

# Effect of bio-stimulants on growth, development and yield of Chilli (*Capsicum annum L.*)

## ABSTRACT

A field experiment was conducted during December 2018 to April 2019 at the Student's farm, Department of Agriculture Science & Rural Development, Loyola Academy, Secunderabad to know the effect of bio-stimulants on growth and yield of Chilli. The experiment was laid out in Randomised Block Design (RBD) and the treatments comprised of: T<sub>1</sub>- Folicist @ 3 ml/L, T<sub>2</sub>- Fylloton @ 3 ml/L, T<sub>3</sub>- Globalga @ 3 ml/L, T<sub>4</sub>- Tata Bahar @ 2.5 ml/L, T<sub>5</sub>- Neo-Alpha @ 2.5 ml/L, T<sub>6</sub>- Daiwik @ 2.5 ml/L, T<sub>7</sub>- Recommended dose of NPK, T<sub>8</sub>- Control. Biostimulants were applied as foliar spray at pre-flowering, flowering and fruit setting stages. From the results of the experiment, it was observed that all the growth parameters i.e., plant height (85 and 82 cm), no. of branches (29 and 26) and number of leaves/plant (288 and 262) were significantly increased by the application of Folicist @ 3.0 ml/L and Tata Bahar @ 2.5 ml/L compared to other treatments and control (54 cm, 13 and 150). Same treatment application resulted in significant increase in terms of no. of flowers/plant (78 and 75), number of fruits/plant (128 and 124) and % fruit set (80.5 and 78.2%). The highest number of fruits/plant, average fruit weight (110.5 and 105.6g/ 10 fruits), yield/plant (682 g) were recorded in foliar application of Folicist @ 3 ml/L closely followed by Tata Bahar (674 g) and Daiwik (650 g) and the lowest values were observed in control (410 g). Application of biostimulants significantly increased the vitamin-C content of fruits compared to control.

**Keywords:** *Biostimulants, Growth, yield, Vit.C, Chilli.*

## **Introduction:**

Chilli (*Capsicum annum L.*) is an important spice cum vegetable crop cultivated extensively in India. Chilli forms an essential ingredient of Indian curries. It is famous for its pleasant aromatic flavour, pungency and high colouring substance. It is widely used in culinary, pharmaceutical and beverage industry. Application of commercial inorganic fertilizers has resulted in drastic reduction in soil microbial population and whole rhizosphere is getting polluted (Deviet *al.* 2022). Continuous deterioration in soil physical properties, nutrient

imbalance and rapid depletion of soil fertility are added disadvantages of chemical fertilization (Selim, 2021). The growth, development and yield of chilli can be increased by the balanced application of N, P and K nutrients (Aslam et al., 2022). However, growth regulation of any crop is manipulated by the exogenous application plant growth regulations (PGR). But in the recent past instead of PGR, biostimulants are being used for crop regulation. The synergistic and complementary effect of biostimulants and essential nutrients is utilized for the synthesis of proteins which eventually leads to stimulated growth and yield (Dhanasekaran and Bhuvaneshwari, 2005). High yielding varieties and hybrid Chilli has got good market preference due to its size and appealing attractive colour (Perez-Caselles, 2020). With this backdrop, the present field experiment was conducted to study the effect of biostimulants on growth, yield and quality of Chilli.

### **Materials and Methods:**

The present investigation was conducted at student's farm, dept. of Agriculture Sci & Rurak Development, Loyola Academy Degree and PG College, Alwal, Secunderabad (TS) during December 2018 to April 2019. The topography of the experimental field was uniform with adequate irrigation and drainage facility. The experimental soil was red sandy loam texture, medium organic carbon (0.7%), slightly alkaline pH(7.7), medium in available-N and P, high in available K. The experiment was laid out in Randomized Block Design (RBD) with 8 treatments replicated thrice. The field layout and randomization of treatments were made with plot size of 3x3 m (9.0m<sup>2</sup>). The seedlings of Chilli cv. LCA-235 of one month old were obtained from Centre of Excellence, dept of Horticulture, Jeedimetla, Secunderabad. They were transplanted in the well prepared main field at a spacing of 60 x 45 cm. Farm yard manure was applied @20t/ha as soil application at last ploughing. NPK nutrients were applied @ 100-60-40 kg/ha to all the treatments except control. Nitrogen was applied in two split doses, i.e., half as basal and the remaining as top dressing. Entire dose of P and K were applied as basal. The crop was raised under protected irrigation. Weeding, intercultivation and timely plant protection measures were taken up. They were applied as foliar spray at pre-flowering, flowering and fruitsetting stages. The treatments of this trial consist of T<sub>1</sub>- Folicist @ 3 ml/L, T<sub>2</sub> – Fylloton @ 3 ml/L, T<sub>3</sub> – Globalga @ 3 ml/L, T<sub>4</sub>– Tata Bahar @ 2.5 ml/L, T<sub>5</sub> – Neo-Alpha @ 2.5 ml/L, T<sub>6</sub>– Daiwik @ 2.5 ml/L, T<sub>7</sub> – Recommended dose of NPK, T<sub>8</sub> – Control. The biometrical parameters viz, plant

height, number of branches per plant, number of leaves, number of flowers per plant, number of fruits per plant, % fruitset, fruit weight (g), yield per plant and yield per plot were recorded. The vitamin-C content of the fruits was expressed as mg/100 g. The statistical analysis was done as per the procedure outlined by (Panse and Sukhatme,1985).

## Results and Discussion:

### Growth Parameters

Plant height in Chilli was significantly increased by the application of biostimulants along with recommended NPK. Among the treatments, Folicist @3ml/L and TataBahar @2.5 ml/L recorded the highest plant height (85 and 82 cm) compared to other treatments and the lowest (54 cm) was observed in control (tab 1). This might be due to the accelerated cell division and cell expansion as N, P and K nutrients plays an important role in cell division and multiplication which ultimately results in maximum vegetative growth (Anbukkarasiet al, 2018). Number of leaves and branches per plant contributes greatly to the growth and development of the crop(Tab 1). Application of Folicist and Tatabahar significantly increased the number of branches (29 and 626) and leaves (288 and 262) per plant compared to other treatments and less in control (13 and 150). This increased number of branches and leaves is due to easy transfer of nutrients, increased meristemetic activity and enhanced supply of photosynthates (Marschner, 2023 and Passioura, 2020).

**Table 1. Effect of biostimulants on growth parameters and flowering of Chilli**

Treatment	Plant height (cm)	No. of branches /Plant	No. of Leaves/plant	No. of flowers /plant	No.of Fruits /Plant
T <sub>1</sub> - Folicist @ 3 ml l <sup>-1</sup>	85	29	288	78	128
T <sub>2</sub> – Fylloton @ 3 ml l <sup>-1</sup>	77	22	233	60	115
T <sub>3</sub> – Globalga @ 3 ml l <sup>-1</sup>	72	20	192	58	102
T <sub>4</sub> – Tata Bahar @ 2.5 ml l <sup>-1</sup>	82	26	262	75	124
T <sub>5</sub> – Neo-Alpha @ 2.5 ml l <sup>-1</sup>	68	21.5	220	58	96

T <sub>6</sub> – Daiwik @ 2.5 ml l <sup>-1</sup>	80	24	235	71	115
T <sub>7</sub> - Recommended dose of NPK	70	18	175	54	82
T <sub>8</sub> – control	54	13	150	42	65
<b>SEd</b>	1.35	1.56	6.2	1.3	2.78
<b>CD (p=0.05)</b>	3.11	3.25	15.1	2.74	6.0

### Floral characters and yield parameters:

Number of flowers per plant was significantly influenced by the application of bio-stimulants. Among the treatments, Folicist and Tata Bahar recorded the highest number of flowers per plant (78 and 75) followed by Fylloton and Daiwik applied plots and lowest in control (42). The significant increase in flower production is due to combined application of inorganic nutrients and biostimulants which has led to the synthesis of auxins and their translocation towards reproductive growth to promote flower production (Netam and Sharma, 2014; Rouphael and Colla, 2020; Ali *et al.*, 2021). The highest number of fruits per plant, fruit weight (g) and yield per plant were observed in treatment Folicist followed by Tata Bahar and Daiwik. Percent fruit set was recorded the highest in Folicist (80.5%) and Tata Bahar (78.2 %) applied plots and the lowest was recorded in the Control (51%). Fruit yield per plant was recorded the highest (682 g) in Folicist applied plants closely followed by Tata Bahar (674 g) and Daiwik (650 g) and the lowest was observed in control (410 g). Fruit yield per plot was also significantly increased by the application of Folicist and tatabahar (13.64 and 13.48 kg/plot) and lowest yield was recorded in control (8.2 kg/plot). The increased yield components and yield could be explained that upon onset of flowering phase, there was improvement of anabolic activities as well as redistribution of metabolites. Thus, the nitrogen which was earlier utilized by vegetative parts was translocated towards reproductive organs to form amino acids, which upon condensation formed proteins and ultimately used for increasing the number of flowers per plant and weight of the fruits (Vandana and Verma, 2014 and Patel *et al.*, 2016).

### Vitamin- C content:

Application of biostimulants significantly influenced the quality of the fruits in terms of vitamin-C content (Tab-2). The highest vit-C content was recorded in the treatment Folicist and Tatabahar 98.92 and 98.61 mg/100 g followed by recommended NPK (98.2) and Daiwik (97.12). The lowest vit.C content was recorded in control plots.

**Table 2. Effect of bio stimulants on fruit set, yield and quality of Chilli**

Treatment	% Fruit set	Average weight of 10 Fruits (g)	Fruit Diameter (Cm)	Fruit length(cm)	Fruit Yield /Plant (g)	Fruit yield /Plot(5 m <sup>2</sup> ) kgs	Vit-C (mg/100 g)
T <sub>1</sub> - Folicist @ 3 ml l <sup>-1</sup>	80.5	110.5	3.2	14.8	682	13.64	98.92
T <sub>2</sub> – Fylloton@ 3 ml l <sup>-1</sup>	74.0	98.3	2.5	12.5	640	12.80	95.33
T <sub>3</sub> – Globalga@ 3 ml l <sup>-1</sup>	65.0	90.4	2.0	9.8	600	12.00	95.00
T <sub>4</sub> – Tata Bahar @ 2.5 ml l <sup>-1</sup>	78.2	105.6	2.9	13.6	674	13.48	98.61
T <sub>5</sub> – Neo-Alpha @ 2.5 ml l <sup>-1</sup>	68.0	90.7	2.3	10.0	565	11.30	96.90
T <sub>6</sub> – Daiwik @ 2.5 ml l <sup>-1</sup>	75.0	100.0	2.6	12.0	650	13.00	97.12
T <sub>7</sub> - Recommended dose of NPK	60.0	80.2	2.0	9.3	495	9.90	98.20
T <sub>8</sub> – control	51.0	64.5	1.5	7.0	410	8.20	94.11
SEd	0.67	2.8	0.12	0.6	5.5	0.5	0.25
CD (p=0.05)	1.54	6.4	0.26	1.3	11.6	1.35	0.66

**Conclusion:**

From the present experimental findings, it can be concluded that application of biostimulants: Folicist @ 3 ml l<sup>-1</sup> (T<sub>1</sub>) along with balanced application of inorganic fertilizers will help in increasing growth, yield and quality of Chilli. If Folicist not available in the market, farmers can opt Tata Bahar @ 2.5 ml l<sup>-1</sup> (T<sub>4</sub>) and also Daiwik (T<sub>6</sub>) @ 2.5 ml l<sup>-1</sup>. By applying these biostimulants will fetch remunerative price to the farmers.

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