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Yield and economic analysis of off-season flower induction in G. I. tagged Mysuru Jasmine (*Jasminum sambac*) as influenced by pruning month, growth regulators and regular application of fertilizers

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Abstract
An experiment was conducted on *Jasminum sambac* cv. Mysuru Mallige to study the influence of pruning month, foliar application of growth regulators and regular application of fertilizers on yield and economic analysis of off-season flower production in G. I. tagged Mysuru Jasmine. The design used for the experiment was FRCBD with three replications and three factors: pruning month, growth regulators and fertilizers application. The results of this experiment envisaged that plants pruned during September month with foliar spray of nitrobenzene at 3 ml/l and split application of fertilizers at alternative month recorded highest BC ratio (₹ 3.04 ± 0.08:1) with the gross returns of ₹ 16,52,550 ± 41,224 and net returns of ₹ 11,07,452 ± 41,224 in both the season.

Keywords: Mysuru Mallige, geographical indication, economics, B: C ratio

Introduction
Jasmine (*Jasminum spp*.) is one of the most fragrant flowering plants belongs to the family Oleaceae. Jasmine flowers have a great economic value in India and mainly used as loose flower for making garland and essential oil extraction. Although more than 200 species are known under the genus *Jasminum*, 40 species have been identified in India and four species namely *J. grandiflorum*, *J. auriculatum*, *J. sambac* and *J. multiforum* are commercially cultivated.

Among the commercial species of jasmine, *Jasminum sambac* Ait. commonly known as Arabian jasmine, Tuscan jasmine, Mogra and Bela. There have several cultivars like Motia, Double Mogra, Single Mogra, Gundu Mallige, Bela, Khoya, Madanbana, Ramabana and Mysuru Mallige. Among these cultivars, Mysuru Mallige (Mysuru Jasmine) being associated with the city of Mysuru, patronized by the wodeyar of the kingdom of Mysuru because of its sweet fragrance. The Mysuru Jasmine has got Geographical Indication status tag (GI under Registration of Protection Act 1999) under agriculture commodity (69th G.I. Product of India) by Govt. of India during 2007-08 for its unique fragrance and flowering characters and commercially cultivated in Mysore and Mandya regions of Karnataka.

Low winter temperature cause ultra-structural cellular changes in the flowers and reduces the growth and yield of the flower (Su *et al.*, 2001) [9]. Hence, flowering in Mysuru Mallige is restricted to summer months only. However, there is lot of demands for the flowers in other seasons in which most of the festivals fall in. The flower production is reduced during cooler months, leading to hike in price during September to February which is almost ten times higher than the remaining part of the year that can be termed as "off season" in jasmine cultivation (Krishnamoorthy, 2014) [3]. Flowering habit in Mysuru Mallige is terminal and axillary. So, increasing the number of shoots would increase the yield, for which pruning is essential. Early flower initiation in early pruning may be attributed to the early start of new vegetative growth along with higher number of leaves per shoot and leaf area, which eventually initiate the flowers during off season (Adhikari and Kandel, 2015) [1]. Plant growth regulators are organic or chemical compounds, which are applied at smaller concentration to promote, inhibit, or otherwise modify any physiological plant process (Mondal *et al*., 2017) [4]. Various growth regulators like Gibberlic acid, Nitrobenzene, Cycocel and Paclobutrazol have a great role in induction of off-season flowering in jasmine since this compound helps for

enhancing the rate of plant growth, stem elongation, induction of secondary branches, cell division and cell elongation and also hastens the flowering period, quality of flower along with flower yield. Among the various factors responsible for high crop yield, supply of appropriate quantity of nutrients at appropriate time plays a vital role in enhancing the quality, productivity and flowering period in jasmine since it is a nutrient loving crop. Hence, split application of major fertilizers like Nitrogen, Phosphorus and Potash (NPK) will meet the specific nutrient requirement of the crop at a specific period helps to initiate the flowering both in on-season as well as off-season (Rao and Sushma, 2016) [7].

Keeping these points in view, the present investigation was carried out to study influence of pruning month, foliar application of growth regulators and regular application of fertilizers on yield and economic analysis of off-season flower production in G. I. tagged Mysuru Jasmine

Material and Method:

The experiment was conducted at college of Horticulture, Mysuru, Karnataka. The soil of the experimental farm was red sandy loam with almost uniform fertility having a pH range of 6.0-6.5. The experimental field is located at the latitude and longitude of 12.2958° North and 76.6394° East, respectively at an altitude of 763 meters above the mean sea level. The maximum and minimum temperatures of the station during the experimental period were 33.80 °C and 16.40 °C, respectively.

Three year old *Jasminum sambac* cv. Mysuru Mallige plants were selected for the experiment and treatment were imposed by adopting different pruning months, different concentration of growth regulators and split application of fertilizers.

The experiment was laid out in Factorial Randomized Block Design with 3 replications and 3 factors *Viz.*, pruning month, foliar spray of growth regulators and fertilizers application interval. The treatments details are presented in table 1.

Pruning was done at the level of 30 cm above the ground using pruning shears. Pruning was done according to the treatments in the month of August, November and January respectively. The plant growth regulators (Gibberlic acid and Nitrobenzene) were sprayed 15 days after pruning according to the treatment. The sprays were given during early morning hours with a hand pressure sprayer. A wetting agent was added as a sticker to the spray solution at one ml per liter of solution. Care was taken to prevent drifting of the spray to other plants by using polythene sheet around the plant. Approximate volume of spray to each plant at a time was 100 ml. Well decomposed Farm yard manure (FYM) was applied at the rate of 10 kg per plant. The manure and fertilizers were applied at 15 cm depth in rings and 30 cm away from the main stem. The plants were supplied with 60g of nitrogen, 120 g of phosphorus and 120 g of potassium per plant according to the different treatments.

Observations like on season flower yield, off-season flower yield, Total cost of production, Net returns and BC ratio were calculated from randomly tagged 5 plants in each replication. The data collected were subjected to statistical analysis as per Panse and Sukhatme (1978) [5].

Table 1: Treatment details

Treatment No.	Treatment combination	Treatment details
1	$P_1G_1F_1$	September month pruning + GA_3 at 10ppm + Split application of RDF at twice in a year
2	$P_1G_2F_1$	September month pruning + GA_3 at 20ppm + Split application of RDF at twice in a year
3	$P_1G_3F_1$	September month pruning + GA_3 at 30ppm + Split application of RDF at twice in a year
4	$P_1G_4F_1$	September month pruning + Nitrobenzene at 2 ml /lt + Split application of RDF at twice in a year
5	$P_1G_5F_1$	September month pruning + Nitrobenzene at 2.5ml /lt + Split application of RDF at twice in a year
6	$P_1G_6F_1$	September month pruning + Nitrobenzene at 3 ml /lt + Split application of RDF at twice in a year
7	$P_1G_7F_1$	September month pruning + Water spray + Split application of RDF at twice in a year
8	$P_1G_1F_2$	September month pruning + GA_3 at 10ppm + Split application of RDF at alternative month
9	$P_1G_2F_2$	September month pruning + GA_3 at 20ppm + Split application of RDF at alternative month
10	$P_1G_3F_2$	September month pruning + GA_3 at 30ppm + Split application of RDF at alternative month
11	$P_1G_4F_2$	September month pruning + Nitrobenzene at 2ml /lt + Split application of RDF at alternative month
12	$P_1G_5F_2$	September month pruning + Nitrobenzene at 2.5ml /lt + Split application of RDF at alternative month
13	$P_1G_6F_2$	September month pruning + Nitrobenzene at 3 ml /lt + Split application of RDF at alternative month
14	$P_1G_7F_2$	September month pruning + Water spray + Split application of RDF at alternative month
15	$P_2G_1F_1$	November month pruning + GA_3 at 10ppm + Split application of RDF at twice in a year
16	$P_2G_2F_1$	November month pruning + GA_3 at 20ppm + Split application of RDF at twice in a year
17	$P_2G_3F_1$	November month pruning + GA_3 at 30ppm + Split application of RDF at twice in a year
18	$P_2G_4F_1$	November month pruning + Nitrobenzene at 2 ml /lt + Split application of RDF at twice in a year
19	$P_2G_5F_1$	November month pruning + Nitrobenzene at 2.5ml /lt + Split application of RDF at twice in a year
20	$P_2G_6F_1$	November month pruning + Nitrobenzene at 3 ml /lt + Split application of RDF at twice in a year
21	$P_2G_7F_1$	November month pruning + Water spray + Split application of RDF at twice in a year
22	$P_2G_1F_2$	November month pruning + GA_3 at 10ppm + Split application of RDF at alternative month
23	$P_2G_2F_2$	November month pruning + GA_3 at 20ppm + Split application of RDF at alternative month
24	$P_2G_3F_2$	November month pruning + GA_3 at 30ppm + Split application of RDF at alternative month
25	$P_2G_4F_2$	November month pruning + Nitrobenzene at 2 ml /lt + Split application of RDF at alternative month
26	$P_2G_5F_2$	November month pruning + Nitrobenzene at 2.5ml /lt + Split application of RDF at alternative month
27	$P_2G_6F_2$	November month pruning + Nitrobenzene at 3 ml /lt + Split application of RDF at alternative month
28	$P_2G_7F_2$	November month pruning + Water spray + Split application of RDF at alternative month
29	$P_3G_1F_1$	January month pruning + GA_3 at 10ppm+ Split application of RDF at twice in a year
30	$P_3G_2F_1$	January month pruning + GA_3 at 20ppm+ Split application of RDF at twice in a year
31	$P_3G_3F_1$	January month pruning + GA_3 at 30ppm+ Split application of RDF at twice in a year
32	$P_3G_4F_1$	January month pruning + Nitrobenzene at 2 ml /lt + Split application of RDF at twice in a year
33	$P_3G_5F_1$	January month pruning + Nitrobenzene at 2.5ml /lt + Split application of RDF at twice in a year
34	$P_3G_6F_1$	January month pruning + Nitrobenzene at 3 ml /lt + Split application of RDF at twice in a year

35	$P_3G_7F_1$	January month pruning + Water spray + Split application of RDF at twice in a year
36	$P_3G_1F_2$	January month pruning + GA_3 at 10ppm + Split application of RDF at alternative month
37	$P_3G_2F_2$	January month pruning + GA_3 at 20ppm + Split application of RDF at alternative month
38	$P_3G_3F_2$	January month pruning + GA_3 at 30ppm + Split application of RDF at alternative month
39	$P_3G_4F_2$	January month pruning + Nitrobenzene at 2 ml /lt + Split application of RDF at alternative month
40	$P_3G_5F_2$	January month pruning + Nitrobenzene at 2.5ml /lt + Split application of RDF at alternative month
41	$P_3G_6F_2$	January month pruning + Nitrobenzene at 3 ml /lt + Split application of RDF at alternative month
42	$P_3G_7F_2$	January month pruning + Water spray + Split application of RDF at alternative month

Results and Discussion

Significant differences were observed with respect to off-season flower yield. $P_1G_6F_2$ interaction (plants pruned during September with foliar spay of nitrobenzene at 3ml/l and split application of RDF at alternative month) was recorded significantly maximum off-season yield per ha (3.61 t during 2019-20 and 3.80 t during 2020-21) followed by $P_1G_5F_2$ (3.52 t during 2019-20 and 3.65 t during 2020-21) and minimum off- season yield per ha (0.87 t during 2019-20 and 0.94 t during 2020-21) was recorded in plants pruned during November and without spray of any growth regulators along with application of RDF at twice in a year ($P_2G_7F_1$). The pooled data revealed that, maximum off-season yield per ha (3.71 ± 0.13 t) was recorded in plants pruned during September along with foliar spray of 3ml/l nitrobenzene and split application of RDF at alternative month ($P_1G_6F_2$) and minimum off-season yield per ha was recorded in $P_2G_7F_1$ (0.91 ± 0.05 t).

Plants pruned during January foliar spray of 3ml/l nitrobenzene along with split application of RDF at alternative month ($P_3G_6F_2$) recorded maximum on- season flower yield per ha (8.90 t during 2019-20 and 9.16 t during 2020-21) followed by $P_3G_5F_2$ (8.81 t during 2019-20 and 8.87 t during 2020-21). Minimum on-season flower yield per ha (5.33 t during 2019-20 and 5.45 t during 2020-21) was recorded in plants pruned during November and without spray of any growth regulators along with application of RDF at twice in a year ($P_2G_7F_1$). In pooled mean, maximum on-season flower yield per ha (9.03 ± 0.18 t) was recorded in plants pruned during January along with foliar spray of 3ml/l nitrobenzene and split application of RDF at alternative month ($P_3G_6F_2$) and minimum on-season flower yield per ha (5.39 ± 0.08 t) was recorded in $P_2G_7F_1$.

Highest BC ratio (₹ 2.98:1 in 2019-20 and ₹ 3.09:1 in 2020-21) was obtained in $P_1G_6F_2$ (plants pruned during September with foliar spay of nitrobenzene at 3ml/l and split application of RDF at an alternative month) with the gross returns of ₹ 16,23,400 during 2019-20 and ₹ 16,81,700 during 2020-21. Net returns of ₹ 10,78,302 during 2019-20 and ₹ 11,36,602 during 2020-21 was recorded in same treatment ($P_1G_6F_2$). Lowest BC ratio (1.45:1 in 2019-20 1.48:1 in 2020-21) was obtained in $P_3G_7F_1$. In pooled mean of cost economics indicated that, highest BC ratio (₹ 3.04 ± 0.08:1) was obtained in $P_1G_6F_2$ (Plants pruned during September with foliar spray of nitrobenzene at 3ml/l and split application of RDF at alternative month) with the gross returns of ₹ 16,52,550 ± 41,224 and net returns of ₹ 11,07,452 ± 41,224. Lowest BC ratio 1.47 ± 0.02 was obtained in $P_3G_7F_1$ with the gross returns of ₹ 5,76,900 ± 7,637 and net returns of ₹ 1,82,400 ± 7,637.

From the present study, it was found that off-season flower yield and benefit-cost ratio was maximum in the plant pruned during September with foliar spay of nitrobenzene at 3ml/l and split application of RDF at an alternative month. This might be due to due to the accelerated mobility of photosynthetic from the source to the sink as influenced by growth hormone released or synthesized due to higher plant growth. Nitrobenzene can be used as spray or in granular form, which increases flower farming substances by balancing auxin, cytokinin, gibberellic acid and ethylene ratio favourably thereby increasing flowers by more than 40 to 45% and yield (Chowdhury *et al.*, 2018 in boro rice) [2]. Split fertilizer applications can play a role in nutrient management strategy that is productive and profitable. Dividing total fertilizers application into two or more applications can enhance nutrient efficiency, improve yields and mitigate nutrient loss (Yang *et al.*, 2011 [10] in cotton). Higher flower yield and higher market price during off-season which resulted in higher benefit cost ratio (Krishnamoorthy, 2014 in *Jasminum sambac*) [3].

Table 2: Cost of cultivation of off-season flower induction of *Jasminum sambac* cv. Mysuru Mallige as influenced by pruning month, growth regulators and split application of fertilizers

Treatments	Land preparation cost	Planting material cost (20 Rs. /plant)	Pit making and planting	Farm yard manure cost (20kg/plant/year)	Inter cultural operation	Treatment imposing cost	Plant protection cost	Harvest and transportation cost	Total cost of production (Rs.)
$P_1G_1F_1$	6,500	88,880	5,000	90,000	20,000	2,00,585	25,000	53,000	4,88,885
$P_1G_2F_1$	6,500	88,880	5,000	90,000	20,000	2,02,700	25,000	53,000	4,90,200
$P_1G_3F_1$	6,500	88,880	5,000	90,000	20,000	2,07,290	25,000	59,000	5,01,590
$P_1G_4F_1$	6,500	88,880	5,000	90,000	20,000	2,15,500	25,000	65,000	5,15,800
$P_1G_5F_1$	6,500	88,880	5,000	90,000	20,000	2,20,465	25,000	65,000	5,20,765
$P_1G_6F_1$	6,500	88,880	5,000	90,000	20,000	2,22,940	25,000	65,000	5,23,240
$P_1G_7F_1$	6,500	88,880	5,000	90,000	20,000	1,42,856	25,000	47,000	4,25,156
$P_1G_1F_2$	6,500	88,880	5,000	90,000	20,000	2,06,425	25,000	65,000	5,06,725
$P_1G_2F_2$	6,500	88,880	5,000	90,000	20,000	2,12,900	25,000	65,000	5,13,200
$P_1G_3F_2$	6,500	88,880	5,000	90,000	20,000	2,13,303	25,000	72,000	5,20,603
$P_1G_4F_2$	6,500	88,880	5,000	90,000	20,000	2,18,950	25,000	77,000	5,31,250
$P_1G_5F_2$	6,500	88,880	5,000	90,000	20,000	2,30,270	25,000	77,000	5,42,570
$P_1G_6F_2$	6,500	88,880	5,000	90,000	20,000	2,38,143	25,000	77,000	5,50,443
$P_1G_7F_2$	6,500	88,880	5,000	90,000	20,000	1,49,201	25,000	59,000	4,43,501
$P_2G_1F_1$	6,500	88,880	5,000	90,000	20,000	2,01,675	25,000	53,000	4,89,975

$P_2G_2F_1$	6,500	88,880	5,000	90,000	20,000	2,06,715	25,000	53,000	4,95,015
$P_2G_3F_1$	6,500	88,880	5,000	90,000	20,000	2,10,383	25,000	55,000	5,00,683
$P_2G_4F_1$	6,500	88,880	5,000	90,000	20,000	2,14,223	25,000	59,000	5,08,523
$P_2G_5F_1$	6,500	88,880	5,000	90,000	20,000	2,20,951	25,000	59,000	5,15,251
$P_2G_6F_1$	6,500	88,880	5,000	90,000	20,000	2,22,854	25,000	65,000	5,23,154
$P_2G_7F_1$	6,500	88,880	5,000	90,000	20,000	1,82,362	25,000	47,000	4,64,662
$P_2G_1F_2$	6,500	88,880	5,000	90,000	20,000	2,03,425	25,000	59,000	4,97,725
$P_2G_2F_2$	6,500	88,880	5,000	90,000	20,000	2,08,730	25,000	59,000	5,03,030
$P_2G_3F_2$	6,500	88,880	5,000	90,000	20,000	2,13,625	25,000	59,000	5,07,925
$P_2G_4F_2$	6,500	88,880	5,000	90,000	20,000	2,19,550	25,000	61,000	5,14,850
$P_2G_5F_2$	6,500	88,880	5,000	90,000	20,000	2,20,591	25,000	61,000	5,16,891
$P_2G_6F_2$	6,500	88,880	5,000	90,000	20,000	2,23,805	25,000	72,000	5,31,105
$P_2G_7F_2$	6,500	88,880	5,000	90,000	20,000	1,97,290	25,000	47,000	4,79,590
$P_3G_1F_1$	6,500	88,880	5,000	90,000	20,000	1,19,152	25,000	47,000	4,01,452
$P_3G_2F_1$	6,500	88,880	5,000	90,000	20,000	1,20,325	25,000	47,000	4,02,625
$P_3G_3F_1$	6,500	88,880	5,000	90,000	20,000	1,22,595	25,000	48,000	4,05,895
$P_3G_4F_1$	6,500	88,880	5,000	90,000	20,000	1,24,985	25,000	50,000	4,10,285
$P_3G_5F_1$	6,500	88,880	5,000	90,000	20,000	1,27,594	25,000	53,000	4,15,894
$P_3G_6F_1$	6,500	88,880	5,000	90,000	20,000	1,31,545	25,000	53,000	4,19,845
$P_3G_7F_1$	6,500	88,880	5,000	90,000	20,000	1,14,250	25,000	47,000	3,96,550
$P_3G_1F_2$	6,500	88,880	5,000	90,000	20,000	1,22,241	25,000	51,000	4,08,541
$P_3G_2F_2$	6,500	88,880	5,000	90,000	20,000	1,24,854	25,000	53,000	4,13,154
$P_3G_3F_2$	6,500	88,880	5,000	90,000	20,000	1,30,454	25,000	53,000	4,18,754
$P_3G_4F_2$	6,500	88,880	5,000	90,000	20,000	1,49,840	25,000	59,000	4,44,140
$P_3G_5F_2$	6,500	88,880	5,000	90,000	20,000	1,55,225	25,000	59,000	4,49,525
$P_3G_6F_2$	6,500	88,880	5,000	90,000	20,000	1,54,230	25,000	65,000	4,54,530
$P_3G_7F_2$	6,500	88,880	5,000	90,000	20,000	1,28,945	25,000	47,000	4,11,245

P_1 – September pruning P_2 – November pruning P_3 – January pruning (Control)
G_1 - GA_3 at 10ppm G_2 - GA_3 at 20ppm G_3 - GA_3 at 30ppm G_4 - Nitrobenzene at 2 ml /lt
G_5 - Nitrobenzene at 2.5 ml /lt G_6 - Nitrobenzene at 3 ml /lt G_7 – Water spray (control)
F_1- Application of RDF twice in a year (Oct and Mar)
F_2- Split application of RDF at alternative month (at a dose of 10:20:20 N: P: K during July, Sep, Nov, Jan, Mar, May)

Table 3: Cost economics of off-season flower induction in *Jasminum sambac* cv. Mysuru Mallige as influenced by pruning, growth regulators and fertilizers during 2019-20.

Treatments	Total cost of production (Rs.)	Off-season flower yield (t)	Off-season evenue (Rs.) (250 Rs/ Kg)	On-season flower yield (t/ha)	On-season evenue (90 Rs/Kg.)	Total revenue (Rs.)	Net returns (Rs.)	B: C ratio
$P_1G_1F_1$	4,87,778	2.30	5,75,000	6.44	5,79,600	11,54,600	6,66,822	2.37
$P_1G_2F_1$	4,88,254	2.31	5,77,500	6.54	5,88,600	11,66,100	6,77,846	2.39
$P_1G_3F_1$	4,95,142	2.36	5,90,000	6.74	6,06,600	11,96,600	7,01,458	2.42
$P_1G_4F_1$	5,14,232	2.76	6,90,000	7.26	6,53,400	13,43,400	8,29,168	2.61
$P_1G_5F_1$	5,18,350	2.89	7,22,500	7.45	6,70,500	13,93,000	8,74,650	2.69
$P_1G_6F_1$	5,21,562	3.02	7,55,000	7.55	6,79,500	14,34,500	9,12,938	2.75
$P_1G_7F_1$	4,23,848	1.82	4,55,000	5.46	4,91,400	9,46,400	5,22,552	2.23
$P_1G_1F_2$	5,03,278	2.40	6,00,000	6.86	6,17,400	12,17,400	7,14,122	2.42
$P_1G_2F_2$	5,09,512	2.44	6,10,000	7.06	6,35,400	12,45,400	7,35,888	2.44
$P_1G_3F_2$	5,17,832	2.58	6,45,000	7.25	6,52,500	12,97,500	7,79,668	2.51
$P_1G_4F_2$	5,20,184	3.41	8,52,500	7.56	6,80,400	15,32,900	10,12,716	2.95
$P_1G_5F_2$	5,34,289	3.52	8,80,000	7.78	7,00,200	15,80,200	10,45,911	2.96
$P_1G_6F_2$	5,45,098	3.61	9,02,500	8.01	7,20,900	16,23,400	10,78,302	2.98
$P_1G_7F_2$	4,41,648	1.89	4,72,500	6.31	5,67,900	10,40,400	5,98,752	2.36
$P_2G_1F_1$	4,85,778	1.07	2,67,500	6.41	5,76,900	8,44,400	3,58,622	1.74
$P_2G_2F_1$	4,93,555	1.18	2,95,000	6.50	5,85,000	8,80,000	3,86,445	1.78
$P_2G_3F_1$	4,99,332	1.24	3,10,000	6.57	5,91,300	9,01,300	4,01,968	1.81
$P_2G_4F_1$	5,01,732	1.36	3,40,000	6.74	6,06,600	9,46,600	4,44,868	1.89
$P_2G_5F_1$	5,06,665	1.48	3,70,000	6.79	6,11,100	9,81,100	4,74,435	1.94
$P_2G_6F_1$	5,11,598	1.70	4,25,000	6.93	6,23,700	10,48,700	5,37,102	2.05
$P_2G_7F_1$	4,63,463	0.87	2,17,500	5.33	4,79,700	6,97,200	2,33,737	1.50
$P_2G_1F_2$	4,93,778	1.16	2,90,000	6.68	6,01,200	8,91,200	3,97,422	1.80
$P_2G_2F_2$	4,96,785	1.19	2,97,500	6.99	6,29,100	9,26,600	4,29,815	1.87
$P_2G_3F_2$	5,05,332	1.26	3,15,000	7.17	6,45,300	9,60,300	4,54,968	1.90
$P_2G_4F_2$	5,11,694	1.56	3,90,000	7.49	6,74,100	10,64,100	5,52,406	2.08
$P_2G_5F_2$	5,15,942	1.69	4,22,500	7.56	6,80,400	11,02,900	5,86,958	2.14
$P_2G_6F_2$	5,29,831	1.96	4,90,000	7.84	7,05,600	11,95,600	6,65,769	2.26
$P_2G_7F_2$	4,80,650	0.98	2,45,000	5.64	5,07,600	7,52,600	2,71,950	1.57
$P_3G_1F_1$	3,95,874	0.00	0,00,000	6.72	6,04,800	6,04,800	2,08,926	1.53
$P_3G_2F_1$	3,97,275	0.00	0,00,000	6.80	6,12,000	6,12,000	2,14,725	1.54

$P_3G_3F_1$	4,02,157	0.00	0,00,000	6.91	6,21,900	6,21,900	2,19,743	1.55
$P_3G_4F_1$	4,06,784	0.00	0,00,000	7.02	6,31,800	6,31,800	2,25,016	1.55
$P_3G_5F_1$	4,13,841	0.00	0,00,000	7.39	6,65,100	6,65,100	2,51,259	1.61
$P_3G_6F_1$	4,15,784	0.00	0,00,000	7.44	6,69,600	6,69,600	2,53,816	1.61
$P_3G_7F_1$	3,94,500	0.00	0,00,000	6.35	5,71,500	5,71,500	1,77,000	1.45
$P_3G_1F_2$	4,06,142	0.00	0,00,000	7.15	6,43,500	6,43,500	2,37,358	1.58
$P_3G_2F_2$	4,11,278	0.00	0,00,000	7.58	6,82,200	6,82,200	2,70,922	1.66
$P_3G_3F_2$	4,15,784	0.00	0,00,000	7.67	6,90,300	6,90,300	2,74,516	1.66
$P_3G_4F_2$	4,41,289	0.00	0,00,000	8.44	7,59,600	7,59,600	3,18,311	1.72
$P_3G_5F_2$	4,45,440	0.00	0,00,000	8.81	7,92,900	7,92,900	3,47,460	1.78
$P_3G_6F_2$	4,48,715	0.00	0,00,000	8.90	8,01,000	8,01,000	3,52,285	1.79
$P_3G_7F_2$	4,08,741	0.00	0,00,000	6.66	5,99,400	5,99,400	1,90,659	1.47
CD at 5%	-	0.20	-	0.44	-	-	-	-

P_1 – September pruning P_2 – November pruning P_3 – January pruning (Control)
G_1 - GA_3 at 10ppm G_2 - GA_3 at 20ppm G_3 - GA_3 at 30ppm G_4 - Nitrobenzene at 2 ml /lt
G_5 - Nitrobenzene at 2.5 ml /lt G_6 - Nitrobenzene at 3 ml /lt G_7 – Water spray (control)
F_1- Application of RDF twice in a year (Oct and Mar)
F_2- Split application of RDF at alternative month (at a dose of 10:20:20 N: P: K during July, Sep, Nov, Jan, Mar, May)

Table 4: Cost economics of off-season flower induction in *Jasminum sambac* cv. Mysuru Mallige as influenced by pruning, growth regulators and fertilizers during 2020-21

Treatments	Total cost of production (Rs.)	Off-season flower yield (t)	Off-season revenue (Rs.) (250 Rs/ Kg)	On-season flower yield (t/ha)	On-season revenue (90 Rs/Kg.)	Total revenue (Rs.)	Net returns (Rs.)	B: C ratio
$P_1G_1F_1$	4,87,778	2.43	6,07,500	6.53	5,87,700	11,95,200	7,07,422	2.45
$P_1G_2F_1$	4,88,254	2.44	6,10,000	6.59	5,93,100	12,03,100	7,14,846	2.46
$P_1G_3F_1$	4,95,142	2.56	6,40,000	6.85	6,16,500	12,56,500	7,61,358	2.54
$P_1G_4F_1$	5,14,232	2.89	7,22,500	7.37	6,63,300	13,85,800	8,71,568	2.69
$P_1G_5F_1$	5,18,350	3.01	7,52,500	7.57	6,81,300	14,33,800	9,15,450	2.77
$P_1G_6F_1$	5,21,562	3.12	7,80,000	7.33	6,59,700	14,39,700	9,18,138	2.76
$P_1G_7F_1$	4,23,848	1.93	4,82,500	5.58	5,02,200	9,84,700	5,60,852	2.32
$P_1G_1F_2$	5,03,278	2.52	6,30,000	6.97	6,27,300	12,57,300	7,54,022	2.50
$P_1G_2F_2$	5,09,512	2.54	6,35,000	7.18	6,46,200	12,81,200	7,71,688	2.51
$P_1G_3F_2$	5,17,832	2.65	6,62,500	7.37	6,63,300	13,25,800	8,07,968	2.56
$P_1G_4F_2$	5,20,184	3.57	8,92,500	7.70	6,93,000	15,85,500	10,65,316	3.05
$P_1G_5F_2$	5,34,289	3.65	9,12,500	8.02	7,21,800	16,34,300	11,00,011	3.06
$P_1G_6F_2$	5,45,098	3.80	9,50,000	8.13	7,31,700	16,81,700	11,36,602	3.09
$P_1G_7F_2$	4,41,648	1.98	4,95,000	6.28	5,65,200	10,60,200	6,18,552	2.40
$P_2G_1F_1$	4,85,778	1.22	3,05,000	6.43	5,78,700	8,83,700	3,97,922	1.82
$P_2G_2F_1$	4,93,555	1.26	3,15,000	6.54	5,88,600	9,03,600	4,10,045	1.83
$P_2G_3F_1$	4,99,332	1.34	3,35,000	6.68	6,01,200	9,36,200	4,36,868	1.87
$P_2G_4F_1$	5,01,732	1.39	3,47,500	6.85	6,16,500	9,64,000	4,62,268	1.92
$P_2G_5F_1$	5,06,665	1.78	4,45,000	6.91	6,21,900	10,66,900	5,60,235	2.11
$P_2G_6F_1$	5,11,598	2.18	5,45,000	7.05	6,34,500	11,79,500	6,67,902	2.31
$P_2G_7F_1$	4,63,463	0.94	2,35,000	5.45	4,90,500	7,25,500	2,62,037	1.57
$P_2G_1F_2$	4,93,778	1.26	3,15,000	6.86	6,17,400	9,32,400	4,38,622	1.89
$P_2G_2F_2$	4,96,785	1.29	3,22,500	6.93	6,23,700	9,46,200	4,49,415	1.90
$P_2G_3F_2$	5,05,332	1.36	3,40,000	7.09	6,38,100	9,78,100	4,72,768	1.94
$P_2G_4F_2$	5,11,694	1.78	4,45,000	7.85	7,06,500	11,51,500	6,39,806	2.25
$P_2G_5F_2$	5,15,942	1.81	4,52,500	7.92	7,12,800	11,65,300	6,49,358	2.26
$P_2G_6F_2$	5,29,831	2.34	5,85,000	7.94	7,14,600	12,99,600	7,69,769	2.45
$P_2G_7F_2$	4,80,650	1.21	3,02,500	5.76	5,18,400	8,20,900	3,40,250	1.71
$P_3G_1F_1$	3,95,874	0.00	0,00,000	6.91	6,21,900	6,21,900	2,26,026	1.57
$P_3G_2F_1$	3,97,275	0.00	0,00,000	6.96	6,26,400	6,26,400	2,29,125	1.58
$P_3G_3F_1$	4,02,157	0.00	0,00,000	7.03	6,32,700	6,32,700	2,30,543	1.57
$P_3G_4F_1$	4,06,784	0.00	0,00,000	7.19	6,47,100	6,47,100	2,40,316	1.59
$P_3G_5F_1$	4,13,841	0.00	0,00,000	7.40	6,66,000	6,66,000	2,52,159	1.61
$P_3G_6F_1$	4,15,784	0.00	0,00,000	7.57	6,81,300	6,81,300	2,65,516	1.64
$P_3G_7F_1$	3,94,500	0.00	0,00,000	6.47	5,82,300	5,82,300	1,87,800	1.48
$P_3G_1F_2$	4,06,142	0.00	0,00,000	7.09	6,38,100	6,38,100	2,31,958	1.57
$P_3G_2F_2$	4,11,278	0.00	0,00,000	7.33	6,59,700	6,59,700	2,48,422	1.60
$P_3G_3F_2$	4,15,784	0.00	0,00,000	7.55	6,79,500	6,79,500	2,63,716	1.63
$P_3G_4F_2$	4,41,289	0.00	0,00,000	8.54	7,68,600	7,68,600	3,27,311	1.74
$P_3G_5F_2$	4,45,440	0.00	0,00,000	8.87	7,98,300	7,98,300	3,52,860	1.79
$P_3G_6F_2$	4,48,715	0.00	0,00,000	9.16	8,24,400	8,24,400	3,75,685	1.84
$P_3G_7F_2$	4,08,741	0.00	0,00,000	6.81	6,12,900	6,12,900	2,04,159	1.50
CD @ 5%	-	0.34	-	0.41	-	-	-	-

P_1 – September pruning P_2 – November pruning P_3 – January pruning (Control)
G_1 - GA_3 at 10ppm G_2 - GA_3 at 20ppm G_3 - GA_3 at 30ppm G_4 - Nitrobenzene at 2 ml /lt
G_5 - Nitrobenzene at 2.5 ml /lt G_6 - Nitrobenzene at 3 ml /lt G_7 – Water spray (control)
F_1- Application of RDF twice in a year (Oct and Mar)
F_2- Split application of RDF at alternative month (at a dose of 10:20:20 N: P: K during July, Sep, Nov, Jan, Mar, May)

Table 5: Pooled mean of cost economics of off-season flower induction in *Jasminum sambac* cv. Mysuru Mallige as influenced by pruning, growth regulators and fertilizers application

Treatments	Total cost of production (Rs.)	Off-season flower yield (t)	Off-season revenue (Rs.) (250 Rs/ Kg)	On-season flower yield (t)	On-season revenue (90 Rs/Kg.)	Total revenue (Rs.)	Net returns (Rs.)	B: C ratio
$P_1G_1F_1$	4,87,778	2.37 ± 0.09	5,91,250 ± 22,981	6.49 ± 0.06	5,83,650 ± 5,728	11,74,900 ± 28,709	6,87,122 ± 28,709	2.41 ± 0.06
$P_1G_2F_1$	4,88,254	2.38 ± 0.09	5,93,750 ± 22,981	6.57 ± 0.04	5,90,850 ± 3,182	11,84,600 ± 26,163	6,96,346 ± 26,163	2.43 ± 0.05
$P_1G_3F_1$	4,95,142	2.46 ± 0.14	6,15,000 ± 35,355	6.80 ± 0.08	6,11,550 ± 7,000	12,26,550 ± 42,356	7,31,408 ± 42,356	2.48 ± 0.08
$P_1G_4F_1$	5,14,232	2.83 ± 0.09	7,06,250 ± 22,981	7.32 ± 0.08	6,58,350 ± 7,000	13,64,600 ± 29,981	8,50,368 ± 29,981	2.65 ± 0.06
$P_1G_5F_1$	5,18,350	2.95 ± 0.08	7,37,500 ± 21,213	7.51 ± 0.08	6,75,900 ± 7,637	14,13,400 ± 28,850	8,95,050 ± 28,850	2.73 ± 0.06
$P_1G_6F_1$	5,21,562	3.07 ± 0.07	7,67,500 ± 17,678	7.44 ± 0.16	6,69,600 ± 14,001	14,37,100 ± 3,677	9,15,538 ± 3,677	2.76 ± 0.01
$P_1G_7F_1$	4,23,848	1.88 ± 0.08	4,68,750 ± 19,445	5.52 ± 0.0	4,96,800 ± 7,637	9,65,550 ± 27,082	5,41,702 ± 27,082	2.28 ± 0.06
$P_1G_1F_2$	5,03,278	2.46 ± 0.08	6,15,000 ± 21,213	6.92 ± 0.08	6,22,350 ± 7,000	12,37,350 ± 28,214	7,34,072 ± 28,214	2.46 ± 0.06
$P_1G_2F_2$	5,09,512	2.49 ± 0.07	6,22,500 ± 17,678	7.12 ± 0.08	6,40,800 ± 7,637	12,63,300 ± 25,314	7,53,788 ± 25,314	2.48 ± 0.05
$P_1G_3F_2$	5,17,832	2.62 ± 0.05	6,53,750 ± 12,374	7.31 ± 0.08	6,57,900 ± 7,637	13,11,650 ± 20,011	7,93,818 ± 20,011	2.54 ± 0.04
$P_1G_4F_2$	5,20,184	3.49 ± 0.11	8,72,500 ± 28,284	7.63 ± 0.10	6,86,700 ± 8,910	15,59,200 ± 37,194	10,39,016 ± 37,194	3.00 ± 0.07
$P_1G_5F_2$	5,34,289	3.59 ± 0.09	8,96,250 ± 22,981	7.90 ± 0.17	7,11,000 ± 15,274	16,07,250 ± 38,254	10,72,961 ± 38,254	3.01 ± 0.07
$P_1G_6F_2$	5,45,098	3.71 ± 0.13	9,26,250 ± 33,588	8.07 ± 0.08	7,26,300 ± 7,637	16,52,550 ± 41,224	11,07,452 ± 41,224	3.04 ± 0.08
$P_1G_7F_2$	4,41,648	1.94 ± 0.06	4,83,750 ± 15,910	6.30 ± 0.02	5,66,550 ± 1,909	10,50,300 ± 14,001	6,08,652 ± 14,001	2.38 ± 0.03
$P_2G_1F_1$	4,85,778	1.15 ± 0.11	2,86,250 ± 26,517	6.42 ± 0.01	5,77,800 ± 1,273	8,64,050 ± 27,789	3,78,272 ± 27,789	1.78 ± 0.06
$P_2G_2F_1$	4,93,555	1.22 ± 0.06	3,05,000 ± 14,142	6.52 ± 0.03	5,86,800 ± 2,546	8,91,800 ± 16,688	3,98,245 ± 16,688	1.81 ± 0.04
$P_2G_3F_1$	4,99,332	1.29 ± 0.07	3,22,500 ± 17,678	6.63 ± 0.08	5,96,250 ± 7,000	9,18,750 ± 24,678	4,19,418 ± 24,678	1.84 ± 0.04
$P_2G_4F_1$	5,01,732	1.38 ± 0.02	3,43,750 ± 5,303	6.80 ± 0.08	6,11,550 ± 7,000	9,55,300 ± 12,304	4,53,568 ± 12,304	1.91 ± 0.002
$P_2G_5F_1$	5,06,665	1.63 ± 0.21	4,07,500 ± 53,033	6.85 ± 0.08	6,16,500 ± 7,637	10,24,000 ± 60,670	5,17,335 ± 60,670	2.03 ± 0.12
$P_2G_6F_1$	5,11,598	1.94 ± 0.33	4,85,000 ± 84,853	6.99 ± 0.08	6,29,100 ± 7,637	11,14,100 ± 92,490	6,02,502 ± 92,490	2.18 ± 0.18
$P_2G_7F_1$	4,63,463	0.91 ± 0.05	2,26,250 ± 12,374	5.39 ± 0.08	4,85,100 ± 7,637	7,11,350 ± 20,011	2,47,887 ± 20,011	1.54 ± 0.05
$P_2G_1F_2$	4,93,778	1.21 ± 0.07	3,02,500 ± 17,678	6.77 ± 0.13	6,09,300 ± 11,455	9,11,800 ± 29,133	4,18,022 ± 29,133	1.85 ± 0.06
$P_2G_2F_2$	4,96,785	1.24 ± 0.07	3,10,000 ± 17,678	6.96 ± 0.04	6,26,400 ± 3,818	9,36,400 ± 13,859	4,39,615 ± 13,859	1.89 ± 0.02
$P_2G_3F_2$	5,05,332	1.31 ± 0.07	3,27,500 ± 17,678	7.13 ± 0.06	6,41,700 ± 5,091	9,69,200 ± 12,587	4,63,868 ± 12,587	1.92 ± 0.03
$P_2G_4F_2$	5,11,694	1.67 ± 0.16	4,17,500 ± 38,891	7.67 ± 0.25	6,90,300 ± 22,910	11,07,800 ± 61,801	5,96,106 ± 61,801	2.17 ± 0.12
$P_2G_5F_2$	5,15,942	1.75 ± 0.08	4,37,500 ± 21,213	7.74 ± 0.25	6,96,600 ± 22,910	11,34,100 ± 44,123	6,18,158 ± 44,123	2.20 ± 0.08
$P_2G_6F_2$	5,29,831	2.15 ± 0.26	5,37,500 ± 67,175	7.89 ± 0.07	7,10,100 ± 6,364	12,47,600 ± 73,539	7,17,769 ± 73,539	2.36 ± 0.13
$P_2G_7F_2$	4,80,650	1.10 ± 0.16	2,73,750 ± 40,659	5.70 ± 0.08	5,13,000 ± 7,637	7,86,750 ± 48,295	3,06,100 ± 48,295	1.64 ± 0.10
$P_3G_1F_1$	3,95,874	0.00 ± 0.00	0.00 ± 0.00	6.82 ± 0.13	6,13,350 ± 12,092	6,13,350 ± 12,092	2,17,476 ± 12,092	1.55 ± 0.03
$P_3G_2F_1$	3,97,275	0.00 ± 0.00	0.00 ± 0.00	6.88 ± 0.11	6,19,200 ± 10,182	6,19,200 ± 10,182	2,21,925 ± 10,182	1.56 ± 0.03
$P_3G_3F_1$	4,02,157	0.00 ± 0.00	0.00 ± 0.00	6.97 ± 0.08	6,27,300 ± 7,637	6,27,300 ± 7,637	2,25,143 ± 7,637	1.56 ± 0.01
$P_3G_4F_1$	4,06,784	0.00 ± 0.00	0.00 ± 0.00	7.11 ± 0.12	6,39,450 ± 10,819	6,39,450 ± 10,819	2,32,666 ± 10,819	1.57 ± 0.03
$P_3G_5F_1$	4,13,841	0.00 ± 0.00	0.00 ± 0.00	7.40 ± 0.01	6,65,550 ± 636	6,65,550 ± 636	2,51,709 ± 636	1.61 ± 0.00
$P_3G_6F_1$	4,15,784	0.00 ± 0.00	0.00 ± 0.00	7.51 ± 0.09	6,75,450 ± 8,273	6,75,450 ± 8,273	2,59,666 ± 8,273	1.63 ± 0.02
$P_3G_7F_1$	3,94,500	0.00 ± 0.00	0.00 ± 0.00	6.41 ± 0.08	5,76,900 ± 7,637	5,76,900 ± 7,637	1,82,400 ± 7,637	1.47 ± 0.02
$P_3G_1F_2$	4,06,142	0.00 ± 0.00	0.00 ± 0.00	7.12 ± 0.04	6,40,800 ± 3,818	6,40,800 ± 3,818	2,34,658 ± 3,818	1.58 ± 0.01
$P_3G_2F_2$	4,11,278	0.00 ± 0.00	0.00 ± 0.00	7.46 ± 0.18	6,70,950 ± 15,910	6,70,950 ± 15,910	2,59,672 ± 15,910	1.63 ± 0.04
$P_3G_3F_2$	4,15,784	0.00 ± 0.00	0.00 ± 0.00	7.61 ± 0.08	6,84,900 ± 7,637	6,84,900 ± 7,637	2,69,116 ± 7,637	1.65 ± 0.02
$P_3G_4F_2$	4,41,289	0.00 ± 0.00	0.00 ± 0.00	8.49 ± 0.07	7,64,100 ± 6,364	7,64,100 ± 6,364	3,22,811 ± 6,364	1.73 ± 0.01
$P_3G_5F_2$	4,45,440	0.00 ± 0.00	0.00 ± 0.00	8.84 ± 0.04	7,95,600 ± 3,818	7,95,600 ± 3,818	3,50,160 ± 3,818	1.79 ± 0.01
$P_3G_6F_2$	4,48,715	0.00 ± 0.00	0.00 ± 0.00	9.03 ± 0.18	8,12,700 ± 16,546	8,12,700 ± 16,546	3,63,985 ± 16,546	1.82 ± 0.04
$P_3G_7F_2$	4,08,741	0.00 ± 0.00	0.00 ± 0.00	6.74 ± 0.11	6,06,150 ± 9,546	6,06,150 ± 9,546	1,97,409 ± 9,546	1.49 ± 0.02

P_1 – September pruning P_2 – November pruning P_3 – January pruning (Control)
G_1 - GA_3 at 10ppm G_2 - GA_3 at 20ppm G_3 - GA_3 at 30ppm G_4 - Nitrobenzene at 2 ml /lt
G_5 - Nitrobenzene at 2.5 ml /lt G_6 - Nitrobenzene at 3 ml /lt G_7 – Water spray (control)
F_1- Application of RDF twice in a year (Oct and Mar)
F_2- Split application of RDF at alternative month (at a dose of 10:20:20 N: P: K during July, Sep, Nov, Jan, Mar, May)

Conclusion

September month pruning, foliar spray of nitrobenzene at 3ml/l along with split application of fertilizers at alternative month will help the farmer for getting a higher flower yield with a minimum cost of cultivation and highest BC ratio

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