

Pink Kakada (*Jasminum multiflorum*): A potential loose flower crop for winter production

***Jasminum multiflorum* (Pink Kakada) is an excellent flower crop to grow in tropical, subtropical, and temperate regions. Pink Kakada has the characteristics of a year-round flowering habit, excellent keeping quality, colourful flower buds, and resistance to common pests and diseases, making it an economically significant crop for commercial cultivation. Pink Kakada produces the suckers and branches continuously and produces flowers in a terminal of every cyme. The peak season for flowering of pink Kakada is during the month of December. However, off-season flowering is a major constraint in commercially cultivated *Jasminum* species. The gap in the supply and demand for Jasmine flowers during the winter season highlights the need to find a solution, which may involve either forcing commercial species to flower during off-seasons or making use of underutilized *Jasminum* species that have year-round flowering habits. Pink Kakada is a potential crop grown instead of commercial jasmine species for the winter season. Commercialization of Pink Kakada reduces demand during the off-season, ensuring a steady supply of flowers for the market and increasing the economy of the growers.**

J. multiflorum (Pink Kakada) is a species of jasmine that belongs to the family *Oleaceae*, and is commonly known as 'Indian Jasmine', 'Winter Jasmine', 'Star Jasmine', and 'Downy Jasmine'. Although it is indigenous to India and South East Asia, it is primarily grown in tropical and subtropical climate. Pink Kakada is a potential loose flower crop due to its vibrant, fragrant buds, exceptional keeping quality, and its ability to flower year-round. Pink Kakada is a perennial plant that grows rapidly and is useful for loose flower production or grown as gardens for making borders and shrubbery.

Phenotypic characteristics of Pink Kakada

Pink Kakada is an evergreen shrub that grows up to a height of 3 m. Branches are produced alternatively. The leaves are 3–5 cm long. The inflorescences are dense terminal cymes on short lateral buds, carrying numerous sessile or sub-sessile flowers. The individual cyme produces 9–12 individual flower buds. Flower buds are pink in colour. Calyx, with its 6–9 fliform lobes, is about 0.6 cm long. The corolla is funnel-shaped and about 2.55 cm long. The opened flowers look elegant white due to their bicolored petals and fragrance. The petals range between 8 and 10.



J. multiflorum (Pink Kakada)



Flower buds

Flowering characters

Commercially cultivated *Jasminum* species typically exhibit peak flowering during the summer season (March), with an off-season bloom occurring in winter. Pink Kakada demonstrates more prolific blooming during the winter season (December) compared to the summer, a phenomenon attributed to its growth characteristics, which are better suited to cooler temperatures for flower initiation. This seasonally adaptive blooming behaviour allows Pink Kakada to maintain a continuous production of fragrant flowers throughout the year.

Propagation

It is propagated by cuttings, suckers, grafting, budding, and tissue culture.

Cutting: Pink Kakada, propagated by cuttings, gives better root system and success percentage. The past-season growth of terminal cuttings ranging from 10 to 15 cm length are ideal for propagation. The cuttings are with treated rooting hormone and planted vertically in polyethylene bags (10 cm diameter × 15 cm height) with sand media and kept under the low-cost polytunnel. After planting, the cuttings sprayed with carbendazim 0.5% to prevent the incidence of fungal diseases. Watering is done with the help of rose can at an interval of 2–3 days. The terminal cuttings treated with IBA 500 ppm + NAA 250 ppm, registered early rooting (28.32 days), increased root length (22.25 cm), number of roots per cutting (19.35), shoot length (15.09 cm) and improved survival percentage (85.36%).

Grafting: Top wedge grafting technique is the easiest method of grafting in Pink Kakada. One-year-old healthy plants of *J. sambac* (Gundumalli) and Double Mogra (ecotype of Gundumalli) are ideal rootstock, and a pencil thickness of 10–15 cm long with 3–4 healthy buds are used as scion material. The rootstock is split to a depth of 4–5 cm through the centre of the stem with a grafting knife. A scion is prepared by giving a wedge-shaped cut about 5 cm long at the proximal end of the scion. The wedge-shaped scion thus prepared is inserted into the slit of the stock. After the insertion of the scion into the cleft of the stock plant, care is taken to see that the scion and the stock are in close contact with each other. The joint (union) is tied firmly with a 1.5 cm wide and 20–25 cm long low-density transparent polythene strip of 150-gauge thickness. The scion is covered with small polythene sleeves to maintain adequate humidity. Then the grafted plants are kept in a mist chamber. The grafts with Double Mogra rootstock treated with kinetin 25 ppm resulted the highest graft success and survival percentage (98.94 and 76.85%, respectively) with increased graft height (69.45 cm) and number of leaves on graft (39.63).

Land preparation

The field is ploughed with chisel plough to ensure fine tilth in the root zone and effective drainage during rainy season. It is followed by three times ploughing with disc plough and cultivator, and then the field is leveled with rotavator.

Spacing

The growing nature of Pink Kakada is shrub and it produces more side suckers. Optimum spacing of 1.25 × 1.25 m is ideal for commercial cultivation. Approximately 6,400 plants may be accommodated per ha.

Planting

The best time for planting in most parts of India is during the monsoon. Once planted, the Pink Kakada plants remain in the field for 10–15 years. The ideal time for planting in North India is between July and August and from the end of January to February, while in South India, planting is done at any time between July and December.

The rooted terminal cuttings of 60 days after rooting are ideal for planting in main field. The pit size of 45 × 45 × 45 cm is prepared for planting. At the time of planting, the pit is filled with a basal mixture containing FYM (1 kg/pit) and vermicompost (0.5 kg/pit). Gap filling is done after 10 days of transplanting.

Drip irrigation

For drip irrigation, water is pumped using a 7.5 HP motor and conveyed to the main line of 2.5" PVC pipes. The separate suction unit of Venturi is provided for supplying water soluble fertilizer. From the main pipes, 2.0" PVC pipes are fixed as sub-main. From sub-main, laterals of 16 mm are taken run along each row of plants. There are two sub-mains with tap control for imposing drip irrigation and fertigation treatments. Along with the laterals, emitters with a discharge rate of 4.0 LPH are fixed at a spacing of 1.25 m.

Fertigation

The Pink Kakada plants produce more suckers and branches, and need balanced nutrients. The split application of fertilizer is better than the basal dose application for Pink Kakada cultivation. The ratio of 60:120:120 g NPK/plant/year is the Recommended Dose Fertilizer (RDF) or optimum dose for flower production throughout the year for Pink Kakada. At the time of planting, 75% of the phosphorus is applied as basal dose and remaining 25% is applied as a water-soluble fertilizer. The 100% of the RDF as water-soluble + foliar spraying of 0.25% Fe is recommended for cultivation of Pink Kakada, which increases the plant height (89.38 cm), plant spread North-South (87.05 cm) and East-West (95.95 cm), total chlorophyll content (1.26 mg/g), total phenol content (9.92 mg/g), number of cymes per plant (313.41) and flower bud length (3.96 g).

Table 1. Fertilizer sources of NPK

Water soluble fertilizer		Straight fertilizer	
Urea	46 - 0 - 0	Urea	46 - 0 - 0
Polyfeed	19 - 19 - 19	SSP	0 - 16 - 0
KNO ₃	13 - 0 - 45	MOP	0 - 0 - 60

Foliar nutrition

Spraying of zinc 0.25% and magnesium 0.5% before flowering increases the yield of flowers. FeSO₄

should be sprayed 5 g/lit. at monthly intervals until the chlorotic symptoms disappear. Foliar spraying of FeSO₄ at 0.25 g along with a small pinch of citric acid at weekly intervals reduces chlorosis in Pink Kakada.

Cultural operations

Pruning is a crucial operation for controlling flowering because it affects the commencement, differentiation, and ultimately formation of flower buds. Naturally, watering is stopped before pruning, and plants are trimmed by cutting away all of the previous season's growth, including any dead or diseased branches. The bushes often lose all of their foliage. It is done to help the lower branches receive enough light to produce food, enhance the shape of the plant, eliminate the presence of disease and damaged branches, and generally make the plant healthier. To achieve a good flower bud yield throughout winter (Nov–Feb), the Pink Kakada should be pruned in September. The optimal pruning height of 60 cm above ground level enhanced the flower production (880.99 g/plant) during winter (Nov–Feb).

Plant protection

Pink Kakada is resistant to the most common pests and diseases, making it a relatively low-maintenance plant. However, it is susceptible to budworm infestations, which primarily occur during the summer months. The warmer temperatures and increased humidity in summer provide favourable conditions for budworm activity. In contrast, these pests are less prevalent during the cooler winter season.

Table 2. Common pests and diseases, and the control measures

Pest / Disease	Control measures
Bud worm (<i>Hendecasis duplifascialis</i>)	Thiacloprid 240 SC @1 mL/L
Red spider mite (<i>Tetranychus cinnabarinus</i>)	Wettable sulphur 50WP @2 g/L
Flower thrips (<i>Thrips orientalis</i>)	Fibronil @ 2 mL/L
<i>Cercospora</i> leaf spot	Mancozeb @ 0.2%
<i>Alternaria</i> blight	Propiconazole (Tilt) @2 mL/L



Chlorosis in Pink Kakada



Bud worm

Table 3. Post-harvest quality and shelf life

BAP 100 ppm	Cold storage (7°C)	Room temperature (28±2°C)
Freshness index (%)	83.83	61.45
Flower opening index (%)	25.32	41.06
Colour retention index (%)	84.25	60.44
Fragrance index (Score)	3.67	3.51
Moisture content (%)	73.65	68.42
Physiological loss in weight (%)	7.05	9.71
Membrane integrity (%)	28.98	34.07
Relative water content (%)	59.23	47.79
Total phenol (mg/g)	5.98	9.80
Peroxidase activity (change in OD/g/min)	22.35	16.58
Total carbohydrates (mg/g)	89.54	81.25
Shelf life (hours)	158.03	98.4

Harvesting

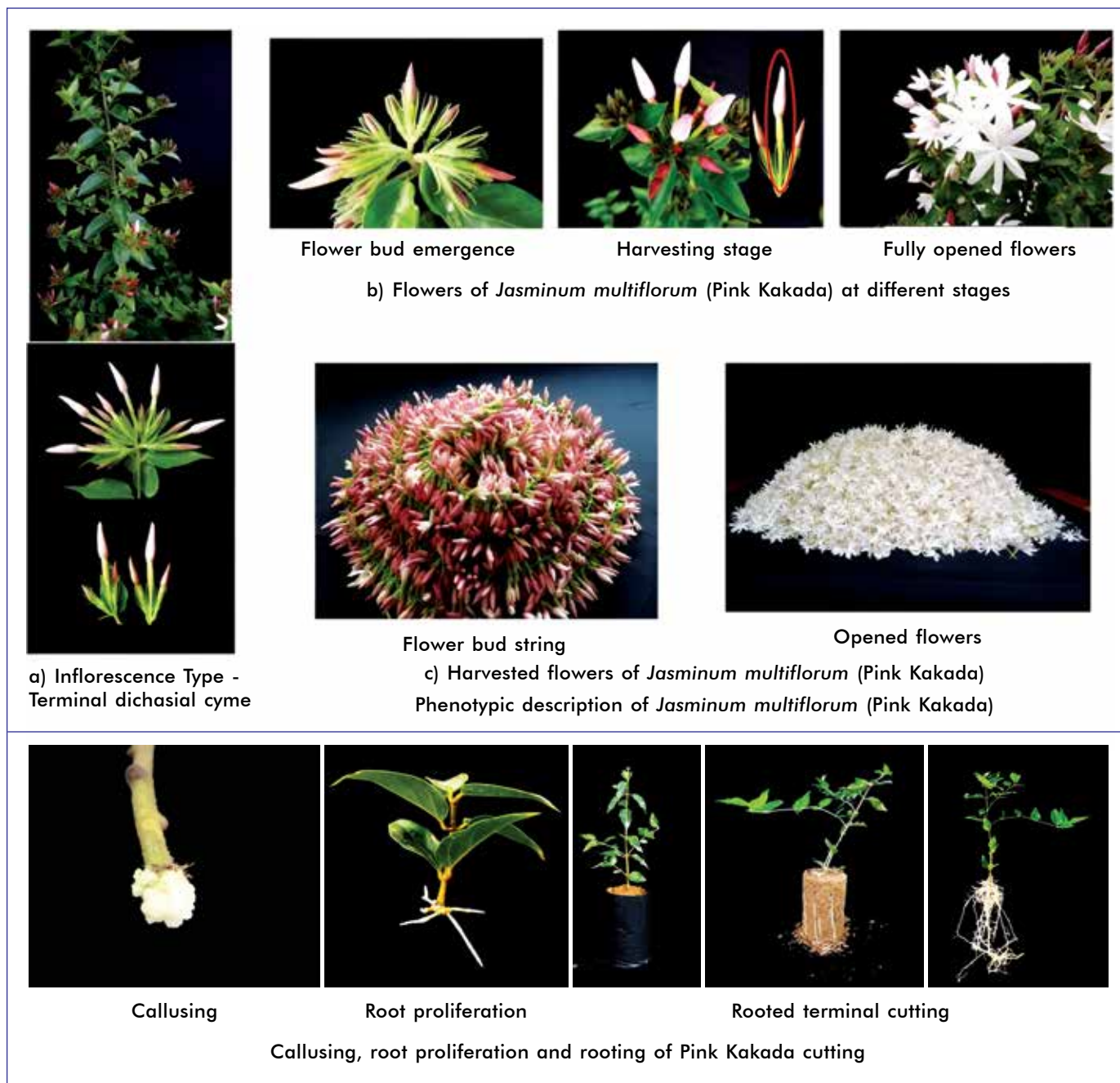
Fully developed, tight coloured flower buds are harvested before 10 AM to ensure optimal freshness. The flower buds are then carefully packed in gunny bags or corrugated boxes for transport.



Flower buds and flowers



Flower bud yield per plot (g) on monthly basis of Pink Kakada



Yield

The individual terminal shots of Pink Kakada produce cymes with 5-10 economic flower buds. The economic yield starts three years after planting. An average yield of 11.83 t/ha can be obtained after 5 years of planting.

Economics

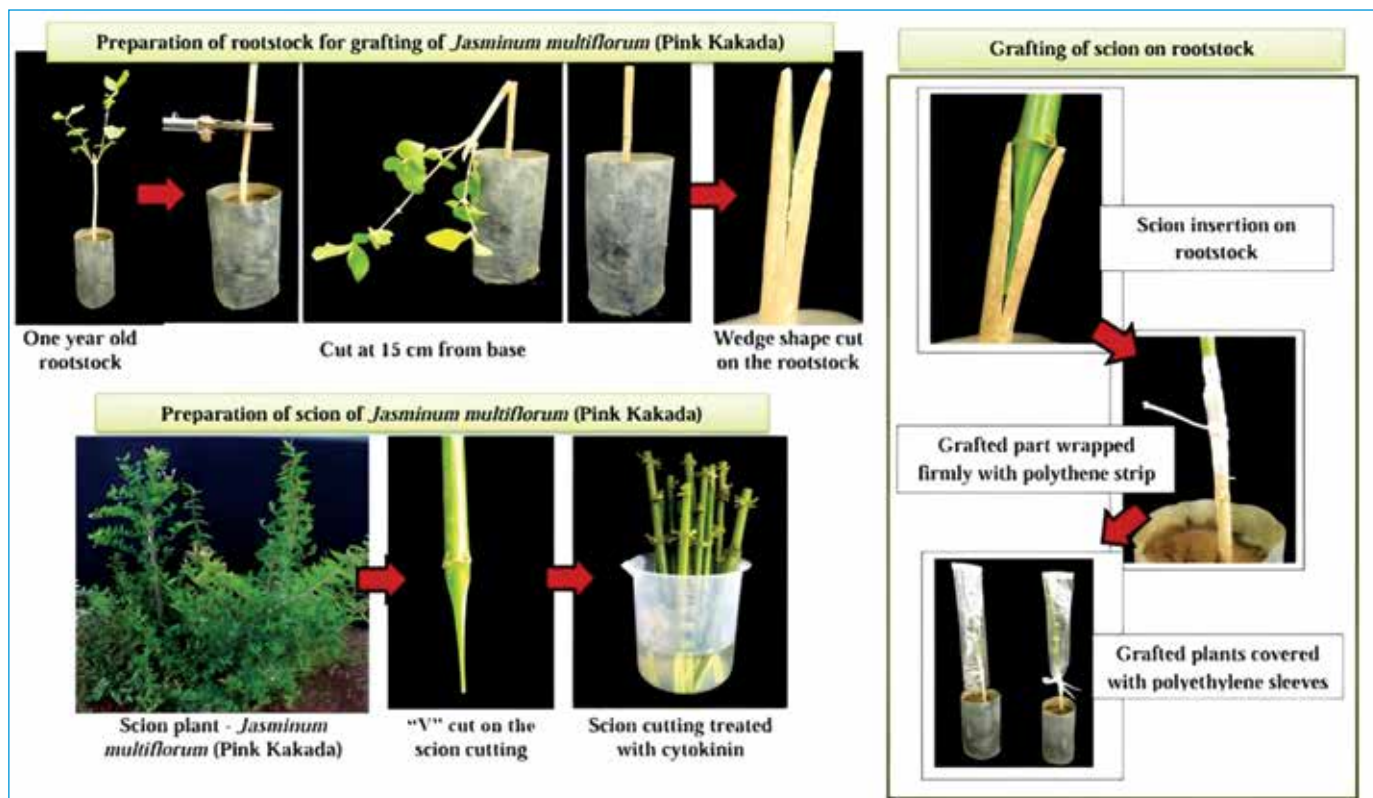
The normal cultivation with 100% Recommended Dose Fertilizer (RDF) (60:120:120 NPK/g/plant/year) revealed lower cost of cultivation of ₹ 524,865.80/ha, gross return of ₹ 783,401.36, net return ₹ 258,535.60 and the benefit cost ratio is 1.49. Besides, the 100% RDF as water soluble fertilizer has highest cost of cultivation ₹ 670,643.20/ha, gross return ₹ 1,775,717.43, net return ₹ 1,105,074.00 and the Benefit cost ratio is 2.65. The farmers who adopted drip irrigation with water soluble fertilizer could have more earnings with benefit cost ratio (1.16) which is higher than farmers who practiced with soil application of fertilizer.

Postharvest management

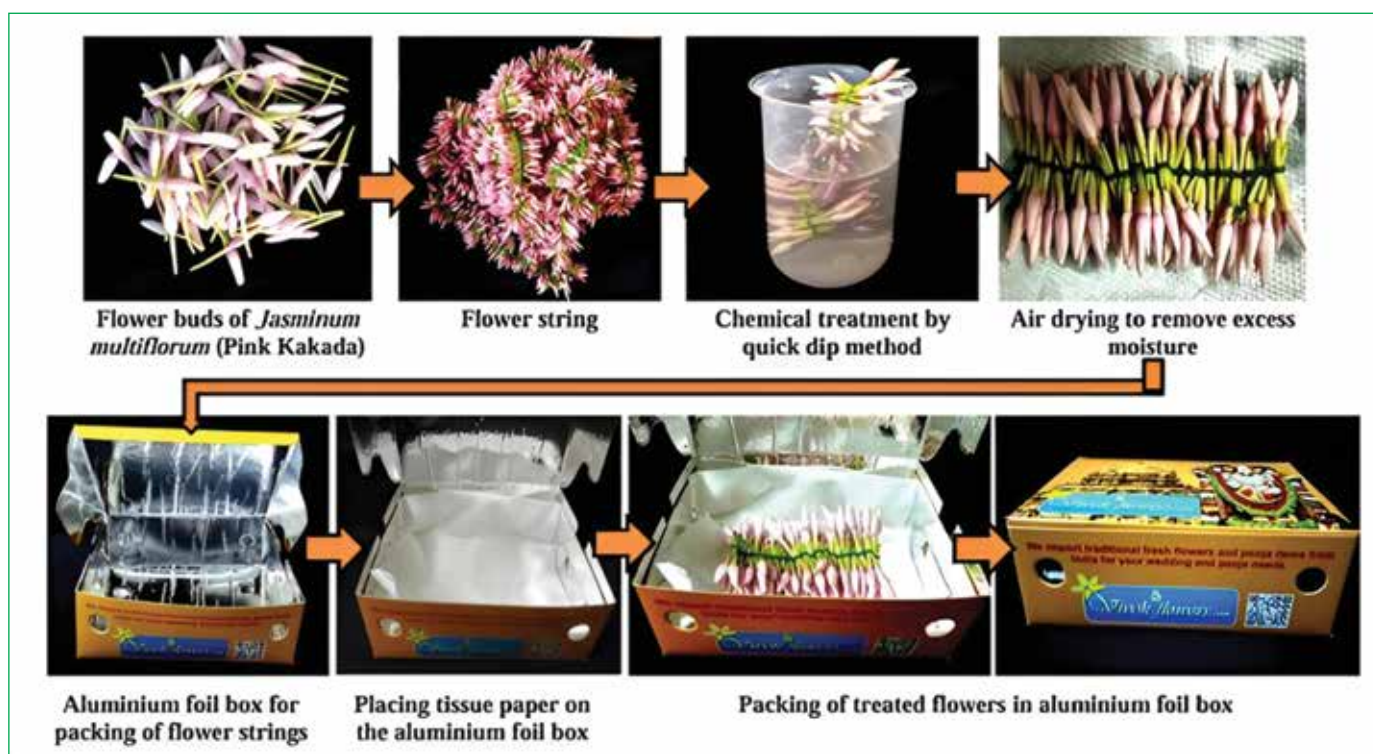
The flower buds are harvested from the field at early morning 6.00 AM to 8.00 AM. Freshly harvested flowers are made into a string and treated with BAP 100 ppm and stored at a cold temperature of 7°C, increasing the flower bud shelf life and quality (Table 3).

Phyto chemical screening and antioxidant potential

Jasminum multiflorum (Pink Kakada) exhibits phytochemical properties. To perform phytochemical screening and antioxidant analysis, methanol, ethanol, ethyl acetate, petroleum ether, and aqueous extracts were utilized as extraction solvents. Maximum phytochemicals are present in the ethanol extract. Using a colorimetric technique, antioxidant activities (DPPH, ABTS, and chelating potential) are measured. In the ethanol extract of leaves, antioxidant activity is expressed as the maximum reduction percentage (MRCP) and EC50 value of 132.26 µg/mL of DPPH,



Top wedge grafting technique



Postharvest management for enhancing flower bud

98.43 $\mu\text{g/mL}$ of ABTS, and 28.9 $\mu\text{g/mL}$ of chelating potential.

SUMMARY

The commercially cultivated species of Jasmines do not produce flowers during off-season, whereas the Pink Kakada has fall high blooming production in off season, and also have year-round production. Hence, the farmers/

growers to can choose Pink Kakada cultivation to have year-round yield and economics benefit of community.

For further interaction, please write to:

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