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Shriya Rai
Ph.D. Scholar, Vegetable Science, Department of Horticulture, College of Agriculture, Gwalior, Madhya Pradesh, India

Dr. Karan Vir Singh
Scientist, Horticulture, Directorate of Extension Services R. V. S. K. V. V, Gwalior, Madhya Pradesh, India

Dr. Arjun Kashyap
Assistant Professor, Contractual, Department of Horticulture, College of Agriculture, Gwalior, Madhya Pradesh, India

Priyanka Gangale
Ph.D. Scholar, Vegetable Science, Department of Horticulture, College of Agriculture, Gwalior, Madhya Pradesh, India

Corresponding Author:
Shriya Rai
Ph.D. Scholar, Vegetable Science, Department of Horticulture, College of Agriculture, Gwalior, Madhya Pradesh, India

Effect of PGRs, sowing time and varieties on growth of coriander *(Coriandrum sativum* L.) under gird region conditions

Shriya Rai, Dr. Karan Vir Singh, Dr. Arjun Kashyap and Priyanka Gangale

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Abstract
The present investigation entitled *"*Influence of PGRs, sowing time and varieties on growth of coriander *(Coriandrum sativum* L.)*"* The present experiment was laid out in the experimental field of department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.) during first year (2018 – 19), second year (2019 – 20) and pooled with 24 treatment combinations that were laid out in split plot design and replicated three times. Sowing time and varieties were assigned to main plots whereas, plant growth regulators to sub plots. The observations were recorded on different aspects of leaf area per plant, leaf area index, crop growth rate, relative crop growth rate, days taken to first flowering and days taken to 50% flowering. The result of experiment revealed that the D_1 (last week of December) significantly improved growth parameters among all the date of sowing D_2 (first week of January) and variety V_1 (RCr-41) was significantly always affected the all growth parameters, whereas PGRs T_3 (Thiourea @ 1000 ppm) enhanced all the growth parameters at different growth stages.

Keywords: *Coriandrum sativum*, PGRs, Gwalior

Introduction
Coriander (*Coriandrum sativum* L.) popularly known as "Dhania" is one of the oldest seed spices used by the mankind. It is the most widely used condiment throughout the world. It is mainly grown for its aromatic and fragrant seed which is botanically a cremocarpic fruit. The fresh green stem leaves and fruits of coriander have a pleasant aromatic odour. The pleasant aroma in the plant is due to an essential oil called 'coriandrol' ranges from 0.1 to 1.3 per cent in dry seeds. The oil of coriander seeds is a valuable ingredient in perfumes, cosmetic products, soup, candy, cocoa, chocolate, meat products, soft drinks and alcoholic beverages. Good quality oleoresin can be extracted from coriander seed which is used for flavouring beverages, sweets, pickles, sausages, snacks, etc. Coriander bark oil has high germicidal activity and can be used as fungicide (Krishna, 1999) [11]. The entire young plant is used for flavouring curried dishes of all sorts and chutney. Coriander leaves are also rich source of vitamin C (125-250 mg/100g) and vitamin A (5200 IU/100 g). In medicines, its seed is used as a carminative, refrigerant and diuretic. The dry seeds of coriander contain 0.3 per cent essential oil, 19.6 per cent non-volatile oil, 24 per cent carbohydrates, 5.3 per cent mineral matter and 175 IU/100 g vitamin A.
Brassinosteroids are a new group of plant hormones with growth promoting activity (Mandava, 1988) [12]. Brassinosteroids are considered as plant hormones with pleiotropic effects as the influence on developmental processes of plants such as growth, seed germination, flowering, senescence, abscission and maturation (Sasse, 1999) [21]. Brassinosteroids improve the resistance in plant against environmental stresses such as water, salinity, low and high temperature stresses (Rao *et al*., 2002) [16] and it also enhances the crop productivity. Thiourea is a sulphydral compound which contains one-SH group and has been known to bring marked biological activity in plants. Use of thiourea as plant growth regulator (Sahu and Solanki, 1991) [18] may be helpful in this regard. Foliar spray of thiourea have been reported not only to improve growth and development of plants, but also the dry matter partitioning for increased grain yield (Arora, 2004) [4].

Application of naphthalic acetic acid (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 vegetables and agricultural crops without substantial increase in the cost of production (Sarada *et al*., 2008) [20]. Coriander variety RCr-41 is an important variety of Rajasthan covering large area and is recommended for normal sowing time. However, the early growth of variety is very slow and the maturity generally coincides with high temperature. Similarly, varieties RCr-435 and RCr-480 are also suitable for normal conditions and also cover a large area of state.

Material and Methods

The present experiment was laid out in the experimental field of department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.). The experiment comprised of two sowing time, two varieties and six plant growth regulators. Thus, there were 24 treatment combinations that were laid out in split plot design and replicated three times. Sowing time and varieties were assigned to main plots whereas, plant growth regulators to sub plots. The treatments were randomly allotted to the plots as shown in plan of layout using Fisher's random number table (Fisher, 1963) [8].

Result and Discussion

Among morphological characters, leaf area per plant, leaf area index, crop growth rate and relative growth rate were studies in coriander. On the basis of two year mean the pooled average was observed that the maximum plant height and fresh weight of leaves were recorded in D_1 (Last week of December), while the minimum data were recorded in D_2 (First week of January) in all growth stages. Results revealed that D_1 sown crop recorded significantly higher leaf area/plant (6.89, 6.98 and 6.94), leaf area index (0.3710, 0.373 and 0.371), dry matter accumulation (0.0490, 0.0498 and 0.0494) and crop growth rate (1.03, 1.04 and 1.04) as compared to D_2 and relative growth rate (89.11, 89.18 and 89015) was significantly higher found in D_2 as compared to D_1 at 60 DAS. It indicates that in D_1, the capability of the levels was more pronounced to produce dry weight as compared to D_2. The improvement in these growth indices might have contributed to higher biomass at harvest when crop was sown at D_1 date compared to D_2. Similar results in coriander crop due to dates of sowing were also reported by Meena *et al*. (2006) [14], Bhadkariya *et al*. (2007) [7] and Balai and Keshwa (2010) [6].

On the basis of two year mean the pooled average was observed that the earliest first flowering (54.93, 55.00 and 54.96) and 50 % flowering (65.21, 65.31 and 65.26) were recorded in D_1 (Last week of December), while the late first flowering (55.68, 55.76 and 55.72) and 50 % flowering (66.77, 66.86 and 66.81) were recorded in D_2 (First week of January). It might be due to on sowing time the temperature was not lower than D_2. It was helpful to early and better germination and growth on later growth stages crop was not suffer from higher temperature, while on date D_1 showed minimum days taken compared to D_2 because of low temperature at early stage and high temperature at terminal phase of the crop might have adversely affected the growth of each developing structure. The findings are in close harmony with the result of Khoja (2004) [10] and Murthy and Swamy (1989) [15].

Performance of varieties

Results also revealed that variety RCr-435 gave significantly higher leaf area/plant (6.97, 7.05 and 7.01), leaf area index (0.378, 0.382 and 0.380) and crop growth rate (1.05, 1.05 and 1.05) as compared to RCr-41 and relative growth rate (89.54, 89.54 and 89.51) was significantly higher found in RCr-41 as compared to RCr-435 at 60 DAS. The improvement in these growth parameters might be due to more interception and absorption of radiant energy, resulting into greater photosynthesis and finally dry matter accumulation (0.0496, 0.0503 and 0.0499) was recorded in RCr-435 however the maximum relative growth rate (89.48, 89.54 and 89.51) was recorded in RCr-41 It is established that for realizing growth potential of a plant to the full extent, its life cycle should match with the growing season and timing of its major growth stages should coincide with required sequence of weather conditions. Thus, the inherent capabilities of varieties RCr-435 with enhanced vegetative growth with optimum duration available under prevailing climatic conditions might have helped the plants to efficiently utilize prevailing climatic conditions. Varieties RCr-435 gave more number of branches and dry matter as compared to RCr-41 (AICRPS, 2008, 2011 and Balai and Keshwa 2010) [6, 1-3].

On the basis of two year mean the pooled average was observed that the earliest first flowering (54.39, 54.45 and 54.42) and 50 % flowering (64.49, 64.59 and 64.54) were recorded in variety RCr-435, while the late first flowering (56.22, 56.31 and 56.27) and 50 % flowering (67.48, 67.57 and 67.53) were recorded in variety RCr-41. It is an established fact that growth, development and yield potential of crop/ variety is an outcome of genomic, environmental and agronomic interactions. Since, both the varieties were grown under identical agronomic (management) practices and environmental conditions; the observed variation in overall growth of varieties seems to be due to their genetic milieu. The findings are in close harmony with the result of AICRPS (2010) [2] and Velayudham (2004) [24].

Effect of plant growth regulators.

The positive effect on leaf area per plant (6.95, 7.03 and 6.99), leaf area index (0.378, 0.381 and 0.379), dry matter accumulation (0.0496, 0.0503 and 0.0499) and crop growth rate (1.4, 1.05 and 1.05) were recorded in T_3 (Thiourea @ 1000 ppm) were also provided a clue to such a possibility that thiourea might have resulted into creation of more photo synthetically active leaf area for longer period during vegetative and reproductive phases, resulting to more absorption and utilization of radiant energy which ultimately led to higher dry matter accumulation, number of branches and plant height. These findings are in close conformity with the results of Sahu *et al*. (1993) [19] who observed that foliar spray of 1000 ppm thiourea significantly increased the LAI and number of leaves in maize. Thus, thiourea treated crop showed more leaf area available for photosynthetic translocation towards sink. This might have been due to improved phloem loading of assimilates under the influence of thiourea spray, most probably on account of SH-group present in thiourea molecules. The SH-group stimulated the photosynthetic carbon fixation mechanism and hence, foliar spray of thiourea might have increased the LAI and canopy photosynthesis, which ultimately resulted in higher growth of coriander. Similar results were also reported by Yadav (2000) [26] in oat, Solanki (2002) [23] in clusterbean, Arora (2004) [4] in barley and Balai (2005) [5] in coriander. The increase in growth parameters due to triacontanol may be attributed to the enhanced physiological activities like cell division, cell elongation, photosynthesis and translocation of nutrients and photosynthesis. Triacontanol caused a favourable influence on the growth of crop when freezing point occurred during growing period. Several researchers such as Yadav (1992) [26] in taramira, Jat (1995) [9] in fenugreek, Reddy *et al*. (2002) [17] in capsicum, Singh (2007) [22] in fenugreek, in coriander also recorded significant improvement in growth characters due to application of triacontanol based PGRs. The minimum relative crop growth rate (88.45, 88.51 and 88.48), Days taken to first flowering (54.55, 54.63 and 54.59) and days taken to 50% flowering (64.47, 64.63 and 64.55) were recorded in T_3 (Thiourea @ 1000 ppm) as compare to other hormone spray. Several researchers such as Sarada *et al*. (2008) [20] and Meena (2011) [13]

Table 1: Effect of PGRs, sowing time and varieties on leaf area, leaf area index, crop growth rate and relative growth rate of coriander

Treatment	Leaf area per plant			Leaf area index			Crop growth rate (CGR)			Relative growth rate (RGR)		
	First year	Second year	Pooled	First year	Second year	Pooled	First year	Second year	Pooled	First year	Second year	Pooled
Sowing date				**Sowing date**			**Sowing date**			**Sowing date**		
D_1 (Last week of December)	6.89	6.98	6.94	0.370	0.373	0.371	1.03	1.04	1.04	88.72	88.78	88.75
D_2 (First week of January)	6.64	6.71	6.68	0.356	0.359	0.357	1.00	1.00	1.00	89.11	89.18	89.15
SEm(d)	0.045	0.050	0.034	0.001	0.002	0.001	0.004	0.005	0.003	0.195	0.194	0.137
CD(at 5%)	0.273	0.307	0.133	0.009	0.010	0.004	0.024	0.030	0.012	1.186	1.178	0.539
Variety				**Variety**			**Variety**			**Variety**		
V_1 (RCr-41)	6.56	6.64	6.60	0.347	0.350	0.349	0.98	0.99	0.99	89.48	89.54	89.51
V_2 (RCr-435)	6.97	7.05	7.01	0.378	0.382	0.380	1.05	1.05	1.05	88.36	88.42	88.39
SEm(d)	0.036	0.041	0.027	0.002	0.002	0.001	0.008	0.006	0.005	0.138	0.135	0.097
CD(at 5%)	0.103	0.118	0.077	0.006	0.006	0.004	0.022	0.016	0.014	0.393	0.386	0.272
Treatment				**Treatment**			**Treatment**			**Treatment**		
T_0 (Water spray (control))	6.36	6.42	6.39	0.328	0.331	0.329	0.94	0.95	0.95	89.98	90.04	90.01
T_1 (Triacontanol @ 1,000 ppm)	6.90	6.99	6.94	0.375	0.379	0.377	1.03	1.04	1.04	88.63	88.69	88.66
T_2 (Brassinolide @ 1 ppm)	6.83	6.92	6.88	0.369	0.373	0.371	1.03	1.04	1.04	88.73	88.79	88.76
T_3 (Thiourea @ 1,000 ppm)	6.95	7.03	6.99	0.378	0.381	0.379	1.04	1.05	1.05	88.45	88.51	88.48
T_4 (NAA @ 50 ppm)	6.76	6.84	6.80	0.363	0.366	0.365	1.01	1.02	1.02	88.88	88.94	88.91
T_5 (GA3 @ 50ppm)	6.81	6.89	6.85	0.364	0.367	0.366	1.03	1.03	1.03	88.83	88.89	88.86
SEm(d)	0.062	0.072	0.048	0.003	0.004	0.003	0.014	0.010	0.008	0.239	0.235	0.167
CD(at 5%)	0.178	0.204	0.134	0.010	0.010	0.007	0.039	0.028	0.024	0.681	0.669	0.470

Table 2: Effect of PGRs, sowing time and varieties on days taken to first flowering, 50 % flowering and dry matter accumulation of coriander

Treatment	Days taken to first flowering			Days taken to 50 % flowering			Dry matter accumulation		
	First year	Second year	Pooled	First year	Second year	Pooled	First year	Second year	Pooled
Sowing date				**Sowing date**			**Sowing date**		
D_1 (Last week of December)	54.93	55.00	54.96	65.21	65.31	65.26	0.0490	0.0498	0.0494
D_2 (First week of January)	55.68	55.76	55.72	66.77	66.86	66.81	0.0465	0.0472	0.0468
SEm(d)	0.018	0.031	0.018	0.039	0.065	0.038	0.0004	0.0003	0.0002
CD(at 5%)	0.112	0.192	0.072	0.239	0.395	0.149	0.0024	0.0019	0.0010
Variety				**Variety**			**Variety**		
V_1 (RCr-41)	56.22	56.31	56.27	67.48	67.57	67.53	0.0459	0.0467	0.0463
V_2 (RCr-435)	54.39	54.45	54.42	64.49	64.59	64.54	0.0496	0.0503	0.0499
SEm(d)	0.019	0.020	0.014	0.068	0.064	0.046	0.0004	0.0004	0.0003
CD(at 5%)	0.053	0.058	0.039	0.193	0.182	0.131	0.0012	0.0010	0.0008
Treatment				**Treatment**			**Treatment**		
T_0 (Water spray (control))	56.92	56.97	56.94	69.33	69.43	69.38	0.0440	0.0447	0.0443
T_1 (Triacontanol @ 1,000 ppm)	54.85	54.92	54.89	65.05	65.13	65.09	0.0490	0.0497	0.0494
T_2 (Brassinolide @ 1 ppm)	54.95	55.03	54.99	65.33	65.41	65.37	0.0487	0.0494	0.0490
T_3 (Thiourea @ 1,000 ppm)	54.55	54.63	54.59	64.47	64.63	64.55	0.0496	0.0503	0.0500
T_4 (NAA @ 50 ppm)	55.36	55.42	55.39	66.05	66.11	66.08	0.0472	0.0481	0.0476
T_5 (GA3 @ 50ppm)	55.21	55.28	55.24	65.70	65.77	65.74	0.0479	0.0487	0.0483
SEm(d)	0.032	0.035	0.024	0.117	0.110	0.080	0.0007	0.0006	0.0005
CD(at 5%)	0.092	0.100	0.067	0.334	0.314	0.226	0.0020	0.0018	0.0013

References

1. AICRPS. Annual Report, 2007-08. All India Co-ordinated Research Project on Spices. S.K.N. College of Agriculture, Jobner, 2008.
2. AICRPS. Annual Report, 2009-10. All India Co-ordinated Research Project on Spices. S.K.N. College of Agriculture, Jobner, 2010.
3. AICRPS. Annual Report, 2010-11. All India Co-ordinated Research Project on Spices. S.K.N. College of Agriculture, Jobner, 2011.
4. Arora D. Effect of thiourea and zinc on growth, yield and quality of barley (*Hordeum vulgare* L.). Ph.D. (Ag.) Thesis, Rajasthan Agricultural University, Bikaner, 2004.

5. Balai LR. Effect of thiourea on growth and productivity of coriander (*Coriandrum sativum* L.) varieties under normal and late sown conditions. Ph.D. (Ag.) Thesis, Rajasthan Agricultural University, Bikaner, 2005.
6. Balai LR, Keshwa GL. Effect of thiourea on yield and economics of coriander (*Coriandrum sativum* L.) varieties under normal and late sowing conditions. Journal of Progressive Agriculture. 2010; 1(1):52-55.
7. Bhadkariya SK, Gupta A, Babade A, Kasana BS, Tomer LS. Effect of different time of sowing on growth, yield and seed quality of coriander (*Corriandrum sativum* L.) cv. CIMPOS– 33. Bhartiya Krishi Anusandhan Patrika. 2007; 22(3):229-232.
8. Fisher RA, Yates F. Statistical Tables. Oliver and Boyd, Edinburgh, London, 1963.
9. Jat ML. Response of fenugreek (Tr*igonella foenum-graecum* L.) to phosphorus and sulphur with and without growth regulators. M.Sc. (Ag.) Thesis, Rajasthan Agricultural University, Bikaner, 1995.
10. Khoja JR. Effect of sowing time and sources of nitrogen on growth, thermal requirement, yield and quality of coriander (*Coriandrum sativum* L.). Ph.D. (Ag.) Thesis, Rajasthan Agricultural University, Bikaner, 2004.
11. Krishna De A. Spice: Some known and unknown facts. Science and Culture. 1999; 65:220-228.
12. Mandava NB. Plant growth promoting brassinosteroids. Annals of Review Plant Physiology. 1988; 39:23-52.
13. Meena SK. Effect of Plant Growth Regulators and Sulphur on Productivity of Coriander (*Coriandrum sativum* L.). M.Sc. (Ag.) Thesis, Swami Keshwanand Rajasthan Agricultural University, Bikaner, 2011.
14. Meena SS, Sen NL, Malhotra SK. Influence of sowing date, nitrogen and plant growth regulators on growth and yield of coriander (*Coriandrum sativum* L.). Journal of Spices and Aromatic Crops. 2006; 15(2):88-92.
15. Murthy SBN, Swamy NP. Coriander a multipurpose aromatic herb. Indian Farming. 1989; 39(2):13-15.
16. Rao SSR, Vardhini BN, Sujatha E, Anuradha S. Brassinostroids: A new class of phytohormones. Current Science. 2002; 81:1339-1245.
17. Reddy BO, Giridhar P, Ravishankar GA. The effect of triacontanol on micro-propagation of Capsicum frutencens and Decalepis hamiltonii, W & A. Plant Cell, tissue and Organ Culture. 2002; 71(3):253-258. Horticultural Abstract. 73(1):363.
18. Sahu MP, Solank AS. Role of sulphydral compounds in improving dry matter accumulation and grain production of maize (*Zea mays* L.). Journal of Agronomy and Crop Science. 1991; 167:65-69.
19. Sahu MP, Solanki NS, Dashora NL. Effect of thiourea, thiamine and ascorbic acid on growth and yield of maize (*Zea mays* L.). Journal of Agronomy and Crop Science. 1993; 171:65-69.
20. Sarada C, Girdhar K, Reddy TV. Effect of bio-regulators and their time of application on growth and yield of coriander (*Coriandrum sativum* L.). Journal of Spices and Aromatic Crops. 2008; 17(2):183-186.
21. Sasse JM. Physiological action of brassinostorids in – A Sakurai, T. Yokota and S.D. Clause (Eds) brassinostorids. Steriodal Plant Hormones, 1999, 137-161.
22. Singh A. Effect of PGRs and Zinc on productivity of fenugreek (*Trigonella foenum-graecum* L.) M.Sc. (Ag.) Thesis, Rajasthan Agricultural University, Bikaner, 2007.
23. Solanki NS. Effect of thiourea and dimethyl sulphoxide on phosphorus use efficiency, dry matter partitioning and productivity of clusterbean [*Cyamopsis tetragonoloba* (L.) Taub.]. Ph.D. (Ag.) Thesis, Maharana Pratap University of Agriculture and Technology, Udaipur, 2002.
24. Velayudham A. Evaluation and effects of organics with bio-inoculants in coriander var. Co 3.M.Sc. (Hort.) Thesis, Univ. Agric. Sci., Dharwad, 2004.
25. Yadav HC. Effect of growth promoters and nitrogen on taramira (*Eruca sativa* L.). M.Sc. (Ag.) Thesis, Rajasthan Agricultural University, Bikaner, 1992.
26. Yadav NS. Response of oat (*Avena sativa* L.) to levels of nitrogen, cutting management and foliar spray of thiourea. Ph.D. (Ag.) Thesis, Rajasthan Agricultural University, Bikaner, 2000.