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Influence of foliar application of plant growth promoters on growth and yield of vegetable cow pea [*Vigna unguiculata* (L.) Walp.]

R. CHATTERJEE AND P. CHOUDHURI

Department of Vegetable and Spice Crops
Uttar Banga Krishi Viswavidyalaya, Cooch Behar-736165, West Bengal

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Cow pea [*Vigna unguiculata* (L.) Walp.] belongs to the family leguminosae, is one of the important summer vegetable valued for its proteins, minerals and energy. The crop is gaining popularity among vegetable growers due to higher remuneration and steady market demand. However, poor productivity level with traditional practices impairs wider acceptability of the crop. There is a tremendous scope to increase the current productivity level by adopting innovative practices. Different treatments of plant growth regulants were found effective in increasing the growth and yield parameters through enhanced biomass production and translocation of assimilates toward developing sink. In addition to GA_3 and IAA other orgamic promoters like biozyme (Jangle *et al.*, 2005), humic acid (Liu *et al.*, 1998) and liquid vermicompost (Karuna *et al.*, 1999) are also emerging as plant booster for improving the physiological efficiency of the crop. In light of the fact, the present experiment was undertaken to study the influences of certain plant growth promoters on growth and yield attributes of cow pea and to identify the most suitable growth promoter for better conversion of increased biomass into pod yield.

The study was conducted during pre-kharif season of 2009 and 2010 at Instructional farm of UBKV, Pundibari, CoochBehar, West Bengal ($26^0$19'86" N latitude, $89^0$23'53" E longitude and 43 m MSL above mean sea level). The soil was sandy loam (60, 19, 19% sand, silt and clay respectively) in texture and slight acidic in reaction (pH 5.74). The initial soil organic carbon was 0.86% and available N P K contents were 159.19, 21.26 and 123.12 kg/ha respectively. The cow pea (cv. CP 4) seeds were sown during mid February for both the years in 2.7 × 2.7 m^2 plots with a both way spacing of 45 cm. Seven different growth regulants namely gibberelic acid (GA_3-150 ppm), indole acetic acid (IAA-100 ppm), ethrel (100 ppm), tricontanol (100 ppm), biozyme (100 ppm), humic acid (300 ppm), vermicompost (1:5 dilution) along with control (distilled water) thus eight treatments were laid out in Randomized Block Design with three replications. The experiment field was supplied with well rotten farmyard manure (20 t ha^{-1}) along with recommended dose of fertilizers (50:75:75 kg N P K ha^{-1}) to all plots and the growth promoters were sprayed at 30 and 60 days after planting. The crop was raised adopting standard cultural practices. The observations were recorded on ten randomly selected plants from each plot on different growth and yield characters (Table 1 and 2). The data was analyzed statistically with the help of INDOSTAT statistical package.

Growth parameters

The pooled result revealed that the growth attributes were significantly modified (Table 1) as a result of foliar application of growth substances. Significantly higher vine length (74.23 cm) and chlorophyll content of leaves (52.30 SPAD value) were observed when 150 ppm GA_3 (T_1) was sprayed to plants. GA_3 is involved in both cell division and cell elongation and can stimulate plant tissue resulting in enhanced vegetative growth (Jones, 1979). The maximum leaf area (27.70 cm^2) and LAI (1.06) were registered by the same treatment (T_1). However, both were closely followed by the treatments T_2 (100 ppm IAA) and T_6 (300 ppm humic acid). Higher chlorophyll in leaves might have increased the photosynthesis rate and activated the leaf growth and subsequently the leaf area and LAI of the plant. The early flowering (38.21 days) in the 150 ppm GA_3 (T_1) treated plants might be due to early completion of vegetative growth and better nourishment of plants. Medhi and Borbora (2002) also reported increased vegetative growth, higher biomass production and early flowering of french bean with GA_3 treatment.

Yield parameters

The observation recorded on yield attributes (Table 2) indicated that all the treatments significantly enhanced the yield parameters as compared to control. The highest number of green pods $plant^{-1}$ (31), pod length (24.80 cm) and pod weight (17.47 g) were recorded when GA_3 at 150 ppm (T_1) was sprayed to the plants, however was at par with the foliar application of 100 ppm IAA (T_2) and 300 ppm humic acid (T_6). As a culmination of favourable effect of

Short communication
Email: ranchat22@rediffmail.com

Table 1: Effect of different growth regulants on growth parameters of cow pea (pooled of 2 years)

Treatment	Vine length (cm)	Chlorophyll content (SPAD Value)*	Leaf area (cm^2)*	LAI *	Days to flowering
T_1- 150 ppm Gibberelic Acid	74.23	52.30	27.70	1.06	38.21
T_2- 100 ppm Indole Acetic Acid	72.41	49.31	25.83	0.95	39.85
T_3- 100 ppm Ethrel	63.17	39.12	22.89	0.71	43.28
T_4 - 100 ppm Tricontanol	64.83	41.31	23.24	0.77	43.87
T_5 - 100 ppm Biozyme	67.19	44.26	23.56	0.83	42.75
T_6 - 300 ppm Humic acid	70.21	47.42	25.17	0.91	41.24
T_7 - Vermicompost (1:5 dilution)	62.29	36.51	21.23	0.62	44.26
T_8 - Control (distilled water)	59.53	31.47	18.74	0.49	47.64
SEm (±)	**2.41**	**1.94**	**1.38**	**0.06**	**1.49**
LSD (P=0.05)	**7.12**	**5.71**	**4.06**	**0.17**	**4.32**

*Note : * at 1st harvest*

Table 2: Effect of different growth regulants on yield parameters of cow pea (pooled of 2 years)

Treatment	No. of pods $plant^{-1}$	Pod length (cm)	Pod weight (g)	Pod yield (g $plant^{-1}$)	Pod yield (kg $plot^{-1}$)	Pod yield (t ha^{-1})
T_1- 150 ppm Gibberelic Acid	31.00	24.80	17.47	534.32	18.73	24.86
T_2- 100 ppm Indole Acetic Acid	29.82	23.46	16.41	482.11	17.12	23.07
T_3- 100 ppm Ethrel	27.12	20.41	14.85	396.19	14.18	19.08
T_4 - 100 ppm Tricontanol	27.78	21.17	15.29	420.04	15.06	20.13
T_5 - 100 ppm Biozyme	27.94	20.89	15.46	424.18	15.16	20.42
T_6 - 300 ppm Humic acid	29.23	23.06	16.12	462.07	16.43	22.14
T_7 - Vermicompost (1:5 dilution)	25.93	19.39	14.69	376.12	13.47	18.11
T_8 - Control (distilled water)	25.67	18.57	14.54	368.28	13.18	17.64
SEm (±)	**0.64**	**0.61**	**0.45**	**26.13**	**0.79**	**0.99**
LSD(0.05)	**1.88**	**1.79**	**1.31**	**77.67**	**2.34**	**2.92**

major yield components the highest pod yield (534.32 g $plant^{-1}$ and 24.86 t ha^{-1}) was recorded by the treatment T_1 (GA_3 at 150 ppm) followed by T_2 and T_6. The lowest pod yield (368.28 g $pant^{-1}$ and 17.64 t ha^{-1}) was obtained from the control plot (T_8). Improvement of cow pea yield with GA_3 treatment was earlier reported by Borkar *et al.* (1991).Application of growth regulators (GA_3 and IAA) encourages rapid growth and higher accumulation of net photosynthesis and subsequently synthesized more C:N ratio that promote early initiation of reproductive phase. Again foliar application of GA_3 had emerged as highly efficient in production and translocation of assimilates to the developing sink. The increased availability of assimilates might have accelerated the formation of more flower buds, number of pods and subsequently produced higher pod yield. Foliar spray of indole acetic acid (100 ppm) and humic acid (300 ppm) emerged as second and third best option for most of the growth and yield attributes. Considering the growth attributes, yield attributes and pod yield, it may be concluded that for high production of summer season vegetable cow pea foliar spray of gibberelic acid (150 ppm) at 30 and 60 days of planting may be practiced for terai zone of West Bengal.

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