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Role of plant growth regulators on the growth and yield of coriander (*Coriandrum sativum* L.)

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ABSTRACT

A field investigation was carried out during 2014-15 and 2015-16 at the Horticultural Research Station, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal to study the role of plant growth regulators on the growth and yield of coriander. The experiment consisting of 6 plant growth regulators along with concentration (GA_3 25 and 50 ppm, NAA 50 and 75 ppm and IAA 10 and 20 ppm) making six treatment combinations altogether, replicated four times in Randomized Block Design. The study revealed that among the plant growth regulators, GA_3 @ 50 ppm performed better than all the other growth regulators for plant height, number of primary and secondary branches per plant, number of umbels per plant, number of umbellets per umbel, number of seeds per umbel, seed yield, oleoresin and essential oil and took minimum number of days to 50% flowering and maturity followed by NAA @ 75 ppm.

Keywords: Coriander, growth, plant growth regulators, yield

Coriander is one of the earliest and most important seed spices known to mankind and is acclaimed throughout the globe for its enormous uses for seeds as well as for leaf purpose (Hnamte *et al.*, 2013). It is native of Mediterranean region and belongs to the family Umbeliferae. Besides being used as spice it has several medicinal values and recently gaining momentum as an important value added export item in the global market. It is also one of the most important seed spice with respect to export and foreign exchange earnings in India (Peter *et al.*, 2006).

Coriander is sown as a cool season crop for commercial seed production, but the average productivity is much less as compared to other coriander producing states (Panda *et al.*, 2007). In West Bengal coriander is mostly grown in marginal type of land. This may certainly have its impact on growth, yield as well as quality of the crop. To mitigate the problem, use of plant growth regulators may be one of the best possible way in affecting production and productivity as they provide an immediate impact on crop improvement programmes and are less time consuming. Gibberellic acid is found to induce stem and internode elongation, flowering and fruit setting and growth. Application of naphthalic acetic acid (NAA) is also known to induce higher physiological efficiency including photosynthetic ability of plants. Plant growth regulators leads also to better growth and yield without substantial increase in the cost of production. Therefore standardizations of levels of growth regulators determine the growth, yield and quality of coriander. Hence, keeping in view the above, the present investigation was undertaken to study the role of plant growth regulators like GA_3, IAA and NAA in the growth, development, yield and quality of coriander.

MATERIALS AND METHODS

The present experiment was undertaken during the *rabi* (winter) season for two consecutive years *i.e.*, 2014-15 and 2015-16 at the Horticultural Research Station, Mondouri, BCKV, West Bengal (23.5^{0}N and 89^{0}E longitude, with an altitude of 9.75 m above the mean sea level). The soil of the experiment field was Entisol with sandy clay loam texture (54.20% sand, 30.50% silt and 15.30% clay), slightly acidic to neutral in reaction (pH 6.9) and with good water holding capacity, well drained with moderate soil fertility status. The maximum and minimum temperature during the crop-growing season was 32.5 and 11.16ºC during 2014–15 and 33.23 and 9.85°C during 2015–16 respectively. The total rainfall received during the crop growing season of 2014–15 and 2015–16 was 29.7 and 4.06 mm respectively. The experiment consisting of 6 plant-growth regulators along with concentration (GA_3 25 and 50 ppm, NAA 50 and 75 ppm and IAA 10 and 20 ppm) making six treatment combinations altogether, replicated four times in Randomized Block Design. Seeds were sown in the plot of 1 × 1.5 m at spacing of 30 × 10 cm. The recommended dose of fertilizers (20 t FYM, NPK

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@ 30: 40: 20 kg ha^{-1}) was applied as basal dose. The remaining dose of N was split into two and applied 30 and 60 days after sowing. Growth regulators were applied as foliar spray at 45 DAS as per the treatments. The data were recorded on the morphological, yield and quality attributing characters.

RESULTS AND DISCUSSION

Morphological characters showed significant variation with different concentrations of growth regulators (Table1). Among various treatments GA3 at 50 ppm recorded the highest plant height at 30 DAS (35.43 cm), 60 DAS (69.22 cm) and at harvest (78.09 cm). These number of primary and secondary branches $plant^{-1}$ was maximum with the application of GA3 50 ppm (5.61 and 11.67 respectively) followed by NAA @ 75 ppm (5.03 and 11.20). The results are in conformation with Verma and Sena, (2006) and Singh *et al.,* (2012) in coriander. Days to 50 per cent flowering and maturity decreased gradually with an increasing level of GA_3 which indicated its involvement in transition of vegetative apices to floral apices. The yield, yield attributing characters showed significant variation among the different concentrations of GA_3, NAA and IAA (Table 2). Application of GA_3 50 ppm was found to be the best for various yield attributing characters such as number of umbels $plant^{-1}$ (26.78), number of umbellets $umbel^{-1}$ (5.47), and number of seeds $umbel^{-1}$ (25.55). The projected seed yield $plant^{-1}$ and seed yield ha^{-1} was maximum with GA_3 50 ppm (6.69 g and 1.59 t ha^{-1}, respectively). Similar findings of the seed yield per plant were found by Rohamare *et al.,* (2013) in Ajwain. The essential oil and oleoresin content in seeds was highest in GA_3 50 ppm (0.33% and 3.77%, respectively). The above results are in conformity with the findings of Meena *et al.,* (2006), Panda *et al.,* (2007) and Singh *et al.,* (2012) in coriander.

From the results it can be concluded that different concentrations of both GA_3 and NAA significantly influenced growth parameters, seed yield and yield attributing characters and quality parameters. However, 50 ppm GA_3 was found to be superior followed by NAA 75 ppm.

Table 1: Effect of PGRs on the morphological parameters of coriander.

Treatment (ppm)	Plant height 45 DAS (cm)	Plant height 90 DAS (cm)	Plant height at harvest (cm)	Primary branches $plant^{-1}$	Secondary branches $plant^{-1}$	Days to 50% flowering
GA_3 25	12.03	64.89	80.61	5.04	10.78	57.86
GA_3 50	12.63	69.45	83.71	5.61	11.67	55.64
IAA 10	10.89	59.49	75.89	4.57	9.46	65.31
IAA 20	11.22	59.94	76.84	4.57	9.97	64.11
NAA 50	11.84	65.32	78.88	4.90	10.45	61.83
NAA 75	12.36	67.40	81.73	5.03	11.20	59.80
SEm±	**0.07**	**0.99**	**0.62**	**0.13**	**0.11**	**0.58**
CD(0.05)	**0.20**	**3.98**	**2.49**	**0.37**	**0.32**	**1.76**

Table.2: Effect of PGRs on the yield and yield attributing and quality parameters of coriander

Treatment (ppm)	Umbels $plant^{-1}$	Umbellets $umbel^{-1}$	Seed $sumbel^{-1}$	Seed yield ha^{-1}	Days to maturity	Essential oil (%)	Oleoresin (%)
GA_3 25	25.03	4.99	23.53	1.42	93.87	0.31	3.22
GA_3 50	26.78	5.47	25.55	1.59	92.06	0.33	3.77
IAA 10	22.13	4.69	21.13	1.12	96.97	0.27	2.90
IAA 20	21.59	4.81	22.04	1.18	96.10	0.28	3.05
NAA 50	21.92	4.85	22.38	1.40	94.99	0.29	3.11
NAA 75	24.90	5.17	23.54	1.49	92.84	0.32	3.14
SEm (±)	**0.71**	**0.06**	**0.55**	**0.04**	**0.26**	**0.003**	**0.05**
LSD(0.05)	**0.06**	**0.19**	**1.60**	**0.13**	**0.80**	**0.008**	**0.15**

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