be regulated during flowering period, otherwise flowering bracts will drop early.

**Multi-grafted bougainvillea:** In recent time, there is also a growing demand of multi-grafted potted bougainvillea in which different coloured bracts bloom on one plant. Different sparkling coloured bougainvillea cultivars are grafted onto a single rootstock plant. For this, 2-4 different coloured scion sticks (5-7 cm length and 5 cm diameter) collected from different plants are side-grafted onto two-year-old rootstock followed by covering with polybags and maintained in shade. After bud sprouts, the cover is removed and all the sprouts taking place below the graft points are removed meticulously. Such pots are sold at a higher price and accordingly are in great demand.

**Bonsai:** For this, cuttings of 15-20 cm length are used and grown in shallow pots. The plants are then pruned continuously after 3 months, and rolled with metallic wires to give different shapes following the established bonsai making techniques. Being an ornamental plant, bonsai made in bougainvillea are very costly and have high entrepreneurial value.

In the present day lifestyle, bougainvillea has multi-faceted uses in landscaping. The different varieties of bougainvillea suitable for different purposes are given in Table 1.

### **Availability of plants**

Garden lovers, amateurs, landscapers, nurserymen and individuals can collect wide range of sparkling genuine and named bougainvillea plants from different sources like ICAR-Indian Agricultural Research Institute, New Delhi; ICAR-Indian Institute of Horticultural Research, Bengaluru, Karnataka; CSIR-National Botanical Research Institute, Lucknow, Uttar Pradesh; CPWD Government Sunder Nursery, Nizamudddin, New Delhi; Government Mehrauli Nursery, Delhi; Government Plant Nursery, Chandigarh; Government Nursery, Jaipur; etc. The current trend is that garden lovers require diverse genotypes of desired vigour. Dwarf bougainvillea are ideal for small spaces or for containers (bonsai), multi-storied flats and typically reach a height and spread to 3 to 5 feet. They are easy to maintain and marketed as mini bougainvilleas and can be pruned to a shrub rather than rambling vine. Dwarf bougainvilleas are important



Rosea Fuschia



Shubhra

**Table 1.** Different bougainvillea varieties and their purposes

| Purpose              | Suitable varieties                                                                              |
|----------------------|-------------------------------------------------------------------------------------------------|
| Shrub                | Flame Sonnet, Spring Festival                                                                   |
| Hedge                | Dr R.R. Pal, Campbell, Mary Palmer                                                              |
| Potted bougainvillea | H.B. Singh, Dr R.R. Pal, Lady Mary Baring, Shubhra, Chitra, Thimma, Mahara, Mary Palmer, Sonnet |
| Bonsai               | Thimma, Golden Glow, Tomato Red                                                                 |
| Topiary              | Parthasarthy, New Red, Lady Richard                                                             |
| Cascade              | Begam Ali, Dog Star, Green Smith                                                                |
| Climber              | Chitra, Dr R.R. Pal, Lady Mary Baring                                                           |
| Arch/ Pergola        | Mahara, Partha, Mary Palmer, Magnifica                                                          |
| Umbrella Shaping     | Dr R.R. Pal, Trinidad                                                                           |
| Hanging Basket       | Scarlet Queen variegated, Dr H.B. Singh                                                         |

feature in smaller landscape. Some very dwarf genotypes are Helen Johnson, Sunvillea™ Rose, Sunvillea™ Cream, Pink Pixie, etc. Similarly, semi-dwarf bougainvilleas are ideal for locations with moderate amount of space. They typically are well suited for growing in the soil as they may be too large for containers. If one is looking for a medium-sized bougainvillea variety, Imperial Delight, Miss Alice, etc. can be good options. For selecting variable colour of bracts, type of bracted, etc. bougainvillea varieties, one should buy from reliable sources.

It can be concluded that bougainvillea is an important landscape plant, which plays a diverse role in the gardens. The availability of different forms in flower (bracts) and plant habit makes bougainvillea popular among the garden lovers. The diversity in bougainvillea cultivars has been evolved through natural mutations (bud sports), whereas, induced mutation and hybridization have also given significant contributions in the development of novelties. Garden lovers, amateurs, landscapers, nurserymen, etc. can collect wide range of sparkling coloured varieties and make their effective use in landscaping.

For further interaction, please write to:

**Meenu Kumari** (Assistant Professor), Department of Vegetable Science and Floriculture, Bihar Agricultural University, Bhagalpur, Bihar 813 210. \*Corresponding author email: meenubhu08111@gmail.com