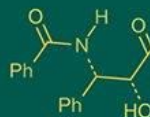


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Influence of time of pruning, bahar treatment followed by chemical defoliation on *Jasminum sambac* (L.)

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Abstract

The present investigation entitled Influence of time of pruning, bahar treatment followed by chemical defoliation in *Jasminum sambac* (L.) was carried out at Floriculture block, Dr. YSRHU- College of Horticulture, Anantharajupeta in the existing 8-year-old Jasmine crop during 2023-24. Pruning was done at a uniform height of 45 cm above ground level in two different months M₁ (December 2023), and M₂ (January 2024). Different defoliant used were C₁ (KNO₃ @ 5%), C₂ (NaCl @ 1%) C₃ (Paraquat dichloride @ 1000 ppm), C₄ (Ethephon @ 1440 ppm), C₅ (Manual defoliation). All the treatments were applied 2 times i.e., December 2023 and January 2024. This study was carried out to identify the right time of treatment application and the best defoliant chemical.

Keywords: Jasmine, pruning, defoliation, Paraquat, ethephon

Introduction

Jasminum sambac is one of the traditional flowers of India, commonly known as Arabian jasmine, Tuscan jasmine, Gundu mulligan, Mogra, etc. (Navya *et al.*, 2024) [14]. It belongs to the family Oleaceae. It is used in floral decorations, religious festivals, cosmetics, perfumes, oils, attars, etc. Its unique scent is due to the presence of synthetic aroma chemicals or natural isolates, hence it is considered as the queen of fragrance. In South India, jasmine flowers are widely used by women to decorate their hair, benefiting from the region's plentiful supply of these fragrant blossoms. The flowers grow in clusters called cymes. Arabian jasmine blooms continuously throughout the year, especially in tropical and subtropical regions. However, its peak blooming season occurs during the warmer months of late spring, summer and early autumn.

Jasmine flowers from both terminal and axillary buds, which means boosting its yield is linked to an increase in the number of branches (Kalimanai *et al.*, 2017) [8]. Pruning is an essential method for revitalizing older plants. By selectively removing excess or undesirable shoots, it not only helps in shaping the plant's growth pattern but also improves energy efficiency (Lokhande *et al.*, 2015) [9]. This process encourages the development of new, robust shoots that yield more flowers than older ones. Eliminating weak, aging or overcrowded branches allows healthier and more productive shoots to emerge, enabling the jasmine plant to focus its energy on producing more blooms. In addition to increasing flower yield, pruning supports the plant's overall health and Vigor, ensuring consistent flowering year after year.

Defoliation plays a significant role in determining the quality and quantity of harvested buds. However, despite its benefits, manual defoliation is labor-intensive and time-consuming (Chiamolera *et al.*, 2023) [5]. Using chemical defoliant can be a more efficient alternative. These substances or mixtures promote leaf shedding, which aids in harvesting and improves the quality of the crop. Common chemical defoliant include Potassium nitrate, Sodium chloride, Paraquat dichloride, Ethephon, Tribufos and Thidiazuron. Due to rising labor costs and shortages, it is important to select defoliant that are effective at low concentrations, safe for both plants and the environment and leave no harmful chemical residues.

Material and Methods

The experiment was carried out at Floriculture block, Dr. Y.S.R. Horticultural University, College of Horticulture, Anantharajupeta during 2023-24.

The existing Jasmine plants are 8 years old. The experiment was laid out in two factorial randomized block design with 10 treatments in 3 replications. T₁: Pruning+ Bahar treatment + NaCl @ 1% (December), T₂: Pruning+ Bahar treatment + KNO₃ @ 5% (December), T₃: Pruning+ Bahar treatment + Paraquat dichloride @ 1000 ppm (December), T₄: Pruning+ Bahar treatment + Ethephon @ 1440 ppm (December), T₅: Pruning+ Bahar treatment + Manual defoliation (December), T₆: Pruning+ Bahar treatment + NaCl @ 1% (January), T₇: Pruning+ Bahar treatment + KNO₃ @ 5% (January), T₈: Pruning+ Bahar treatment + Paraquat dichloride @ 1000 ppm (January), T₉: Pruning+ Bahar treatment + Ethephon @ 1440 ppm (January), T₁₀: Pruning+ Bahar treatment + Manual defoliation (January). Pruning was done to a height of 45cm above ground level in all the plants. Basins were made around the plants by digging 15-20 cm of soil and exposing the roots partially to impose stress in accordance with the treatments planned during December, 2023 and January, 2024. Observations were recorded for three plants per each treatment. The collected data was statistically analysed to determine the mean values of the following characteristics i.e., days taken for complete defoliation, leaf area (cm²), canopy spread (m²), stomatal conductance (m mol H₂O m⁻² s⁻¹), transpiration rate (m mol H₂O m⁻² s⁻¹), shelf life of flower (hours), Blooming period (days).

Results and Discussion

Days taken for defoliation

Early defoliation (7.33) days was observed in C₃ (Paraquat dichloride @ 1000 ppm), M₁ (Treatment application in December) 9.96 days, and M₁C₃ (Pruning + Bahar treatment followed by application of Paraquat dichloride @ 1000 ppm in January) 6.89 days, significantly superior to other treatments. More days were taken in C₁ (KNO₃ @ 5%) 16.28 days, M₂ (Treatment application in January) 11.67 days, M₂C₄ (Pruning + Bahar treatment followed by application of Ethephon @ 1440 ppm in January) 18.89 days (Table 1). Paraquat dichloride acts swiftly due to its redox characteristics (Michaelis *et al.*, 1933) [11]. It disrupts plant photosynthesis, leading to plant tissue burning when exposed to light, which causes defoliation (Aguiar *et al.*, 2023) [1]. Similar results were reported by Chaitanya *et al.* (2016) [4].

Table 1: Days taken for defoliation and new flush initiation as influenced by time of pruning, bahar treatment followed by chemical defoliation in *Jasminum sambac*.

Days taken for defoliation			
	M1	M2	Mean
C1	17.00	15.56	16.28
C2	14.78	15.11	14.94
C3	6.89	7.78	7.33
C4	10.11	18.89	14.50
C5	1.00	1.00	1.00
Mean	9.96	11.67	
	M	C	M*C
SE (m)	0.367	0.58	0.821
C.D.	1.099	1.738	2.458

Leaf area (cm²)

Maximum leaf area was recorded in C₃ (Paraquat dichloride @ 1000 ppm) 45.69, 48.38 and 49.33 cm², M₁ (Treatment application in December) 41.35, 45.03 and 46.35 cm², M₁C₃ (Pruning + Bahar treatment followed by application of

Paraquat dichloride @ 1000 ppm in January) 46.45, 51.13 and 51.97 cm² at 30, 60 and 90 days after treatment application respectively (Table 2). The observed results might be attributed to enhanced light penetration and improved canopy structure following pruning. This alteration affects the chlorophyll content in leaves, thereby influencing their photosynthetic capacity. Similar outcomes were documented by Selvaniyagam *et al.* (2022) [16] in roses and Hossain *et al.* (2007) [6] in Bougainvillea.

Table 2: Leaf area (cm²) as influenced by time of pruning, bahar treatment followed by chemical defoliation in *Jasminum sambac*.

	30			60			90		
	M1	M2	Mean	M1	M2	Mean	M1	M2	Mean
C1	40.48	37.48	38.98	46.49	39.19	42.84	49.51	40.18	44.84
C2	37.19	33.38	35.29	40.23	36.02	38.12	41.05	38.71	39.88
C3	46.45	44.92	45.69	51.13	45.64	48.38	51.97	46.70	49.33
C4	39.44	34.94	37.19	42.18	37.65	39.91	43.29	38.66	40.98
C5	43.17	37.61	40.39	45.11	35.45	40.28	45.92	36.53	41.22
Mean	41.35	37.67		45.03	38.79		46.35	40.15	
	M	C	M*C	M	C	M*C	M	C	M*C
SE (m)	0.98	1.55	2.19	0.531	0.839	1.187	0.46	0.727	1.029
C.D.	2.94	4.65	N/A	1.59	2.513	3.554	1.378	2.178	3.08

Canopy spread (m²)

Maximum Canopy spread was recorded in C₃ (Paraquat dichloride @ 1000 ppm) 0.42, 0.61 and 0.64, M₁ (Treatment application in December) 0.35, 0.49 and 0.52, M₁C₃ (Pruning + Bahar treatment followed by application of Paraquat dichloride @ 1000 ppm in January) 0.47, 0.67 and 0.71 at 30, 60 and 90 days after treatment application respectively (Table 3). The timing of pruning significantly influences plant growth. The observed results can be attributed to favorable climatic conditions. Enhanced light intensity, better aeration and sap flow towards lateral buds contributed to increased plant spread in both north-south and east-west directions. Ratikanth *et al.* (2005) [15] and Makwana *et al.* (2024) [10] reported similar findings in *Jasminum sambac*.

Table 3: Canopy spread (m²) as influenced by time of pruning, bahar treatment followed by chemical defoliation in *Jasminum sambac*.

	30			60			90		
	M1	M2	Mean	M1	M2	Mean	M1	M2	Mean
C1	0.40	0.34	0.37	0.53	0.52	0.53	0.56	0.53	0.55
C2	0.25	0.32	0.29	0.48	0.32	0.40	0.46	0.48	0.47
C3	0.47	0.37	0.42	0.67	0.54	0.61	0.71	0.57	0.64
C4	0.28	0.19	0.23	0.29	0.37	0.33	0.38	0.35	0.37
C5	0.34	0.28	0.31	0.49	0.41	0.45	0.49	0.48	0.48
Mean	0.35	0.30		0.49	0.43		0.52	0.48	
	M	C	M*C	M	C	M*C	M	C	M*C
SE (m)	0.02	0.03	0.04	0.02	0.03	0.04	0.01	0.02	0.03
C.D.	0.05	0.07	N/A	0.05	0.08	0.12	0.04	0.06	0.09

Stomatal conductance (m mol H₂O m⁻² s⁻¹)

Maximum stomatal conductance was observed in C₃ (Paraquat dichloride @ 1000 ppm) 0.17, 0.19 and 0.20, M₁ (Treatment application in December) 0.15, 0.17, 0.19, M₁C₃ (Pruning + Bahar treatment followed by application of Paraquat dichloride @ 1000 ppm in January) 0.18, 0.20 and 0.20 at 30, 60 and 90 days after treatment application respectively (Table 4). Newly emerged leaves following defoliation are typically young, tender, and actively growing. These leaves generally exhibit higher stomatal

density and increased stomatal activity. Sharma *et al.* (2004) [17] observed similar results in Peach.

Table 4: Stomatal conductance as influenced by time of pruning, bahar treatment followed by chemical defoliation in *Jasminum sambac*.

	30			60			90		
	M1	M2	Mean	M1	M2	Mean	M1	M2	Mean
C1	0.14	0.15	0.15	0.17	0.18	0.17	0.18	0.19	0.19
C2	0.15	0.15	0.15	0.18	0.15	0.16	0.20	0.17	0.18
C3	0.18	0.17	0.17	0.20	0.18	0.19	0.20	0.19	0.20
C4	0.15	0.13	0.14	0.17	0.13	0.15	0.17	0.16	0.16
C5	0.13	0.16	0.14	0.16	0.17	0.17	0.19	0.18	0.18
Mean	0.15	0.15		0.17	0.16		0.19	0.18	
	M	C	M*C	M	C	M*C	M	C	M*C
SE (m)	0.003	0.005	0.007	0.004	0.006	0.008	0.005	0.007	0.01
C.D.	N/A	0.014	0.02	0.011	0.017	0.024	0.014	0.022	N/A

Transpiration rate ($\text{m mol H}_2\text{O m}^{-2} \text{ s}^{-1}$)

The maximum rate of transpiration was recorded in C₃ (Paraquat dichloride @ 1000 ppm) 3.17, 3.54 and 3.68, M₁ (Treatment application in December) 2.93, 3.20 and 3.44, M₁C₃ (Pruning + Bahar treatment followed by application of Paraquat dichloride @ 1000 ppm in January) 3.27, 3.68 and 3.71 at 30, 60 and 90 days after treatment application respectively (Table 5). The rate of transpiration rises in direct relation to leaf stomatal conductance. These findings align with the research conducted by Islam *et al.* (2014) [7] and Bernacchi *et al.* (2007) [3] on Soybean.

Table 5: Transpiration rate as influenced by time of pruning, bahar treatment followed by chemical defoliation in *Jasminum sambac*.

	30			60			90		
	M1	M2	Mean	M1	M2	Mean	M1	M2	Mean
C1	3.16	2.94	3.05	3.31	3.20	3.26	3.53	3.39	3.46
C2	2.60	3.05	2.82	2.95	3.09	3.02	3.13	3.35	3.24
C3	3.27	3.07	3.17	3.68	3.41	3.54	3.71	3.65	3.68
C4	2.78	2.73	2.76	3.02	2.89	2.95	3.41	2.95	3.18
C5	2.85	2.84	2.84	3.06	3.13	3.09	3.42	3.41	3.42
Mean	2.93	2.92		3.20	3.14		3.44	3.35	
	M	C	M*C	M	C	M*C	M	C	M*C
SE (m)	0.04	0.07	0.10	0.02	0.03	0.05	0.03	0.05	0.07
C.D.	N/A	0.21	0.29	0.06	0.10	0.14	0.09	0.14	0.20

Shelf life of Flower

Maximum shelf life was recorded in C₃ (Paraquat dichloride @ 1000 ppm) 32.04 hours, M₁ (Treatment application in December) 28.12 hours, M₁C₃ (Pruning + Bahar treatment followed by application of Paraquat dichloride @ 1000 ppm in January) 32.71 hours. Similar findings were reported by Naik *et al.* (2019) [13] in *Jasminum sambac* L.

Blooming period

Maximum Blooming period was recorded in C₃ (Paraquat dichloride @ 1000 ppm) 142.61 days, M₁ (Treatment application in December) 135.60 days, M₁C₃ (Pruning + Bahar treatment followed by application of Paraquat dichloride @ 1000 ppm in January) 147.22 days at 30, 60 and 90 days after treatment application respectively. The variation in flowering duration can be linked to the higher maximum and minimum temperatures and the shorter days from December to March. Flowering stopped in July, likely due to increased temperatures and longer daylight hours. Nair *et al.* (2009) [12] and Chaitanya *et al.* (2016) [4] observed similar results in *Jasminum sambac*.

Table 6: Shelf life and blooming period as influenced by time of pruning, bahar treatment followed by chemical defoliation in *Jasminum sambac*.

	Shelf life of the flower			Blooming period		
	M1	M2	Mean	M1	M2	Mean
C1	30.81	27.33	29.07	141.67	125.44	133.56
C2	28.09	27.05	27.57	127.67	122.78	125.22
C3	32.71	31.37	32.04	147.22	138.00	142.61
C4	24.17	22.77	23.47	125.22	108.56	116.89
C5	24.82	23.47	24.14	136.22	127.11	131.67
Mean	28.12	26.40		135.60	124.38	
	M	C	M*C	M	C	M*C
SE (m)	0.22	0.35	0.50	0.82	1.29	1.83
C.D.	0.67	1.06	N/A	2.45	3.88	5.48

Conclusion

The present study showed that pruning, bahar treatment followed by Paraquat dichloride @ 1000 ppm as a defoliant in the month of December has shown quick defoliation, maximum leaf area, canopy, transpiration, stomatal conductance, shelf life of flower and blooming period in *Jasminum sambac*.

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