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Effect of bio-regulators and their time of application on growth and yield of coriander (*Coriandrum sativum*)

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Abstract

The effect of plant growth regulators and their time of application on growth and yield of coriander was studied during 2004-06 at Regional Agricultural Research Station, Lam, Guntur, Andhra Pradesh. Bioregulators used were NAA (10 & 50 ppm) and triacontonol (e 0.5 ml and 1 ml/ litre). Triacontanol @1.0ml/lt recorded maximum plant height, more number of branches and more number of umbellets per umbel. NAA @10ppm recorded more number of umbels per plant and increased crop duration. Maximum seed yield was recorded with NAA @10ppm followed by Triacontanol @1.0ml/lt. With regard to number of sprays two sprays at 40 and 60 DAS recorded maximum seed yield, compared to one spray at 40 DAS or three sprays at 40, 60 & 80 DAS.

Key words: coriander, *Coriandrum sativum*, NAA, Triacontanol, growth, yield
Abbreviations: DAS - Days after sowing, NAA - Naphthelene acitic acid

There is a lot of potential for coriander seed spices in our country because of the export potential and daily internal consumption as it finds place in almost all the Indian dishes. Approximately, 21000 MT of coriander is exported every year, earning a foreign exchange worth Rs. 7104 lakhs (Vasistha and Malhothra, 2005). Coriander (*Coriandrum sativum*) is an important seed spice in Andhra Pradesh grown in rabi season for grain purpose under rainfed conditions in vertisols. The crop has to survive under residual soil moisture throughout the cropping period and it generally experiences terminal moisture stress which results in poor yields. This is the major constraint in production of coriander in Andhra Pradesh. Bioregulators play an important role in mitigating the stress and increasing the flower set. Foliar application of Triacontanol is known to enhance dry matter accumulation resulting in higher seed yield in maize. Application of NAA is known to induce higher physiological efficiency including photosynthetic ability of plants. It has also been shown to enhance growth and yield of several vegetable and agricultural crops without substantial increase in the cost of production. Information regarding the use of plant growth regulators and their time of application suitable for rainfed vertisols in Andra Pradesh is not available. Keeping this in view the field experiment was conducted to study the effect of plant growth regulators and their time of application on growth and yield of coriander.

The present study was conducted for three years during rabi season of 2004-2005, 2005-06 and 2006-07 at RARS, Lam, Guntur in

vertisols in FRBD consisting of number of sprays as one factor (spraying once at 40 DAS, 40 and 60 DAS, 40, 60 and 80 DAS and spray chemicals (triacontanol- @ 0.5ml, and - 1ml/ lt, NAA- @ 50 and 10 ppm, water spray & control). Sowing was taken on 19th October 2004, 11th November 2005 and 17th November 2006 with seed rate @ 30 kg/ha. The experiment was conducted by direct sowing with seed drill at a spacing of 30 cm. Plant to plant distance was maintained at 10 cm. The plot size was 4 x 2.4 sq. m. The experimental soil was medium in available N (238 kg ha^{-1}), medium in available P_2O_5 (29 kg ha^{-1}) and high in exchangeable K_2O (971 kg ha^{-1}). The recommended dose of fertilizers (30 kg N, 40 kg P_2O_5 and 20 K_2O) were applied as basal dose. Need based cultural and plant protection operations were taken up to harvest good crop. Five plant samples for each replication was selected at random to record data. The data were recorded on plant height (cm), number of primary branches per plant, number of secondary branches per plant, days to 50% flowering, days to maturity, number of umbels per plant, number of umbellets per umbel and seed yield (kg per ha). The data collected for three years was subjected to statistical analysis individually year wise as well as pooled over three years.

Growth regulators significantly influenced the plant growth, yield and yield attributing characters of coriander. (Tables 1 and 2.)

Among the different growth regulators used under present investigation, triacontanol @ 1ml/lt recorded maximum plant height (70.5 cm) wich was on par with Triacontanol @ 0.5 ml/lt (68.9 cm) and @ NAA 10 ppm (67.9 cm). There was no significant influence of number of sprays on plant height. Similar trend was observed with respect to number of primary branches. Triacontanol @ 1ml/lt recorded significantly more number of branches (6.2) than all other treatments. Number of sprays had no influence on the number of branches. These results are in agreement with findings of Verma and Sen (2006) and Meena et al. (2006) in coriander. The increase in vegetative growth due to application of plant growth regulators may

Table 1. Effect of Bioregulators on growth of coriander

S.No.	Plant height (cm)	No.of Primary Branches	No. of secondary branches	No. of umbels per plant	No.of Umbellets per umbel
Triacontanol 0.5 ml/lt	68.9	5.9	14.0	20.8	5.4
Triacontanol 1.0 ml/lt	70.5	6.2	15.6	21.8	5.6
NAA 10 ppm	67.9	6.1	16.0	22.6	5.5
NAA 50 ppm	63.5	5.9	15.7	20.8	5.3
Water Spray	62.4	5.1	14.6	17.8	4.9
Control	60.2	4.9	13.7	16.9	4.8
CD (Factor1)	3.18	0.67	NS	2.7	0.44
40 DAS	65.1	5.3	14.8	19.5	5.2
40 & 60 DAS	65.8	5.9	14.8	20.2	5.3
40, 60 & 80 DAS	65.9	5.8	15.2	20.6	5.3
CD (Factor2)	NS	NS	NS	NS	NS
Interaction	NS	NS	NS	NS	NS
CV	5.1	12.39	14.3	14.02	8.7

be attributed to the enhanced physiological activities like cell division, cell elongation, photosynthesis and translocation of nutrients and photosynthates (Paleg, 1965, Mohammed, 1975 and Saxena, 1989). However, these parameters were not studied in the present experiment.

Number of sprays had no significant influence on the number of days to 50% flowering and maturity. Triacontanol @ 1ml/lt recorded maximum number of days to reach 50% flowering (49.4) which was on par with NAA 10 ppm (48.9) and triacontanol @ 0.5 ml/lt (48.6). NAA @ 10 ppm recorded maximum number of days to reach maturity (87.9), which was on par with triacontanol @ 1ml/lt (87.5) and triacontanol @ 0.5 ml/lt (87.4). Number of umbels per plant was highest with NAA @ 10 ppm (22.6) which was on par with triacontanol @ 1ml/lt (21.8) and triacontanol @ 0.5 ml/lt (20.8). triacontanol @ 1ml/lt recorded significantly more number of umbellets per umbel (5.6) which was on par with NAA @ 10 ppm (5.5), triacontanol @ 0.5 ml/lt (5.4) and NAA @ 50 ppm (5.0). Number of sprays had no significant influence on umbels per plant and umbellets per umbel. The increase in yield attributing characters due to application of plant growth regulators may be due to the stimulatory effect of growth regulators which induce large number of reproductive sinks leading to greater activity of carboxylating enzyme (ribose-1, 5-di phosphate carboxylase) thus resulting in higher photosynthetic rates with greater translocation and accumulation of metabolites in the sink (Nehara *et al*., 2006). The favourable hormonal balance maintained at cellular level on NAA application might also have greater photosynthetic efficiency and enzymatic activity through the production of endogenous auxin. Such as a mechanism may be operating in coriander also.

Maximum seed yield was recorded with NAA @ 10 ppm (848 kg/ha) followed by triacontanol @ 1ml/lt (830 kg/ha). With regard to number of sprays 2 sprays at 40 and 60 DAS recorded maximum seed yield (698 kg/h). These findings are in conformity with results obtained by Amrutavalli (1979), Verma

Table 2. Effect of bioregulators on yield attributes and yields of coriander

S.No.	No. of umbels per plant	No. of umbellets per umbel	Days to 50% flowering	Days to maturity	Yield/ha	BC Ratio
Triacontanol 0.5 ml/lt	20.8	5.4	48.6	87.4	799	2.84
Triacontanol 1.0 ml/lt	21.8	5.6	49.4	87.5	830	2.99
NAA 10 ppm	22.6	5.5	48.9	87.9	848	3.11
NAA 50 ppm	20.8	5.3	48.3	87.0	729	2.50
Water Spray	17.8	4.9	47.0	85.9	721	2.51
Control	16.9	4.8	46.8	83.9	692	2.46
CD (Factor1)	2.7	0.44	0.85	1.204	39.5	
40 DAS	19.5	5.2	48.2	86.4	689	2.57
40 & 60 DAS	20.2	5.3	48.3	86.7	698	2.91
40, 60 & 80 DAS	20.6	5.3	48.1	86.8	689	2.73
CD (Factor2)	NS	NS	NS	NS	27.9	2.61
Interaction	NS	NS	NS	NS	NS	
CV	14.02	8.7	1.83	1.45	5.4	

and Sen (2006) in coriander, Nehara *et al.* (2006) and Jain *et al.* (1988) in fenugreek, Meenaria and Maliwal (2007) in fennel who reported higher vegetative growth, and increased yield attributes resulting in maximum seed yield due to plant growth regulators application. The increase in yield due to the application of growth regulators may be attributed to the better efficacy of sink under the influence of growth regulators. Evans *et al.* (1972) reported the involvement of growth regulating substances with sink efficiency in influencing the yield potential. It is evident from the study that water spray and control registered significantly lower yields than growth regulator sprays which indirectly indicates that seed yield is the manipulation of morphological, physiological and growth parameters as reported by Channakesava *et al.* (2007)

The present study indicated that application of NAA 10 ppm/Triacontanol @ 1ml/lt twice at 40 and 60 DAS resulted in increased yield. The same can be practiced by farmers to obtain better yields in coriander.

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