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Effect of Paclobutrazol on growth, flowering and maturity of pigeonpea (*Cajanus cajan* (L.) Millsp) under Konkan conditions

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Abstract: *Paclobutrazol at different concentrations were applied through foliar spray, soil application (50, 75,100 ppm) at 30, 60 and 90 DAS and seed soaking with 50,100,150 ppm at the time of sowing. The experiment consisted of sixteen treatments laid out in randomized block design with two replications. Among the treatments seed soaking with paclobutrazol @ 100 ppm recorded significant difference on growth, flowering and maturity of pigeonpea as compared to other treatments. The plant height decreased significantly due to application of paclobutrazol and the extent of reduction was more in the treatment seed soaking with paclobutrazol @ 150 ppm. Growth period of the crop significantly reduced with the application of paclobutrazol. The number of days required for flower initiation, pod initiation, days to 50 % flowering and days to maturity significantly reduced with the application of paclobutrazol and the effect was earlier in seed soaking with paclobutrazol @ 100 ppm.*

Keywords: *Paclobutrazol, Pigeonpea, growth, flowering, maturity*

INTRODUCTION

Pigeonpea is an important pulse crop in semi-arid tropics of Andhra Pradesh and Maharashtra states. It is a versatile crop and is ideally suited for drought prone areas. It is endowed with diverse useful characteristics and is a multipurpose crop. Its area and production, however, are highly fluctuating year after year on account erratic, scanty and uneven rainfall; high infestation of pests and diseases and highly varying market prices. Being a drought tolerant crop, pigeonpea is being raised as a sole main crop in Andhra pradesh state, while it is grown as an inter-crop and subsidiary crop in Maharashtra state with cotton, sorghum and green gram as the main crops.

India is largest producer of pigeonpea constituting 75 per cent of world production. In India, pigeonpea is grown over an area of about 36.3 lakh hectares. India had produced 27.6 lakh tonnes pulses during *Kharif* 2010-11. The production of tur in India is approximately 2.76 million tonnes (Anonymous 2010-11). The average productivity of the country is about 760.33 kg ha^{-1} against the average global productivity of 857 kg ha^{-1}. (Anonymous, 2011). Maharashtra contributes 39.24 per cent and remaining states contributes 60.76 per cent of total output in the country. In Maharashtra, pigeonpea is grown over an area of about 1.17 million hectares. (Anonymous, 2011).

New agricultural development policies and programmes have increased production paved the way for 'Green Revolution'. Yet is also facing the problems of imbalances in cropping pattern which is evident from the fact that pulses declined from 16.7 percent in 1950-51 to 8.6 percent in 1885-86. Over past four decades the area (21 to 23 million ha) production (10 to 13 million tonnes) and productivity 457-547 kg ha^{-1} (Anonymous, 1990) of pulses remain static. As result the availability of pulses per capita declined sharply.

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Similarly, pulses including pigeonpea has low harvest index. Improved varieties of pigeonpea have high yield potential, but farmers are not able to realize the potential due to various constraints. The result of frontline demonstrations on farm conducted at various places revealed that, the yield potential of pigeonpea up to 25-30 q ha^{-1}. But the average productivity of this crop is very low in comparison to its potentiality. Panwar and Yadav (1980) recorded yield as high as 26 q ha^{-1} from April planted pigeonpea at Kanpur. Roysharma et al. (1981) recorded yield of late maturity cultivar Basant of pigeonpea was 32.4 q ha^{-1} under Dholi (Bihar) conditions, when sown in September. It is therefore, evident from the above results that pigeonpea has high yield potentiality and also more profitable because of it's comparatively low cost of cultivation and high prices. Among the several constraints attributed for low yield in pulses vegetative biomass uncertain with growth habit with low partioning ability is considered as one of the major physiological constraints in improving yield in pulses.

MATERIAL AND METHODS

The experimental material for the study consisted of one variety of Pigeonpea *i.e.* Konkan Tur-1. The variety was selected on the basis of varied growth duration and yield potential. Paclobutrazol at different concentrations were applied through foliar spray, soil application (50, 75,100 ppm) at 30, 60, 90 DAS and seed soaking with 50,100,150 ppm at the time of sowing. The experiment comprised of single variety of pigeonpea laid out in randomized block design with two replications, provided with sixteen treatments of one growth retardant *i.e.* paclobutrazol at different concentrations. The plot size was 6.1 × 2.2 m^2. Seeds of pigeonpea were sown at spacing of 60 cm between rows and 60 cm between plants.

RESULTS AND DISCUSSION

Significantly the highest mean plant height was found in control *i.e.* T_{16} (204.4), followed by T_7 (203.0 cm), T_8 (202.6 cm), and T_6 (201.8 cm), which were found at par with each other. The lowest mean plant height was recorded with T_{15} (196.38 cm). Paclobutrazol, a prime growth retardant, significantly influence the morphological characters. Some researchers found the similar effects with other growth retardants like cycocel and mepiquat chloride by Koli (2008) in rice and Singh *et al*. (2009). In pigeonpea, plant height decreased significantly due to application of growth retardants and the extent of reduction was more in the treatment foliar application paclobutrazol @ 100 ppm by Sul (2012).

The data showed that, the number of days to flower initiation as influenced by different concentrations of paclobutrazol showed significant differences. In general, paclobutrazol took lesser days to flower initiation compared to control. Significantly the lowest days to flower initiation was recorded with T_{14} (112). The highest days to flower initiation was recorded in control T_{16} (126).

The days required for pod initiation was differed significantly from each other and control. Significantly the lowest days to pod initiation were recorded with T_{14} (121.73). The highest days to pod initiation was found in control *i.e.* T_{16} (139.69), followed by T_2 (138.34), T_{13} (137.84) and T_7 (133.97), which were found at par with each other.

The number of days to physiological maturity differed significantly among the different treatments. Significantly the highest days to physiological maturity was found in control T_{16} (201.33), followed by T_{13} (198), T_2 (197.44), T_7 (196.94) T_4 (196.28) and T_{10} (196), which were found at par with each other. The lowest days to physiological maturity were recorded with T_{14} (183.94).

Amongst all the treatments, T_{14} (112 days) *i.e.* seed soaking with paclobutrazol @ 100 ppm, T_{12} (116 days) *i.e.* soil application of paclobutrazol @ 100 ppm and T_{15} (116.50 days) *i.e.* seed soaking with paclobutrazol @ 150 ppm at the time of sowing caused significantly early flowering by near about 10-14 days than control and also, pod initiation by 13-18 days. Earliness in flowering by paclobutrazol was reviewed in various crops, like rice by Koli (2008) and in pigeonpea; number of days required for flower initiation and pod initiation, significantly reduced with the application of growth retardants and the effect was earlier in foliar application of paclobutrazol @ 100 ppm by Sul (2012).

Table 1
Effect of paclobutrazol on mean plant height (cm), flower initiation, pod initiation and days to maturity at different growth stages in pigeonpea

Treatments	*Plant height (cm)*	*Flower initiation (Days)*	*Pod initiation (Days)*	*Days to maturity*
T_1	201.32	123.00	131.56	195.00
T_2	200.48	125.00	138.34	197.44
T_3	199.10	122.50	132.45	194.28
T_4	200.92	123.00	133.06	196.28
T_5	200.41	119.50	130.23	190.33
T_6	201.78	117.50	127.78	190.28
T_7	203.00	124.50	133.97	196.94
T_8	202.60	120.00	131.22	191.50
T_9	200.17	120.50	131.45	193.33
T_{10}	198.53	124.00	132.83	196.00
T_{11}	200.59	118.00	129.19	192.67
T_{12}	199.61	116.00	126.78	187.17
T_{13}	199.72	125.50	137.84	198.00
T_{14}	198.16	112.00	121.73	183.94
T_{15}	196.38	116.50	127.45	190.00
T_{16}(control)	204.35	126.00	139.69	201.33
S.E ±	0.88	1.80	1.93	1.79
CD at 5%	2.66	5.43	5.82	5.41

The various morphological characters such as plant height, days to flower initiation, days to pod initiation and days to physiological maturity significantly influenced by paclobutrazol. Among the various treatments tried, T_{15} (seed soaking with paclobutrazol @ 150 ppm at the time sowing) performed better for reducing plant height (196.38 cm), followed by treatment T_{14}, T_{10}, T_3, T_{12} and T_{13}.

CONCLUSION

From the present investigations, it could be stated that paclobutrazol have the ability to shorten the vegetative growth of the pigeonpea crop. Amongst all paclobutrazol treatments tried, seed soaking with paclobutrazol @ 100 ppm significantly shortened the growth, flowering and maturity period of the pigeonpea crop under Konkan condition.

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