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RESEARCH ARTICLE

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Effect of bio-regulators on the yield of greengram

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ABSTRACT

An experiment was conducted at Millet Breeding Station, TNAU, Coimbatore during *Kharif* (July, 2006 - October, 2006) in CO 6 greengram with nine different treatments. The yield and yield components were significantly increased by the application of chemicals and bioregulators. Various yield components such as days to 50 per cent flowering, days to maturity, number of clusters per plant, number of flowers per plant, number of pods per cluster, number of pods per plant, fertility co-efficient, number of seeds per pod, pod weight per plant, seed weight per plant, seed - pod ratio, pod length, hundred seed weight, grain yield per plot, grain yield per hectare and harvest index were favourably enhanced by the foliar spray of 0.1% humic acid with 0.1 ppm brassinosteroid treatment.

KEY WORDS : Bio regulators, Greengram, Yield

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INTRODUCTION

Pulses occupy a strategic position in intensive as well as subsistence agriculture, as they are excellent source of dietary protein for millions of people, nutritious feed for livestock and a mini nitrogen plant having profound ameliorative effect on the soil. Green gram is extensively grown in all types of soil under varying climatic conditions. Greengram is considered as the most whole some among pulses, free from heaviness and flatulence. The green pods are used as vegetable and haulms are used as fodder. On an average, the biomass has 1.5 % N on fresh weight basis, serving as a good source of animal feed. Flower and pod shedding is a common problem in greengram. There is also a possibility to overcome these constraints by foliar application of bio-regulators at the pre-flowering stage, which is one of the latest trends in agriculture. These bioregulators includes humic acid (HA), naphthalene acetic acid (NAA), benzyl adenine (BA), salicylic acid (SA), brassinosteroid (BR) etc. These plant growth regulators (PGRs) in general, help to increase the number of flowers on the plant when applied at the time of flowering. The flower and pod drop may be reduced to some extent by spraying various growth regulators on foliage (Ramesh and Thirumuguran, 2001). The foliar application of PGRs and urea significantly increased seed yield per plant (Patil *et al*., 2005). The HA increased the yield of plants more especially, with insufficient nutrient supply than with optimum nutrient supply (Pagel, 1960). The NAA is one of the important synthetic, stable and also widely used form of auxins. Auxins had been very effective in promoting growth and development in pulse crops. Upadhaya (1994) reported that foliar spray of NAA at bud initiation and pod formation stage of chick pea increased plant height, number of branches, number of flower bud, number of flowers and yield. The main role of NAA rests with the efficient transport of sugars from the photosynthesizing parts of the plant (source) to the developing grains (sinks) and also facilitating nitrogen accumulation that probably result in higher total dry matter production. Foliar spray of 25 ppm NAA recorded significantly higher seed yield by 21to 22 per cent than control through increased flower production, clusters per plant, pod setting percentage and pods per plant in mungbean (Patil *et al.,* 2005). Cytokinins are adenine derivatives characterized by an ability to induce cell division in the presence of auxins. Cytokinin improves crop growth and yield through redirecting the metabolic balance of growth, delayed leaf senescence, increased photosynthetic CO_2 uptake and partitioning of assimilates (Brault and

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Maldiney, 1999). Benzyl adenine (BA) is a synthetic cytokinins, which enhance the photosynthetic rate of the plant through the increased LAI, which ultimately resulted in higher DMA. Ramesh and Thirumurugan (2001) reported that foliar spray of 25 ppm BA registered a higher DMA in soybean. Salicylic acid belongs to the group of plant phenolics. A concentration of 100 and 500 ppm of SA affected both seed germination and seedling growth in two blackgram cultivars (*viz.,* CO 5 and T_9), but induced more flowering at 10 and 100 ppm levels, respectively (Anandhi and Ramanujam, 1997). Brassinosteroid is a novel plant growth promoting steroidal lactone which is the most biologically active compound and acting as bioregulators in crop plants. Bindhu (2000) recorded an increased yield in groundnut by the foliar application of BR. Senthil *et al.* (2003) reported that foliar spray of 0.5 ppm BR increased the chlorophyll content in soybean.

MATERIALS AND METHODS

A field experiment was conducted at Millet Breeding Station, TNAU, Coimbatore during *Kharif* (July, 2006 - October, 2006) in green gram (CO 6) with nine different treatments in randomized block design with nine treatments and replicated thrice. Duration of the crop was 75 days. Sowing was done on 20.07.2006 with a spacing of 30 x 10 cm between rows and between plants. The soil was low in available nitrogen and phosphorus content and high in potassium content. The cultural management and plant protection measures were undertaken as and when needed. The treatment details are given below.

Treatment details are as follows : T_1 - Control, T_2 - HA 0.1 % alone, T_3 - HA 0.1 % + 10 ppm Benzyl adenine (BA), T_4 - HA 0.1 % + 100 ppm Salicylic acid (SA), T_5 - HA 0.1 % + 0.1 ppm Brassinosteroid (BR), T_6 - HA 0.1 % + micronutrient mixture, T_7 - HA 0.1 % + micronutrient mixture + 10 ppm Benzyl Adenine (BA), T_8 - HA 0.1 % + micronutrient mixture + 100 ppm SA and T_9 - HA 0.1 % + micronutrient mixture + 0.1 ppm BR

Sprays of 2 % DAP and 40 ppm NAA were common for all the above treatments. Time of sprays: First spray at peak vegetative phase and second spray at 10 days thereafter).

The important components contributing to the yield potential of the crop were recorded from the commencement of flowering to the harvest of the crop. Different yield parameters were recorded and analyzed statistically.

RESULTS AND DISCUSSION

The data collected on various pod characters as well as the yield components are presented in Table 1,2 and 3.

Growth regulator spray on crop growth period had significant influence on the number of clusters per plant. Foliar spray of 0.1 % HA + 0.1 ppm BR spray (T_5) produced significantly more number of clusters per plant (7.7), which was closely followed by the foliar spray of 0.1 % HA + 10 ppm BA (T_3) with comparable value (7.6) (Table 1). The treatment of NAA was effective in increasing the number of clusters per plant (Patil *et al.,* 2005) in greengram. A high correlation was also observed between number of clusters per plant and grain yield in pigeonpea (Dani, 1979). Different treatments had significant influence on the number of pods per cluster which is an important yield component. Higher number of pods per cluster was recorded with the 0.1 % HA + 0.1 ppm BR spray (T_5) (4.1), while the minimum number was rested with control (3.8) treatment (Table 1). Rajavel (2004) pointed out the application of BR significantly

Table 1 : Effect of foliar spray of liquid humic acid with growth regulators on yield and yield components in greengram

Treatments	Days to 50% flowering	Days to maturity	No. of clusters plant^{-1}	No. of flowers plant^{-1}	No. of pods clusters^{-1}	No. of pods plant^{-1}
T_1	30.6	67.5	5.7	74.6	3.8	21.6
T_2	29.8	67.1	6.0	77.3	4.0	23.9
T_3	27.1	65.2	7.6	94.5	4.1	31.2
T_4	27.7	65.5	7.3	92.6	4.1	29.9
T_5	26.3	64.7	7.7	95.5	4.1	31.7
T_6	29.6	67.6	6.2	79.5	4.0	24.7
T_7	28.5	66.6	6.9	89.5	4.1	28.2
T_8	28.9	67.1	6.7	86.8	4.0	26.8
T_9	28.1	66.3	7.4	90.5	4.1	26.6
Mean	28.5	66.4	6.8	86.7	4.0	21.65
S.E.±	0.3	0.8	0.2	1.5	0.1	1.2
C.D. (P=0.05)	0.5	1.9	0.4	3.1	0.3	2.7

influenced the pods per cluster resulting in higher yield in black gram. Maximum number of seeds per pod was recorded by the treatment of 0.1 % HA + 0.1 ppm BR (9.75), which was followed by T_3 (9.48) and was quite comparable. Both the treatments were significantly different from control. Minimum number of seeds per pod was however, produced by the control treatment (6.60) (Table 2). The influence of BA on number of seeds per pod was explained by Upadhyay (1994).

No significant differences were observed in seed - pod ratio due to growth regulator / nutrient sprays. However, treatment T_3 produced higher seed - pod ratio (0.96) which was closely followed by the spray of 0.1 % HA + 0.1 ppm BR (0.93). The least value was recorded by the control (0.84) (Table 2). Ghosh *et al.* (1991) pointed out that the spray of NAA at pre-flowering stage significantly increased the shelling percentage. Similar results were obtained by Gomathi (1996) in mungbean.

The grain yield per plot of green gram was significantly influenced by various treatments tried. Among the treatments, foliar spray of 0.1% HA + BR 10 ppm (T_5) ranked first with higher grain yield per plot of 1047 g plot^{-1}, followed by T_3 (925). This was 23.32 and 8.95 per cent increase over the unsprayed control (849) The grain yield of greengram was significantly influenced by the foliar spray of different growth regulators and nutrients. Significantly higher grain yield/ha was registered (873 kg) with the treatment of 0.1 % HA + 0.1 ppm BR (T_5) in comparison with the control (708 kg). The increased yield in the best treatment was found to be 23.31 per cent over control. Second best treatment was T_3 (771 kg) which was comparable with T_5 (Table 3 and Fig 1). The production of higher seed yield due to growth regulators may be attributed to the fact that plants treated with growth regulators remained physiologically more active to build up sufficient food reserves for developing flowers and seeds. Thus, the plant showed early flower initiation and better seed development which ultimately resulted in higher

Table 2 : Effect of foliar spray of liquid humic acid with growth regulators on fertility co-efficient and pod characters in greengram

Treatments	No. of seeds pod^{-1}	Pod weight plant^{-1} (g)	Seed weight plant^{-1} (g)	Seed / Pod ratio
T_1	6.60	11.24	9.68	0.84
T_2	7.28	11.61	10.58	0.86
T_3	9.48	13.58	12.25	0.96
T_4	8.84	13.26	11.67	0.90
T_5	9.75	13.83	12.55	0.93
T_6	7.58	11.90	10.77	0.87
T_7	8.57	12.51	11.30	0.89
T_8	8.33	12.15	10.94	0.90
T_9	8.74	12.81	11.34	0.90
Mean	8.35	12.54	11.23	0.89
S.E.±	0.14	0.47	0.48	0.03
C.D. (P=0.05)	0.30	0.99	1.02	0.06

Table 3 : Effect of foliar spray of liquid humic acid with growth regulators on yield and yield components in greengram

Treatments	Pod length (cm)	Hundred seed weight (g)	Grain yield (g plot^{-1})	Grain yield (kg/ha)	Harvest index (%)
T_1	5.8	3.28	849	708	26.24
T_2	5.7	3.52	875	729	26.88
T_3	7.1	4.13	925	771	30.57
T_4	6.8	4.05	912	760	30.01
T_5	7.3	4.27	1047	873	31.64
T_6	5.9	3.53	892	743	27.71
T_7	6.5	3.85	907	756	28.85
T_8	6.4	3.79	901	751	28.21
T_9	6.6	3.97	912	760	29.97
Mean	6.4	3.94	916	761	29.24
S.E.±	0.10	0.28	47	57	0.99
C.D. (P=0.05)	0.19	0.59	100	120	2.13

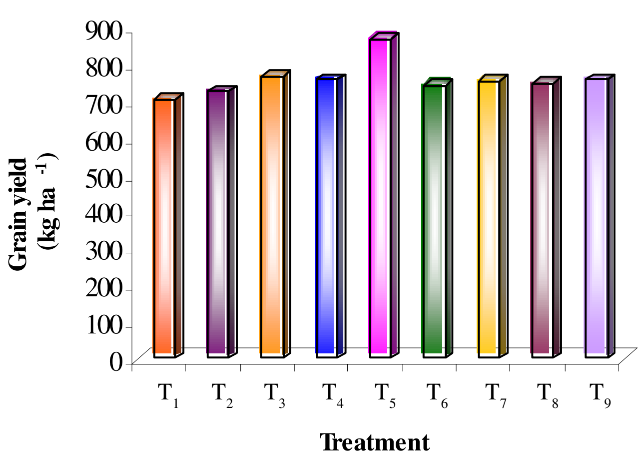

Fig. 1 : Effect of foliar spray of liquid humic acid with growth regulators on grain yield (kg/ha) in greengram

seed yield in the treated plants. Increased grain yield was recorded by BR spray in greengram as reported by Bhatia and Kaur (1997). Application of NAA also enhanced the number of flowers, number of pods per plant, seed yield per plant and hundred seed weight in greengram (Patil *et al.,* 2005).

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