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Effect of bioregulators and cow's urine on flower production in jasmine (*Jasminum sambac*)

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ABSTRACT : Jasmine buds and blossoms are used for preparing garlands, decorative purposes, religious offerings and perfumery industry. There is high demand for the flower in Kerala especially during festival seasons and special occasions and "bush jasmine" (*Jasminum sambac*) is grown by many farmers in the state. Usually flower production is highly reduced during cooler months, leading to a hike in the price which can be termed as "off season" in jasmine cultivation. Hence, any method to enhance the flower production will be much useful to farmers. A trial was conducted at Cashew Research Station, Kerala Agricultural University, Madakkathara,Thrissur during 2008 - 2011 to enhance flower production in bush jasmine, using bioregulators and cow's urine. One year old plants grown in pots were sprayed with paclobutrazol, cycocel, GA_3 and cow's urine at various concentrations at monthly intervals during February - May and observations on vegetative and floral characters were recorded. The study revealed that vegetative and floral characters were significantly improved by the application of GA_3 cow's urine and cycocel. Maximum flower yield was noticed in GA_3 20 ppm followed by cycocel 1000 ppm. Lowest yield recorded was in paclobutrazol treated plants. Monthly flower yield was also improved by the application of cow's urine and bio regulators. In general, there was an increase in yield during April - May and October to December period indicating the favourable effect of the application of GA_3 and cycocel in enhancing flower production during the cooler months especially October, November and December, which in turn helps farmers to get high returns during the off season.

KEY WORDS : Jasmine, Cycocel, Paclobutrazol, GA_3, Cow's urine, Bioregulator

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Jasmine is known as queen of the night in India because of its intoxicating perfume released during night hours. It also symbolizes deep affection, happiness and elegance and is one of the oldest fragrance flowers cultivated by man. In Kerala there is good demand for jasmine especially during festival seasons and marriages. Bush jasmine is being cultivated in Kerala by large number of small and marginal farmers and house wives in small scale. The flower production is reduced during cooler months, leading to a hike in price, which can be termed as "offseason" in jasmine cultivation. In this context a study was conducted at Kerala Agricultural University, Thrissur, to enhance flower production using bioregulators and cow's urine during 2008-11.

RESEARCH METHODS

The trial was carried out at Cashew Research Station, Madakkathara under Kerala Agricultural University, Thrissur, during 2008 - 2011 in bush jasmine (*Jasminum sambac*). One year old plants grown in pots were sprayed with paclobutrazol, cycocel, GA_3 and cow's urine at various concentrations as listed below, during February - May at monthly intervals.

Paclobutrazol - 10 ppm, 25 ppm
Cycocel - 500 ppm,1000 ppm
GA_3 - 10 ppm, 20 ppm
Cow's urine - 15 times dilution
Control - without any treatment.

There were 8 treatments with 3 replications and 5 plants in each replication. The trial was laid out in Completely Randomized Design. Observations were recorded on vegetative and floral characters *viz*., plant height, plant spread, number of primary shoots, number of productive shoots, flower size and flower yield during the three years. Data were tabulated and statistically analyzed following the method suggested by Panse and Sukhatme (1967).

RESEARCH FINDINGS AND DISCUSSION

The data on vegetative characters and floral parameters recorded during the experimental period are presented in Table 1. It is evident from Table 1 that all the parameters were significantly improved by the application of GA_3, cycocel and cow's urine. Maximum yield was obtained from GA_3 20ppm and cycocel-1000ppm treated plants (Fig.1). Regarding flower size, there was no significant difference among the treatments except in paclobutrazole treated plants, at both the levels, 10ppm and 25ppm. Plants treated with paclobutrazole 10ppm had the least flower size. Plants sprayed with cow's urine also gave enhanced yield compared to control plants without any treatments. In the case of primary shoots significant difference could not be noticed among the treatments. But productive shoots were significantly higher in the plants which received cycocel,GA_3 and cow's urine in all the concentrations. The increased number of productive shoots in these treatments might be the reason for enhanced production of flower buds leading to high yield. All the vegetative characters like plant height, plant spread, number of primary shoots, number of productive shoots as well as floral parameters like flower size and flower yield were the minimum in the paclobutrazole treated plants, even less than those of control plants. The same trend was noticed throughout the experimental period. A negative effect might have happened for the concentrations of the paclobutrazol used for the study leading to yield reduction.

GA_3 is a very potent plant hormone which regulates plant growth at very low concentrations. It can affect plant growth by its effect on cell growth and cell elongation leading to bigger plants and ultimately enhanced yields. In this experiment GA_3 resulted in more number of productive shoots and maximum yield. Cycocel is a plant growth regulator usually

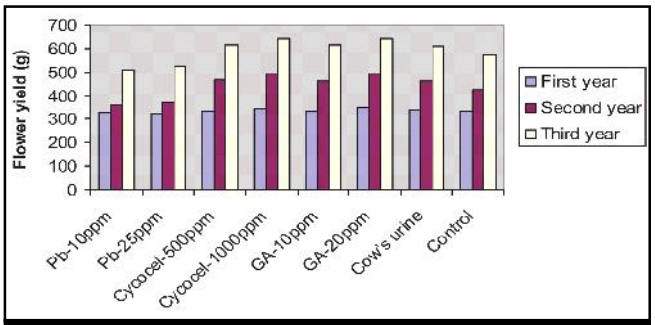

Fig. 1 : Effect of bioregulators and cow's urine on flower yield of jasmine

Table 1 : Effect of bioregulators and cow's urine on the vegetative and floral characters of jasmine

Year	Treatments	Plant height (cm)	Plant spread (cm)		Primary shoot (no.)	Productive shoot (no.)	Flower size (cm)	Flower yield (g)
			EW	NS				
First year	Pb-10ppm	31.45^{b}	30.30	37.09^{bc}	2.15^{a}	3.27^{b}	1.99^{b}	330.00^{b}
	Pb-25ppm	28.70^{b}	30.29	30.44^{c}	2.19^{a}	4.20^{b}	2.01^{b}	324.77^{b}
	Cycocel-500ppm	48.18^{a}	50.95^{a}	51.88^{ab}	2.36^{a}	6.67^{a}	2.19^{a}	333.67^{ab}
	Cycocel-1000ppm	48.17^{a}	49.86^{a}	52.06^{ab}	2.42^{a}	6.13^{a}	2.20^{a}	344.77^{a}
	GA_3-10ppm	52.83^{a}	47.10^{a}	48.06^{abc}	2.64^{a}	6.07^{a}	2.20^{a}	336.67^{ab}
	GA_3-20ppm	49.14^{a}	46.61^{a}	47.21^{abc}	2.64^{a}	7.21^{a}	2.19^{a}	347.83^{a}
	Cow's urine	48.70^{a}	48.03^{a}	64.00^{a}	2.86^{a}	6.16^{a}	2.28^{a}	340.00^{ab}
	Control	48.17^{a}	46.15^{a}	46.96^{b}	2.34^{a}	6.40^{a}	2.18^{a}	332.77^{ab}
Second year	Pb-10ppm	31.45^{b}	37.09^{bc}	30.30^{b}	5.15^{a}	3.27^{b}	1.99^{b}	359.32^{b}
	Pb-25ppm	28.70^{b}	30.44^{c}	30.29^{b}	2.19^{a}	4.20^{b}	2.00^{b}	372.59^{b}
	Cycocel-500ppm	48.18^{a}	51.88^{ab}	50.95^{a}	2.36^{a}	6.67^{a}	2.19^{a}	467.37^{ab}
	Cycocel-1000ppm	52.00^{a}	52.06^{ab}	49.86^{a}	2.42^{a}	6.13^{a}	2.20^{a}	492.67^{a}
	GA_3-10ppm	52.83^{a}	48.06^{abc}	47.10^{a}	2.34^{a}	6.07^{a}	2.20^{a}	463.37^{ab}
	GA_3-20ppm	49.14^{a}	47.21^{abc}	46.61^{a}	2.34^{a}	7.21^{a}	2.19^{a}	493.79^{a}
	Cow's urine	48.70^{a}	64.00^{a}	48.03^{a}	2.86^{a}	6.16^{a}	2.28^{a}	460.71^{ab}
	Control	48.17^{a}	46.96^{b}	46.15^{a}	2.64^{a}	6.40^{a}	2.18^{a}	423.51^{ab}
Third year	Pb-10ppm	31.08^{c}	33.08^{a}	31.71^{a}	1.67^{a}	3.79^{b}	2.02^{b}	509.32^{b}
	Pb-25ppm	38.42^{c}	40.65^{a}	29.92^{a}	2.50^{a}	4.33^{b}	2.03^{b}	522.59^{b}
	Cycocel-500ppm	57.88^{ab}	49.42^{a}	41.17^{a}	3.33^{a}	7.41^{a}	2.15^{a}	617.64^{ab}
	Cycocel-1000ppm	56.40^{ab}	48.40^{a}	35.70^{a}	3.17^{a}	7.00^{a}	2.07^{a}	642.67^{a}
	GA_3-10ppm	61.52^{a}	50.30^{a}	40.00^{a}	4.50^{a}	6.91^{a}	2.07^{a}	613.37^{ab}
	GA_3-20ppm	60.63^{a}	51.58^{a}	41.75^{a}	4.00^{a}	8.25^{a}	2.17^{a}	643.79^{a}
	Cow's urine	41.63^{bc}	33.54^{a}	32.79^{a}	4.00^{a}	6.92^{a}	2.11^{a}	610.71^{ab}
	Control	59.81^{a}	41.98^{a}	43.19^{a}	4.42^{a}	6.38^{a}	2.09^{a}	573.51^{ab}

used in the production of ornamental plants.Cycocel spray application at 200-600ppm is reported to improve flower yield in hibiscus. Foliar sprays of cycocel-1000ppm gave higher yields and early flowering in *Jasminum sambac* var. Gundumalli as reported by Gowda and Gowda (1990) as well as Srivastava *et al.* (2001).According to Arumugham *et al.* (2002) GA_3 20ppm and CCC-100ppm increased flower number by 31.8- 49.0 per cent over control plants.The increased yield by the application of GA_3 10ppm was also reported by Srivastava *et al.* (2001) in jasmine. Cow's urine is reported to contain nitrogen, phosphate, magnesium, manganese,sulphur, vitamins, minerals, hormones, enzymes, etc. These might have

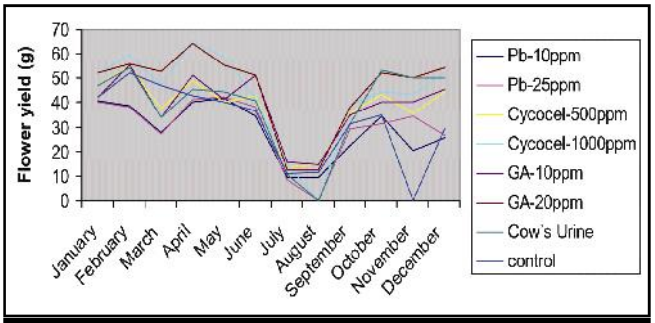

Fig. 3 : Effect of bioregulators and cow's urine on monthly flower yield in jasmine (Second year)

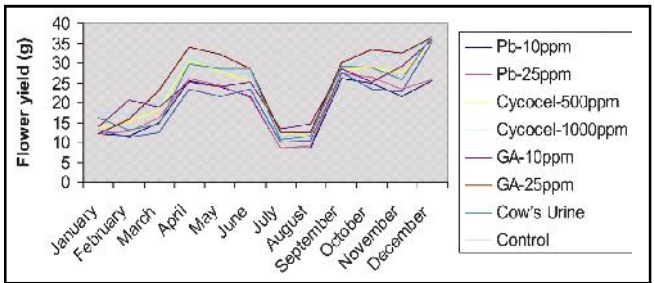

Fig. 2 : Effect of bioregulators and cow's urine on monthly flower yield in jasmine (First year)

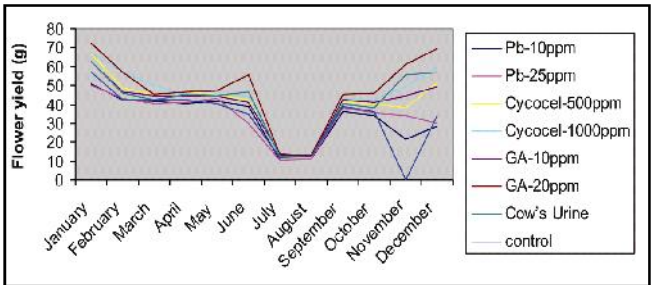

Fig. 4 : Effect of bioregulators and cow's urine on monthly flower yield in jasmine (Third year)

Table 2 : Effect of bioregulators and cow's urine on monthly flower yield in jasmine

Year	Treatments	January	February	March	April	May	June	July	August	September	October	November	December
First	Pb-10ppm	12.10^{abc}	11.53^{c}	14.70^{b}	25.33^{b}	23.97^{b}	21.53^{b}	8.34^{c}	8.59^{bc}	25.98^{a}	24.97^{ab}	21.63^{ab}	25.39^{ab}
year	Pb-25ppm	12.20^{abc}	12.63^{bc}	16.13^{ab}	26.17^{ab}	24.20^{b}	21.35^{b}	8.42^{c}	8.98^{bc}	27.13^{a}	26.47^{ab}	23.47^{b}	25.63^{ab}
	Cycocel-500ppm	13.58^{ab}	15.07^{abc}	18.20^{ab}	30.60^{ab}	27.87^{ab}	25.17^{ab}	12.40^{ab}	11.42^{abc}	28.17^{a}	28.73^{ab}	27.57^{abc}	34.70^{a}
	Cycocel-1000ppm	17.47^{a}	17.10^{ab}	19.88^{ab}	31.08^{ab}	28.05^{ab}	27.09^{ab}	11.44^{abc}	12.56^{ab}	28.60^{a}	31.55^{ab}	32.32^{a}	35.39^{a}
	GA-10ppm	14.05^{ab}	20.57^{a}	18.67^{ab}	25.17^{b}	23.80^{b}	25.30^{ab}	13.44^{a}	14.52^{a}	28.55^{a}	25.03^{ab}	28.94^{abc}	35.63^{a}
	GA-20ppm	12.06^{abc}	15.83^{abc}	22.90^{a}	34.00^{a}	32.20^{a}	28.34^{a}	12.42^{ab}	12.50^{ab}	29.85^{a}	33.30^{a}	32.44^{a}	36.25^{a}
	Cow's urine	16.08^{ab}	13.17^{b}	14.56^{b}	29.77^{ab}	28.37^{ab}	28.43^{a}	10.59^{b}	11.44^{abc}	28.95^{a}	28.73^{ab}	25.70^{b}	36.77^{a}
	Control	12.95^{abc}	11.12^{c}	12.38^{b}	23.45^{b}	21.52^{b}	23.25^{ab}	10.01^{bc}	10.22^{b}	27.71^{a}	23.22^{b}	22.68^{a}	35.26^{a}
Second	Pb-10 ppm	40.63^{bc}	38.75^{b}	27.46^{bc}	40.25^{d}	41.58^{bc}	34.25^{d}	9.18^{c}	9.30^{bc}	22.36^{c}	34.25^{c}	20.36^{cd}	25.36^{d}
year	Pb-25 ppm	40.38^{bc}	38.17^{b}	27.40^{bc}	41.25^{cd}	42.25^{b}	38.25^{c}	8.20^{cd}	8.32^{c}	29.35^{bc}	31.25^{cd}	34.36^{bcd}	26.89^{cd}
	Cycocel-500 ppm	47.08^{ab}	55.08^{ab}	37.76^{abc}	49.35^{b}	40.25^{bcd}	42.58^{abc}	13.40^{abc}	14.56^{a}	35.36^{abc}	43.25^{abcd}	35.36^{bc}	44.36^{bc}
	Cycocel-1000ppm	52.15^{a}	59.36^{a}	47.03^{ab}	65.36^{a}	58.36^{a}	41.58^{b}	14.39^{ab}	12.49^{ab}	39.36^{a}	44.36^{abc}	43.56^{abc}	52.36^{ab}
	GA-10 ppm	42.40^{b}	55.42^{ab}	33.96^{b}	51.36^{abc}	41.36^{c}	51.25^{a}	15.58^{a}	14.66^{a}	35.25^{abc}	40.25^{b}	40.36^{b}	45.36^{b}
	GA-20 ppm	52.40^{a}	55.69^{ab}	52.60^{a}	64.36^{ab}	55.36^{ab}	51.25^{a}	12.62^{b}	12.42^{ab}	38.36^{ab}	52.25^{ab}	50.36^{a}	54.36^{a}
	Cow's urine	46.93^{abc}	54.36^{abc}	33.95^{b}	45.36^{bc}	44.25^{abc}	40.55^{bc}	10.46^{bc}	10.20^{b}	31.25^{b}	53.36^{a}	50.26^{ab}	50.36^{abc}
	Control	42.20^{b}	52.36^{b}	46.88^{ab}	42.58^{bcd}	40.36^{cd}	36.58^{cd}	10.98^{bc}	11.46^{abc}	31.36^{b}	35.26^{bc}	32.36^{c}	29.38^{c}
Third	Pb-10 ppm	50.63^{bc}	42.46^{c}	41.75^{bc}	40.25^{c}	41.58^{bc}	39.25^{c}	10.52^{bc}	10.89^{b}	36.25^{d}	34.25^{d}	21.24^{cd}	28.37^{d}
year	Pb-25 ppm	50.38^{bc}	43.40^{bc}	40.17^{c}	41.25^{bc}	43.25^{b}	30.25^{d}	10.44^{bc}	10.90^{b}	38.36^{cd}	35.26^{cd}	33.82^{bcd}	29.69^{cd}
	Cycocel-500 ppm	67.08^{ab}	49.030^{ab}	45.08^{ab}	46.35^{a}	45.36^{ab}	42.58^{b}	12.44^{abc}	13.44^{a}	41.36^{b}	40.25^{b}	38.22^{bc}	51.38^{bc}
	Cycocel-1000ppm	67.15^{ab}	56.76^{a}	50.36^{a}	45.36^{ab}	45.36^{ab}	44.36^{abc}	12.01^{b}	12.49^{ab}	43.25^{ab}	42.36^{ab}	49.63^{abc}	59.52^{ab}
	GA-10 ppm	62.40^{abc}	46.95^{abc}	44.36^{abc}	44.36^{abc}	44.36^{abc}	41.25^{bcd}	14.21^{a}	12.22^{ab}	42.36^{abc}	41.25^{abc}	44.30^{b}	49.32^{b}
	GA-20 ppm	72.20^{a}	56.88^{a}	45.42^{ab}	46.36^{a}	47.25^{a}	55.58^{a}	13.00^{ab}	13.26^{a}	45.28^{a}	46.25^{a}	61.37^{a}	69.43^{a}
	Cow's urine	62.40^{abc}	45.96^{b}	42.36^{b}	45.36^{ab}	44.25^{abc}	46.55^{ab}	12.24^{abc}	12.59^{an}	40.25^{bc}	38.25^{bc}	55.43^{ab}	57.30^{abc}
	Control	56.93^{b}	42.60^{c}	42.69^{b}	42.58^{b}	40.36^{c}	34.58^{cd}	12.12^{abc}	12.34^{ab}	39.25^{c}	36.25^{c}	35.50^{c}	33.81^{c}

contributed for the increased yield in the cow's urine treated plants. Cow's urine is a constituent of *Panchagavya*,which is a biostimulant for enhanced growth and flower production in plants.

The data recorded on monthly flower yield to find out the effect of bioregulators and cow's urine on flower yield in jasmine are presented in Table 2. It is clear from the table that monthly flower production was affected by the application of various bioregulators and cow's urine. There was a reduction of flower yield from January to March, increased during April –May and a reduction in June. After pruning in July, the flower production increased from September to December (Fig. 2, 3 and 4).A direct correlation between yield and temperature has been established in *Jasminum sambac.* In *Jasminum sambac* cv. Gundumalli, a steep rise in yield from February to April (27 and 46%) and gradual decline thereafter was reported by Arumugham *et al.* (2002), other varieties had peak yield in May and June. The results obtained in the present work, with regard to monthly production of jasmine flowers, is in conformity with these findings.

Conclusion:

There is always a good demand for jasmine flowers in Kerala and *J. Sambac*, commonly known as "bush jasmine", is the most preferred one. Even though some farmers are cultivating jasmine in Kearla, there are certain constraints hampering the cultivation, one of which is the low production. The present study indicated that flower production in jasmine can be enhanced by the application of bioregulators. Application of GA_3 20ppm and cycocel 1000ppm during February to May at monthly intervals enhanced the flower production from September to December. Due to the high cost involved in the purchase of cycocel as well as reduced availability of the chemical, application of GA_3 20ppm is recommended for enhanced flower production in jasmine on the basis of the present study. The result of the study is highly useful for the farmers.

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