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

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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 D1 (last week of December) significantly improved growth parameters among all the date of sowing D which significantly always affected the all growth parameters, whereas PGRs T3 (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 (Krisha, 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). [29] 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 D1 (Last week of December), while the minimum data were recorded in D2 (First week of January) in all growth stages. Results revealed that D1 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 D2 and relative growth rate (89.11, 89.18 and 89015) was significantly higher found in D2 as compared to D1 at 60 DAS. It indicates that in D1, the capability of the levels was more pronounced to produce dry weight as compared to D2. The improvement in these growth indices might have contributed to higher biomass at harvest when crop was sown at D1 date compared to D2. 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 D1 (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 D2 (First week of January). It might be due to on sowing time the temperature was not lower than D2. It was helpful to early and better germination and growth on later growth stages crop was not suffer from higher temperature, while on date D1 showed minimum days taken compared to D2 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) [21] 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 T3 (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) 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) in tamarind, Jat (1995) in fenugreek, Reddy et al. (2002) in capsicum, Singh (2007) 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 T3 (Thiourea @ 1000 ppm) as compare to other hormone spray. Several researchers such as Sarada et al. (2008) and Meena (2011) in capers.  

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

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Leaf area per plant</th>
<th>Leaf area index</th>
<th>Crop growth rate (CGR)</th>
<th>Relative growth rate (RGR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First year</td>
<td>Second year</td>
<td>Pooled</td>
<td>First year</td>
</tr>
<tr>
<td>D1 (Last week of December)</td>
<td>6.89</td>
<td>6.98</td>
<td>6.94</td>
<td>0.370</td>
</tr>
<tr>
<td>D2 (First week of January)</td>
<td>6.64</td>
<td>6.71</td>
<td>6.68</td>
<td>0.356</td>
</tr>
<tr>
<td>SEm(d)</td>
<td>0.045</td>
<td>0.050</td>
<td>0.034</td>
<td>0.001</td>
</tr>
<tr>
<td>CD(at 5%)</td>
<td>0.273</td>
<td>0.307</td>
<td>0.133</td>
<td>0.009</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Days taken to first flowering</th>
<th>Days taken to 50% flowering</th>
<th>Dry matter accumulation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First year</td>
<td>Second year</td>
<td>Pooled</td>
</tr>
<tr>
<td>Sowing date</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D1 (Last week of December)</td>
<td>54.93</td>
<td>55.00</td>
<td>54.96</td>
</tr>
<tr>
<td>D2 (First week of January)</td>
<td>55.68</td>
<td>57.65</td>
<td>55.72</td>
</tr>
<tr>
<td>SEm(d)</td>
<td>0.018</td>
<td>0.031</td>
<td>0.018</td>
</tr>
<tr>
<td>CD(at 5%)</td>
<td>0.112</td>
<td>0.192</td>
<td>0.072</td>
</tr>
</tbody>
</table>

References


