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Review on Propagation Techniques of Jasmine (*Jasminum sambac* (L.))

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Abstract
Jasmine (in Kannada mallige) is an important traditional flower crop widely cultivated in the Southern and Eastern parts of India. Although more than 2,000 species are known, 40 species have been identified in India and 20 species are cultivated in South India (Bhattacharjee, 1980). Usual method of propagation observed in jasmine is layering and cuttings and these methods of propagation restricts the quantity of plants produced as they are dependent on season and climatic factors. Layering is a cumbersome method of propagation involving more time and also restricts the number of plants propagated from the shrub. According to Cai *et al.,* (2007) long term cutting/layering has found to cause varietal degeneration, lack resistance and decline in flower production. Seed propagation though very rarely observed in wild varieties and certain species, is necessary for crop improvement through planned hybridization. Multiplication through suckers, grafting, budding and tissue culture has also been found successful. Tissue culture has emerged as a promising technique to obtain genetically pure elite population under *in vitro* conditions (Malik, 2007). Micro-propagation provides a fast and dependable method of production of a large number of uniform plantlets in a short time. Moreover, the plant multiplication can be continued throughout the year, irrespective of season and the stock of germplasm can be maintained for many years.

Keywords: Layering, cutting, micro-propagation, germplasm

Introduction
Jasmine belongs to family Oleaceae, reported to be native of Indo–Malayan region (Anonymous, 1959) [2]. Jasmine is grown for making garland which is used in religious functions, adoring Gods and also for extraction of essential oils, a prime raw material for perfumery industry. The fragrance emitted from jasmine flowers are known to have medicinal value and are known to cure depression, nervous exhaustion and stress. According to Ambasta, 1986 and Chadha, 1976, [1, 10] Jasmine flowers have got high potential in perfumery and essential oil sector. *Jasminum grandiflorum*, *Jasminum sambac* and *Jasminum auriculatum* are the commercially cultivated species which are found to be originated from Indian sub-continent. Considerable work on varietal improvement through selection and hybridization, cultural practices and propagation techniques has been reported throughout India. Besides the species mentioned above certain ecotypes are also been reported *viz.,* Udupi Mallige, Mangalore Mallige, Bhatkal Mallige, Amboor Mallige, Elusuttina Mallige, Mysore Mallige, which are specific to certain regions and are exported to Gulf countries for fresh flowers and perfumery industries. The increased demand for jasmine in recent years has resulted in demand for quality planting material. Though layering and cuttings are the popular methods followed in propagation of Jasmine, there are certain limitations. Propagation through seeds are rarely observed in jasmine plants which are cultivated commercially and are restricted to the wild varieties. Other propagation methods *viz.,* suckers, grafting and *in-vitro* propagation are also been reported in recent times. *In-vitro* propagation is the successful method for production of quality planting material wherein true to type plants can be produced with reduced cost of production. Work on standardization of protocol for *in-vitro* propagation in *Jasminum spp* has been reported by different scientists throughout world. A review work on different propagation techniques has been reported for exploring in the area of research and development for the future work.

Seed Propagation
Seed setting is a very rare phenomenon and could be observed under unusual weather conditions (Inderesh *et al.,* 1994) [12]. Hence, propagation through seeds is not a regular practice. In some species seed setting has been observed. Inter-clonal variations in seed germination have been reported in *J. auriculatum* and *J. grandiflorum* and also among other species. In general, diploid species of *J. auriculatum* and *J. grandiflorum* have better

Germination potentiality (75-84 percent), than tetraploids like *J. flexile* (55 per cent). Higher temperature and humidity hastened the germination and maximum germination occurred in saw dust and sphagnum moss. Seed dormancy has been noted in *J. auriculatum* and longevity of seeds does not exceed ten months (Veluswamy *et al.*, 1974, 1975, 1977) [34, 35, 36].

Vegetative propagation

Layering

Layering has been the mode of vegetative propagation in jasmine. Simple layering during June-July to October-November gives good success in 90 days to 120 days. Stems of *Jasminum nudiflorum* have been found to develop adventitious roots when the branch comes in contact with ground and these can easily be propagated from layers (Burns, 1953) [8]. This method of multiplication, however, involves more time and restricts the number of plants propagated from a bush.

Cutting

Propagation through cutting is found to be the easiest method of raising new plants and has been attempted in certain species which are grown on commercial scale. Several factors like type of cutting, rooting media, environmental conditions *etc*., are known to influence root formation in cuttings.

- **Type of cutting**

Bose *et al.,* (1973) [17] observed higher percentage of rooting and maximum number of roots per cutting in cuttings of *J. auriculatum*, which were 15 cm long having two leaves and taken from the middle portion of the shoot. The cuttings which were taken with the leaves reported maximum root formation according to Mukhopadhyay and Bose (1979) [17] who reported that rooting percentage as well as number of roots per cutting increased with the increase in leaf number. Cuttings which didn't have any leaves or buds failed to produce roots even when they were treated with growth regulators. According to Paulas (1980) [22], single node cutting having one leaf was found to be the best cutting for production of faster, cost effective and efficient propagation technique of *J. sambac* cv. Gundumalli. Jayapal *et al.,* (1980) [13] studied on the success of rooting in different types of cutting in different *J. spp*. Semi hard wood cuttings of *J. auriculatum* recorded 70 per cent rooting, terminal cuttings of *J. grandiflorum* recorded 98 percent rooting where as semi-hardwood and terminal cuttings of *J.sambac* rooted 92 and 94 per cent respectively.

- **Season of propagation**

Propagation through cuttings depends on the season and it varies from place to place. According to Siddique (1973) [29], better rooting was observed in the cuttings which were taken during the month of March as compared to the cuttings taken during the month of June, September or December.

The combined effect of different concentrations of hormones, different type of rooting environment and different months on rooting of cuttings of *J. grandiflorum* was studied at IIHR, Bangalore by Bhattacharjee, (1988) [5]. Treatment with IBA resulted in maximum rooting, cuttings under shade without mist were found to be insignificant when compared to the rooting of cuttings which were treated with intermittent mist. Maximum rooting percentage and long roots were recorded in the cuttings taken during April to September as compared to the cuttings taken during October-February, which reveals the requirement of higher humidity for root formation.

- **Type of media used**

Different type of media are used for root formation in cuttings of Jasmine *viz.,* sand, vermiculite, moss and mixture of sand, moss, vermiculite. Nakasone and Bowers (1956) [18] reported that vermiculite was the most suitable media for rooting of cuttings of *J. officinale*. Singh (1979) [30] observed maximum rooting of 95% in cuttings which were planted in coarse sand media. Mukhopadhyay and Bose, (1979) [17] studied on rooting percentage on different media. The study revealed that highest percentage of rooting and maximum number of roots were recorded in cuttings of *J. auriculatum* planted in coarse sand followed by a mixture of sand and moss (1:1 or 1:3) and vermiculite, whereas poor root formation was observed in the garden soil media. According to Polikarpova *et al*., (1971) best rooting was observed in full day light whereas temperature of rooting media didn't influence root formation.

- **Use of rooting hormones**

Pappiah and Muthuswami (1976) [20] conducted trial on effects of IBA and IAA each at 1000-2500 ppm, SADH at 100-1000 ppm and Seradix on rooting of softwood cuttings of *J. auriculatum.* IAA at 2000 ppm recorded highest rooting percentage of 85% followed by SADH at 500 ppm and IBA at 2000 ppm.

Investigation was carried out at IIHR, Bengaluru by Bhattacharjee and Balakrishna (1983) [5] on the role of leaves, length of the cuttings, hardiness of cuttings and effect of rooting hormone on the rooting of cuttings and survival of rooted cuttings on four different species of *Jasminum*. The result revealed that best performance in rooting and survival of rooted cuttings can be obtained by using 15cm tip shoot cuttings having four leaves, treated with 4000 ppm IBA rooting hormone and planted in vermiculite media under mist. Keeping all the other factors constant, it was recommended to use 10 cm long cuttings in case of *J. auriculatum*, basal cuttings for *J. grandiflorum* and sand medium for *J. sambac*.

Singh, (1979) [30] conducted experiments on rooting of cuttings of *J. sambac* cv. Madhanban by treating with IAA and NAA each at 4000 ppm which resulted in 100 per cent rooting of cuttings. Singh and Motial (1981) [31], achieved the best rooting (97.5-100%) and survival of rooted cuttings (100%) by treating with IBA at 4000 ppm. The days taken for rooting were found to differ among different species of *Jasminum*. Maximum number of days (70 days) was recorded for rooting in *J. auriculatum* followed by 68 days in case of *J. sambac*. *J. grandiflorum* recorded minimum number of days (45 days) for rooting of cuttings (Pappiah *et al*., 1980) [21].

Grafting and Budding

Different methods of budding and grafting were studied in jasmine. Experiment conducted by Veluswamy *et al.,* (1980) [37], where they used *J. grandiflorum* as scion on eleven different species of *Jasminum.* Different methods of budding *viz..,* shield and patch budding, different methods of grafting *viz..,* side and cleft grafting was tried. The compatibility studies revealed that *J. grandiflorum* is found to be compatible with *J. sambac* cv. Madhanban, Mathria and Single Mogra. Other methods like T-budding and side grafting, however, failed. Studies on inter- species grafting was carried out by Nambisan and Krishnan (1980) [19]. Approach grafting was successful with survival percentage of 76 per cent in Gundumalli (*J sambac*) on Mullai (*J auriculatum*), 72 per cent in Mullai on Gundumallige and 90 per cent in Jathimalli (*J. grandiflorum*) on Mullai. The number of days taken for detachment of grafts from mother plant ranged from 16 weeks to 24 weeks.

***Ex-Situ* Conservation**

Ex-Situ Conservation / micro-propagation is the practice of rapidly multiplying stock plant material to produce a large

number of progeny plants, using modern plant tissue culture method (Anon., 2008) [2]. NAA was added in the B5-medium in propagation of cape-jasmine *in vitro* (LI Bin, 2000). The results showed that NAA had promoted rooting at concentrations from 0. 1mg/L to 0.8 mg/L, and NAA at 0.2 mg/L was the best concentration for the growth of shoot and root. A single bud cutting could form a plant about 6.67 cm length with 5 roots after 35 day's culture.

- **Shoot and bud proliferation**

Sabita Bhattacharya and Sanghamitra Bhattacharya (1997) [26], micro propagated successfully *Jasminum officinale* L. by culturing nodal segments. MS basal media with 17.76 µM 6-BA and 0.53 µM NAA supplemented with 3% sugar was used for shoot proliferation. U-Kong *et al.,* (2012) [33] reported that 50% shoot buds were proliferated from shoot tips when *J. sambac* strain 1 was cultured on modified MS medium supplemented with BA 4 mg/L and 60% shoot buds were initiated on kinetin 1mg/L. Further he reported that 75% shoot buds were induced from shoot tip explants when cultured on BA 4 mg/L whereas 54.5 % shoot buds were initiated from shoot tips when cultured on modified MS medium supplemented with kinetin 1 mg/L from *J. sambac* strain 2.

SUN Yan *et al*., (2009) [32], work on rapid propagation *in vitro* of Jasmine results showed that the highest bud induction rate of 96.75% was obtained in WPM medium supplemented with 2.0 mg/L 6-BA and 0.1 mg/L IBA. The optimal rooting culture mode was two-step rooting method, *i.e*., pre-culturing shoots on the rooting medium of ½ WPM+ NAA 1.0 mg/L for 7 days, then transferring pre-cultured shoots to ½ WPM without supplement of any plant growth regulators. The rooting rate was up to 98.41%.

Reza Farzinebrahimi *et al* (2014) [25] used young stems (each contained one nodal part) of *J sambac* for shoot development on MS medium supplemented with a combination of BAP (3.0 mg/L) and NAA (1mg/L) that showed 20 percent shoot regeneration. Early bud break was observed (25-26 days) when MS medium was supplemented with BAP (2.0 mg/L), Kinetin (1.0 mg/L)and Ads (50 mg/L)in *Jasminum sambac* (Biswal *et al*.,2016) [6]. MS medium having BAP (2.0 mg/L.), Kn (1.0 mg/L.), Ads (50 mg/L) and 3 percent sucrose higher percentage of bud break and multiple shoots formation (83.7 and 90.5) within 4 weeks of subculture in *J. sambac***.**

MS basal medium combined with benzyl adenine (2.0 mg/L) and NAA (0.1 mg/L)was considered as appropriate medium for optimum bud proliferation according to Cai *et al.,* (2007) [9]. Optimum number of multiple shoots induction in axillary buds was recorded in MS basal medium combined with benzyl adenine (1.5 mg/L) and NAA (0.3 mg/L).

- **Callus Proliferation and direct organogenesis**

Reza Farzinebrahimi *et al.,* (2014) [25] studied about regeneration of *Jasminum sambac* (L.) Aiton Var. Maid of Orleans through direct and indirect organogenesis. In direct organogenesis they found 20 % shoot regeneration from young stems cultured in MS media supplemented with a combination of BAP and NAA. In indirect organogenesis, among different explants only young stems inoculated in MS media supplemented with 2,4-D yielded callus. Sabita Bhattacharya and Sanghamitra Bhattacharya (2010) [27] developed protocol for *in vitro* propagation of *Jasminum officinale* L by shoot regeneration from existing as well as newly developed adventitious axillary buds via proper phyto-hormonal stimulation. Layous (2004) [14] worked on time effect on bud proliferation elongation and root formation and obtained proper clones after acclimatization. He used Modified MS medium which gave best rooted plantlets.

Induction of average number of shoots (2.8 shoots/explants) was reported by U-Kong *et al.,* (2012) [33] when inoculated *J sambac* strain 1 on modified MS medium supplemented with combination of BA (4mg/L) and NAA (0.1 mg/l) and the callus production was observed in 18 days. Induction of average number of shoots (3.2 shoots/explants) when supplemented with kinetin 1 mg/L in combination with NAA (0.1 mg/L) and the callus production was observed in 26 days. Rajasekaran *et al.,* (2000) [24] conducted studies in *Jasminum sambac* (L.) Aiton to standardize the type of explants and level of plant growth regulator for callus production, shoot proliferation and elongation of rhizogenesis. Different explants were used to induce callus in MS medium supplemented with Benzyl adenine (BAP) and 1AA at different concentration and reached to a conclusion that leaf bit showed highest callus ability in MS medium supplemented with 1mg 1AA /L and 10mg BAP/L within 23 days and when compared to kinetin, among the Auxin tried, 3 mg NAA/L proved to be the best for rhizogenesis. Reza Farzinebrahimi *et al*., (2014) [25] observed the young stems of *J sambac* inoculated in MS medium supplemented with 2,4-D (0.5 g/L) developed callus. MS medium supplemented with 4.0 mg/L BA+0.1mg/L 2,4-D and 6.0mg/l BA+ 0.1 mg/L 2,4-D recorded highest percentage of callus induction whereas highest number of buds (10.1) was recorded in the combination 4.0 mg/L BA + 2.0 mg/L Kin from the inter-nodal explants of *J azoricum* (Salim, 2016) [28].

- **Rhizogenesis**

Experiments related to rhizogenesis with respect to *Jasminum spp* are very few. Sun, Y.N. *et al.,* (2009) [32] attempted rooting of *in vitro* propagated shoots. In his studies he conducted two step procedures for rooting in jasmine. In the first step micro shoots were cultured on half strength WPM medium supplemented with NAA (0.1 mg/L) for 7 days. In the second step the micro shoots were the transferred to half strength WPM medium without adding any growth regulator to obtain profuse rooting. *In-vitro* grown micro-shoots were isolated from *Jasminum sambac* by He *et al*., (2011) [11] and was immersed in 450 mg/L NAA solution for 10 minutes. Later the NAA treated micro-shoots were sub-cultured in half strength WPM medium for rooting. According to him better rooting could be achieved in *Jasminum sambac* by treating with NAA and hence NAA was considered as the most effective auxin in inducing roots. Cai *et al.,* (2007) [9] reported that rooting can be induced in *Jasminum sambac* by inoculation of micro-shoots in half strength MS medium devoid of sugar and supplemented with NAA (1.2 mg/L).

References

1. Ambasta SP. The useful plants of India. Publications and Information Directorate, CSIR, New Delhi, India, 1986, 301.
2. Anonymous. The Wealth of India. Raw materials, 5(H-K):279, Council for Scientific and Industrial Research, New Delhi, 1959.
3. Anonymous. Micro-propagation –definition from dictionary.com. Retrieved 2008.
4. Bhattacharjee SK. Native jasmine of India. Indian Perfumes. 1980; 24(3):126-133.
5. Bhattacharjee SK, Balakrishna M. Indian Perfumer, 27(1):36-42. Bhattacharjee, S.K. 1988, Punjab Horticulture Journal. 1983; 28(3&4):243-251.
6. Biswal M, Palai SK, Mishra P, Chhuria S, Sahu P. Callus induction and shoot proliferation of jasmine, *Jasminum*

sambac(L.) Aiton. International Journal of Current Research. 2016; 8(5):30164-30168
7. Bose TK, Mondal DP, Pramanik DK. Progressive Hort. 1973; 5:43-50.
8. Burns W. *Trans. Bot. Soc*. Edinburgh. 1953; 36:84-98.
9. Cai H, Chen X-Q, Xiong Z-M, Xie L-I, Zao L-J. Techniques of *in vitro* micro propagation and sugar-free rooting of jasmine (*Jasminum sambac*), Jiangsu Journal of Agricultural Sciences. 2007; 23(5):464-468.
10. Chadha YR. The wealth of India-raw materials series. Publications and Information Directorate, CSIR, New Delhi, India, 1976, 279.
11. He L, He J, Xia B, Meng X, Peng F, He S *et al*. *In vitro* propagation of *Jasminum sambac* L. Double Petals by axillary buds. Propagation of Ornamental Plants. 2011; 11(4):172-176
12. Indiresh KM, Mohan E, Lingaiah HB. Floriculture-Technology, Trades and Trends – Prakash, J. and Bhandary, K.R. (Eds.). Oxford and IBH Publishing Co., New Delhi. 1994, 148-151. 9
13. Jayapal R, Sambandamurthi S, Vedamuthu PGB. National Seminar on Production Technology of Commercial *Flower Crops*, Tamil Nadu Agricultural University, Coimbatore, 1980, 15-16.
14. Layous LN. Micro propagation of jasmine (*Jasminum azoricum* L) using tissue culture technique. 2004; 12(2): 295-308.
15. LI Bin. Effects of NAA on propagation of cape-jasmine *in vitro*, Journal of Gansu Agricultural University. 2000; 2:235-238.
16. Malik CP. Applications of biotechnology innovations in pharmaceutics and nutraceutics in multi therapeutic medicinal and special plants, edited by Karan Singh, M.L. Jahdon and D.Singh. Aavishkar publishers, Jaipur. 2007; 2:243-265.
17. Mukhopadhyay TP, Bose TK. Punjab Horticulture Journal. 1979; 19:98-101.
18. Nakasone HY, Bowers FA. Hawaii 'Fm. Sci. 1956; 5:1, 7.
19. Nambisan KMP, Krishnan BM. Nat. Seminar Prodn. Tech. Comm. Flower Crops. Tamil Nadu Agricultural University, Coimbatore, 1980, 19-20.
20. Pappiah CM, Muthuswami S. South Indian Horticulture. 1976; 24:30-32.
21. Pappiah CMS, Sambandamurthi, Jayapal R. National Seminar Production Technology of Commercial Flower Crops, Tamil Nadu Agricultural University, Coimbatore, 1980, 21-24
22. Paulas D. National Seminar on Production Technology of Commercial Flower Crops, Tamil Nadu Agricultural University, Coimbatore, 1980, 17-18.
23. Polikarpova FYA, Tyrina MM, Prokhorova TB. Shorn. Nauch. Rabot. Plodo. Yagodo, Necher. Polosy, Vol III, Moscow, 1971, 242-6,
24. Rajasekaran Haripriya V, Armugam A, Shakila. Micro-propagation studies in Jasmine plants (*Jasminum Sambac* Ait.), Species and aromatic plants, challenges and opportunities, in the new century. Contributory papers, Centennial conference on species and aromatic, Calicut, Kerala, 2000, 20-23:47-49.
25. Reza Farzinebrahimi, Kamaludin Rashid, Rosna Mat Taha, Khairul Anwar Ishak, Callogenesis and Plant Regeneration of *Jasminum sambac* L. (Jasmine). Paper presented in International Conference on Biological, Environment and Food Engineering, 2014, 4-5. Bali (Indonesia).
26. Sabita Bhattacharya, Sanghamitra Bhattacharya. Rapid multiplication of *Jasminum officinale* L. by *in vitro* culture of nodal explants. Plant Cell, Tissue and Organ Culture. 1997; 51:57-60
27. Sabita Bhattacharya, Sanghamitra Bhattacharya. *In vitro* propagation of *Jasminum officinale* L: A Woody Ornamental Vine Yielding Aromatic Oil from Flowers. Protocols for *In vitro* propagation of Ornamental Plants Methods in Molecular Biology, 2010, 589-593.
28. Salim SAA. Effect of plant growth regulators BA, 2,4-D, IBA and Kin on in-vitro propagation of white jasmine (*Jasminum azoricum* L.). Journal of Babylon University/ Pure and Applied Sciences. 2016; 24(3):795-802.
29. Siddique MA. Indian Journal of Horticulture. 1973; 30:440-443.
30. Singh SP. South Indian Horticulture. 1979; 27:68-69.
31. Singh SP, Motial VS. Haryana Journal of Horticulture Science. 1981; 10:54-57
32. Sun YN, Tang FP, Fang WM, Tan GH. Rapid propagation *In-vitro* of jasmine. Acta Agriculturae Zhejiangensis. 2009; 21:390-394.
33. U-Kong W, Wongsawad, P, Buddhark P. Shoot bud and young leaf induction of *Jasminum spp* in in vitro culture, International Journal of Applied Agricultural Research. 2012; 7(1):17-26
34. Veluswamy P, Muthuswami S, Thangaraj T. A study on germination of seeds of some *Jasminum species* and clones, South Indian Hort. 1974; 22:127-128.
35. Veluswamy P, Thangaraj T, Muthuswamy S. A study on germination of seeds of some *Jasminum species* and clones. South Indian Hort. 1975; 23:71-72.
36. Veluswamy P, Muthuswami S, Thangaraj T. A study on germination of seeds of some *Jasminum species* and clones. *South Indian Hort*. 1977; 25:20-25.
37. Veluswamy P, Viiayakumar M, Muthuswami S. Grafting in Jasmines. South Indian Hort. 1980; 28:156-7.