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## Effect of different pot mixtures, light intensity and foliar application on growth and yield in coriander (*Coriandrum sativum*)

**C Krishnamoorthy**DOI: <https://doi.org/10.22271/chemi.2021.v9.i1g.11274>**Abstract**

The experiment was conducted at Vanavarayar Institute of Agriculture, Pollachi, Tamil Nadu affiliated under Tamil Nadu Agricultural University during the year 2018-2019. The experiment was laid out in Factorial randomized block design with three replications. The main factors were open, laboratory and shade (50 per cent) and the sub factor treatments consisted of different pot mixtures and foliar application of bio-stimulants. Various growth characters were recorded at 10 days interval from 35 and 45 days after sowing. The results revealed that foliar application of 19:19:19 (All 19) at 1% under laboratory condition (T<sub>2</sub>) improved most of the growth and yield parameters namely plant height (22.45 cm), number of branches per plant (8.5), number of leaves per plant (19.5), leaves fresh weight (7.500 g), stem fresh weight (8.335 g), root length (8.50 cm) at different stages of growth as compared to other treatments and the lowest values were recorded in the treatment T<sub>1</sub> (control) in field condition.

**Keywords:** Pot mixtures, foliar, application, coriander, *Coriandrum sativum***Introduction**

India contributes around 80% of world coriander production and produces 5.92 lakh tonnes in 2018 - 2019. Rajasthan (60%) is the major producer of coriander in India followed by Madhya Pradesh, Andhra, Karnataka, Tamil Nadu and Orissa. India exported about 35,000-40,000 tonnes of Coriander in 2018 - 2019. Major importers are Malaysia, Pakistan, UAE and Saudi Arabia (Verma and Sen 2011) <sup>[13]</sup>.

In Tamil Nadu, the area under coriander was 10,804 hectares with a production of 5,049 tonnes and Thoothukudi district ranks first in area (3975 ha) followed by Sivagangai and Ramanathapuram. Coriander is valued for its tender leaves and grains. The nutritional value of coriander leaves per 100 g is total calories (23), Protein (2.1 g), Fat (0.4 g), Carbohydrate (3.7 g), vitamin A (37%), vitamin C (45%), Calcium (67 mg), Phosphorus (48 mg), Iron (1.7 mg), Magnesium (26 mg), and Potassium (521 mg). It has eleven components of essential oils, six types of acids (including ascorbic acid, better known as vitamin-C), minerals and vitamins, each having a number of beneficial properties (Uddain *et al.*, 2014) <sup>[12]</sup>.

Coriander is mostly grown by small and marginal farmers in drought prone areas following traditional cultivation practices and hence the yield obtained is 400kg ha<sup>-1</sup>. The prolonged drought situation and erratic monsoon limits their timely sowing and establishment of the crop. Application of nutrients plays a pivotal role in the growth, production and quality of the crop. Continuous and heavy application of chemical inputs resulted in a major shift in soil microbial population, nutrient imbalance, fast depletion of soil fertility and continuous deterioration of soil physical and chemical properties and accumulation of toxic contaminants (Tharmaraj *et al.*, 2014) <sup>[11]</sup>.

The increasing cost of chemical fertilizers widens the gap between the supply and demand thereby lowering the purchasing power of the small and marginal farmers. This necessitates for a viable alternate techniques to overcome these problems. Similarly luxurious use of organic manures is also under question due to its bulkiness, non-availability and cost. Therefore, it is inevitable to adopt a strategy by combining all these factors besides the application of bio-stimulants. Bio-stimulants are biologically active substances which influences photosynthesis, cell division and cell elongation of plants. Several growth substances have been commercialized and are available in the market to enhance the growth and development.

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These bio-stimulants increase the productivity in an environmentally safe way and maximize the grower's economic returns.

### Materials and Methods

The lab and field experiment was conducted at the Horticultural department of Vanavarayar Institute of Agriculture, Pollachi, Tamil Nadu. Geographically, it is located at 3°39' N latitude, 76°53' E longitude and at an altitude of 201.5m above MSL. The investigation was carried out under different environmental conditions in shade net (50 percent), partial shade (28 °C to 30 °C) and open condition (35 °C to 38 °C). The five sub factors are T<sub>1</sub> - soil, T<sub>2</sub> - coir + FYM + 19:19:19 (All 19), T<sub>3</sub> - Coir + sand + FYM + GA<sub>3</sub>, T<sub>4</sub> - soil + sand + FYM + Azospirillum (Seed treatment), T<sub>5</sub> - soil + sand + FYM + panchagavya. The experiment was laid out in a Factorial Randomized Block Design (RBD) with five treatments replicated thrice. Sandhiya variety was used to conduct the experiment. It is a variety with extended vegetative phase widely used for greens.

Seeds were sowed in pots by broadcasting. Irrigation was given on the third day after sowing and subsequent irrigations were scheduled at 1 to 2 days intervals depending on the soil and climatic conditions. The foliar spray of bio stimulants were given uniformly to all the pots during morning hours. The treatment was given at 25 and 35 DAS (Days after sowing) with an interval of 10 days. Observations were taken after 5 days of each spraying. Five plants in each treatment in each replication were selected at random and utilized for recording observations on the germination, plant height, number of branches, number of leaves, leaf fresh weight, stem fresh weight, root length and the mean values were subjected to statistical analysis. Fully opened leaf was used for recording leaf measurements and physiological analysis.

### Results and Discussion

Plant growth characters reflect the growth, vigour and the stand of the crop, which ultimately decides the yield. It has been known for a long time that plants which are grown in shaded habitat are capable of performing efficiently at low light intensities. Sunlight is the primary source of energy for photosynthesis. The yield of a plant is mainly determined by the factors associated with solar radiation namely its intensity, quality and duration.

#### Plant height

Among the foliar spray treatments, T<sub>2</sub> (All 19) recorded the highest plant height of 22.45 cm at 45 DAS followed by the seed treatment with Azospirillum (Table 1). The lowest plant height of 12.90 cm was obtained in control (T<sub>1</sub>). The increase in plant height may be due to stimulation of cellular expansion and cell division under laboratory condition. The luxuriant growth of the plants under laboratory might be due to the prevalence of optimum heat units and protection from wind. Mohanalakshmi and Vadivel (2012) [7] explained that in etiolated seedlings, shading caused the plants to grow taller due to increase in concentrations of certain growth promoting substances like auxins and gibberellins. The rate of detoxification of free auxins in the plants might be less, leading to the lengthy growth, which reflected on greater internodal length and plant height with thin stem.

#### Number of branches per plant

Foliar application of All 19 @ 1% recorded the highest number of branches per plant compared with other levels of

treatments (Table 2). The highest mean number of branches was noticed in T<sub>2</sub> (8.5) at 45 DAS respectively. The least number of branches (4.5) were observed in control (T<sub>1</sub>) in field at 45 DAS. This might be due to increased uptake of nutrients and availability for the plant growth.

The easy transfer of nutrients to plants would have been enhanced by foliar application of All 19 which would have promoted protein synthesis from reserved carbohydrates leading to the production of more carbohydrates thereby leading to the production of more number of primary branches and leaves. The same effect was observed by Nowak and Strojny (2009) [8] in gerbera.

#### Number of leaves per plant

Among the interactions, the treatment combination of T<sub>2</sub> (Coir + FYM + All 19 @1%) in shade produced more number of leaves (19.5) at 45 days after sowing respectively (Table 3). Generally a crop under shade should produce sufficient number of leaves and expose maximum photosynthetic area (leaf area) to harness the available light energy and efficiently use it to synthesize adequate amount of photosynthates for biomass production which could have contributed for increased leaf production. The increased leaf area under shade may be the phenomenon of plant's adaptation to expose larger photosynthetic surface under shaded condition as reported in the earlier work by Khan *et al.* (2010) [4]. The tendency of increased leaf number under shade was also recorded by Singh (2014) [9] in coriander, Kalyanasundaram *et al.* (2012) [3] in sweet flag, Khayyat *et al.* (2011) [5] in turmeric, Swaminathan *et al.* (2012) [10] in davana and Hemla *et al.* (2009) [2] in ginger which further ascertains the present study.

#### Leaves and stem fresh weight

The interaction effect with the treatment combination of partial shade + ALL 19 @ 1% (T<sub>2</sub>) showed the highest leaf weight (7.500 g) and stem fresh weight (8.335 g). The lowest leaf weight and stem weight was obtained in the treatment combination T<sub>1</sub> (open + absolute control) with 4.001g and 4.376 g respectively (Table 4 and 5). Besides, under shaded condition, reduced radiation may prevent scorching or wilting of leaves caused by marked increase in temperature within the leaf tissue from direct sunlight (Chattoo, 2011) [1] and thereby increases the leaf and stem fresh weight resulting in maximum retention of leaves.

#### Root length

The treatment T<sub>2</sub> (shade) recorded highest root length of 8.50 cm (Table 6). Least value was recorded in soil T<sub>1</sub> (4.84 cm). The results of present study were well supported by Kumar *et al.* (2013) [6] observed that increase the results of the experiments revealed that among the different treatments the foliar application of NPK (19:19:19) and biostimulants recorded the tallest plants, highest fruit weight, root length and fruit yield.

**Table 1:** Effect of different pot mixtures, light intensity and foliar application of biostimulants on plant height in coriander

Treatment	Lab (cm)	Shade (cm)	Field (cm)
T <sub>1</sub>	12.90	13.25	13.40
T <sub>2</sub>	22.45	18.25	14.90
T <sub>3</sub>	17.75	14.00	13.40
T <sub>4</sub>	19.75	13.45	13.00
T <sub>5</sub>	18.85	14.00	12.00
Mean	18.34	14.59	13.34
CD	1.094	2.325	1.625

**Table 2:** Effect of different pot mixtures, light intensity and foliar application of biostimulants on number of branches in coriander

Treatment	Lab	Shade	Field
T <sub>1</sub>	5.5	4.5	4.5
T <sub>2</sub>	8.5	8.0	5.0
T <sub>3</sub>	5.0	6.5	5.5
T <sub>4</sub>	4.5	4.5	5.5
T <sub>5</sub>	6.0	5.0	3.5
Mean	5.7	5.7	4.8
CD	0.433	0.793	0.799

**Table 3:** Effect of different pot mixtures, light intensity and foliar application of biostimulants on number of leaves in coriander

Treatment	Lab	Shade	Field
T <sub>1</sub>	12.0	5.5	6.5
T <sub>2</sub>	19.5	17.5	15.0
T <sub>3</sub>	11.0	14.5	8.0
T <sub>4</sub>	10.0	8.5	8.0
T <sub>5</sub>	15.5	8.0	7.0
Mean	13.2	11.2	8.9
CD	1.43	3.03	2.253

**Table 4:** Effect of different pot mixtures, light intensity and foliar application of biostimulants on leaves fresh weight in coriander

Treatment	Lab (g)	Shade (g)	Field (g)
T <sub>1</sub>	4.573	4.220	4.001
T <sub>2</sub>	7.500	6.485	5.950
T <sub>3</sub>	6.058	5.990	5.750
T <sub>4</sub>	6.007	5.682	5.338
T <sub>5</sub>	6.047	5.420	5.005
Mean	6.037	5.560	5.209
CD	0.987	0.820	0.741

**Table 5:** Effect of different pot mixtures, light intensity and foliar application of biostimulants on stem fresh weight in coriander

Treatment	Lab (g)	Shade (g)	Field (g)
T <sub>1</sub>	7.804	4.500	4.376
T <sub>2</sub>	8.335	7.951	6.189
T <sub>3</sub>	6.508	6.114	5.995
T <sub>4</sub>	6.299	5.872	5.597
T <sub>5</sub>	6.501	5.885	5.093
Mean	7.089	6.064	5.450
CD	0.985	0.882	0.759

**Table 6:** Effect of different pot mixtures, light intensity and foliar application of biostimulants on root length in coriander

Treatment	Lab (cm)	Shade (cm)	Field (cm)
T <sub>1</sub>	5.43	4.99	4.84
T <sub>2</sub>	8.50	7.91	7.03
T <sub>3</sub>	7.84	7.62	6.77
T <sub>4</sub>	7.01	7.00	6.28
T <sub>5</sub>	6.28	6.48	6.33
Mean	7.012	6.800	6.250
CD	0.778	0.957	0.721

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