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## Efficiency of different quantities of bio stimulant on chilli (*Capsicum annum* L.) crop under polyhouse condition

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### Abstract

A present investigation was carried out with title “Efficiency of Different Quantities of Bio Stimulant on Chilli (*Capsicum annum* L.) crop under Polyhouse Condition” at the central research farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, Uttar Pradesh during rabi, 2023-24 with a view to identify the effects of different doses of bio stimulant and its role in growth, yield and quality of Chili variety New Ghoomar-2 F1 Hybrid. The experiment was laid in the randomized block design with 05 treatments and 06 replications with different combination of different quantities of bio stimulant. Under this experiment, over all, 10 treatments were taken including control. Different quantities of bio stimulant used comprised of Amalgerol Essence virtue all one at different doses of 1.0 L, 2.0 L, 3.0 L, and 4.0 L, (1 hectare) and mix with water each. From the above experiment finding it may be concluded that the treatment of 3.0 L/ hac. Amalgerol Essence was found to be best in the terms of growth viz, Plant height, Days to First Flowering, Days to 50% Flowering, Number of Fruits per plant and in terms of yield viz, Average fruit weight, Yield per plant, Yield per Hectare and in terms of quality viz, TSS and Ascorbic acid.

**Keywords:** Bio Stimulant, Amalgerol Essence

### 1. Introduction

Chili (*Capsicum annum* L.) is one of the most important vegetable cum spice crops in the Indian subcontinent. It has originated in Mexico, Southern Peru and Bolivia. In 2020, 36 allion tons of green chilli peppers were produced worldwide, it seems that the genetic potentiality of the varieties to increase their production has already been reached saturation, Chilli belongs to the genus *Capsicum* which are members of the nightshade family Solanaceae, cultivated for their pungency. It is a diploid (2n-24) species and genetically self- pollinated and chasmogamous crop whose flowers open only after pollination. The numerous races of chillies are broadly divided in to two species: *Capsicum annum* L and *Capsicum frutescens* L.

Chilli peppers are widely used in many cuisines as a spice to add heat to dishes. Capsicum and related compounds are known as carcinoids are the substances giving chilli peppers their intensity when ingested or applied totally. It is mainly cultivated for three constituents of fruits viz., capsaicin, capsanthin and oleoresin. Undoubtedly, chilli is a pungent stimulant, its pungency is due to the presence of a crystalline volatile alkaloid called "capsaicin (C18 H27 NO3. 8-methyl-N-vanillyl-6- none amid) in the cross wall or septuin of the fruits. Green chillies are rich in vitamin 'A' and 'C' and the seeds contain traces of starch. In addition, peppers are a good source of most B vitamins and vitamin B6 in particular.

Regardless of the scale of the agricultural business, growers face issues affecting plant growth and crop yields. This constant problem prompts farmers to adopt new technology as the world changes. Some farmers have turned to biostimulants as advanced horticultural technology to help solve their plant growth and crop production problems. Experts claim that biostimulants reduce the need for plant inputs, like fertilizers and pesticides while maintaining an ideal quality and quantity of crop output. With less input and a constant or pibly higher output, any grower

would naturally assess their options to improve their forming productivity.

Stimulants are a new type of agricultural additive product that many European experts have observed to improve plant growth and crop yields. Biostimulants have no direct action against pests and therefore do not fall within the regulatory framework of pesticides.

Biostimulants can improve food crop quality through biofortification, enhancing the plant's nutritional composition, such as their sugar and protein content. Biostimulants are substances or microorganisms that can be applied to plants to enhance their growth, development, and productivity. They can stimulate plant growth by improving nutrient uptake, increasing stress tolerance, and enhancing plant metabolism.

In chilli crop production, biostimulants can play a vital role in improving crop performance and yield. Biostimulants can enhance root growth and development, leading to improved nutrient uptake and water absorption. This can result in healthier plants with higher yields. Chilli plants can be subjected to various stresses, such as drought, high temperatures, and diseases. Biostimulants can help plants cope with these stresses by improving their resistance and resilience. Enhanced fruit quality can improve the quality of chilli fruits by increasing their

size, color, and flavor. This can increase market value and profitability. Improved soil health can promote beneficial microbial activity in the soil, leading to improved soil health and fertility. This can create a more favorable environment for chilli crop growth.

## 2. Materials and Methods

- 1. Experimental Site and Location:** The experiment was conducted during kharif season of the year 2023–24 at Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj. The experimental site is located in the sub-tropical region which is located at 35° 32' N latitude, 94° 65' E longitude and 98 m above the mean sea level.
- 2. Climate Condition:** Area of Prayagraj district comes under subtropical belt in the south east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46 °C – 48 °C and seldom falls as low as 4°C – 5°C. The relative humidity ranges between 20 to 94 %. The average rainfall in this area are around 1013.4 mm annually.

**Table 1:** Details of treatment combination

Treatment Notation	Treatment Details
T <sub>0</sub>	Untreated control (water spray) 10t FYM, 120:60:50 NPK kg/ha
T <sub>1</sub>	Amalgerol essence 1.0 L /ha. is added to the amount of water required for foliar spray. At different stages of plant.
T <sub>2</sub>	Amalgerol essence 2.0 L /ha. is added to the amount of water required for foliar spray. At different stages of plant.
T <sub>3</sub>	Amalgerol essence 3.0 L /ha. is added to the amount of water required for foliar spray. At different stages of plant.
T <sub>4</sub>	Amalgerol essence 4.0 L /ha. is added to the amount of water required for foliar spray. At different stages of plant.

**Statistical analysis** the statistical analysis of the data was carried out using STATISTICA (7.0) software.

## 3. Results and Discussion Growth parameters

Crop growth parameters in chili were measured in terms of days to germination plant height (cm), Plant spread at 30, 60, 90 DAT and at Harvest are shown in Table 2. The minimum number of days taken to germination of plants with the treatment T<sub>3</sub> (3.0 L/hac Amalgerol Essence) was 7.57 days and the Maximum number of days to germination was found the treatment (control). The application of bio stimulants might have improved the soil physical and chemical properties and leading to the adequate supply of nutrients to the 4 plant which might have promoted the early germination. Similar Finding were reported. Maximum height was reported 3.0 L/hac. (Amalgerol essence) (T<sub>3</sub>) with an average height of 117.67 cm followed by 4.0 L/hac. (Amalgerol essence) (T<sub>4</sub>) with an average height recorded 117.17 cm which was significantly higher from rest of treatments. All the treatments significantly increase plant height as compared to control. Minimum plant height 106.56 cm was recorded (T<sub>0</sub>). The present study was in line with Choudhary *et al.*, (2012).

The highest number of branches per plant at 90 DAT was observed in 3.0 L/hac. (Amalgerol essence) (T<sub>3</sub>) (27.73) which were statistically at par with all other treatments. All the different quantities of bio stimulant had the positive effect on generating and retaining higher number of branches per plant. Least number of branches per plant was recorded in control (T<sub>0</sub>) (26.30). Favourable weather and moisture of the soil are the important parameters affecting the number of branches per plant. It was concluded that a greater number of branches were recorded in bio stimulant treated plots as compared to control. It

might be due to favourable microclimatic conditions and soil moisture conservation with the use of bio stimulants which results in better vegetative growth leads to increase in number of branches per plant. The present study finds support of (Singh *et al.*, 2017).

Different quantities of bio stimulant treatments minimum number of days taken to flower initiation was observed (T<sub>3</sub>) (33.46) followed by 4.0 L/hac (Amalgerol essence) (T<sub>4</sub>) (34.89) and the further perusal of the data revealed application the minimum number of days were taken by plant to reach days to 50 % flowering by the 3.0 L/hac. (Amalgerol essence) (T<sub>3</sub>) took days followed by 4.0 L/hac. (Amalgerol essence) (T<sub>4</sub>) 54.30 days after transplanting. Consistency in availability of nutrients through bio stimulant means might have supplemented the additional nutrient requirement caused due to early flowering coupled with concomitant increase in flower number and consecutive fruit development.

The observation regarding flowering viz., Fruit Length (cm), Fruit Weight (gm), Fruit Girth (cm), Fruit Diameter (cm), Number of 5 Fruits per Plant, Yield per Plant (gm), Yield per ha (q), TSS and Ascorbic acid were shown in Table 3. Maximum Fruit Length was observed in 3.0 L/hac. (Amalgerol essence) (T<sub>3</sub>) (21.13 cm), Maximum Fruit Weight was observed in 3.0 L/hac. (Amalgerol essence) (T<sub>3</sub>) 74.92 gm and Minimum Weight observed with control treatment (68.09 gm), Maximum fruit girth was observed in 3.0 L/hac. (Amalgerol essence) (T<sub>3</sub>) 10.53 cm and minimum fruit girth observed with control treatment (8.57 cm) and Maximum fruit diameter was observed in 3.0 L/hac. (Amalgerol essence) (T<sub>3</sub>) (3.2 cm). The reason of maximum fruit length might be due to increase in the production of leaves, ultimately in photosynthesis, higher amount of carbohydrates production and translocation from source (leaves)

to sink (reproductive parts) resulted increase in fruit length observed by Saraswathi *et al.*, (2003).

The maximum number of fruits (15.51) was recorded in (T<sub>3</sub>) which was significantly higher from rest of the treatments. Among the rest of treatments number of fruits different significantly which was as 3.0 L/hac. (Amalgerol essence) (T<sub>3</sub>) (15.51) and 4.0 L/hac. (Amalgerol essence) (T<sub>4</sub>) (14.55). The minimum number of fruits per plant i.e., 11.44 recorded in the control treatment which was lower significantly. Maximum fruit yield per plant i.e., 1174.84 gm was obtained in 3.0 L/hac. (Amalgerol essence) (T<sub>3</sub>) which was significantly higher from rest of the treatments followed by 4.0 L/hac. (Amalgerol essence) (T<sub>4</sub>) (1044.24 gm). The minimum fruit yield per plant i.e., 756.84 gm recorded from the plot which was kept control (T<sub>0</sub>) and it was significantly lower from rest of treatments. The data showed that maximum yield of 869 (kg/200 m<sup>2</sup>) with the treatment (T<sub>3</sub>) was reported using bio stimulants were followed by treatment (T<sub>4</sub>) with the value of 773 (kg/200 m<sup>2</sup>). Minimum fruit yield of chili was recorded in weedy check (T<sub>0</sub>) 560 (kg/200m<sup>2</sup>) which was significantly lower from rest of treatments. The popularity of bio stimulants in agriculture is associated with the possibility of obtaining higher yields without the need to discontinue the production of ecological crops. According to numerous scientific studies, bio stimulants have a positive effect on yielding plants. The yield is usually determined as the amount of fruit obtained from one plant or plot. The yield depends on the type of bio stimulant used, the

dose, the method of application, and the plant variety. Increased yield is often associated with improving the quality of vegetables or fruit. This is particularly important in organic farming, where artificial fertilizers cannot be used.

Among the various treatments, application 3.0 L/ha. (Amalgerol essence) (T<sub>3</sub>) maximum increase in Ascorbic acid content of 157.74 mg/100 gm. The Followed by ascorbic acid content of (T<sub>4</sub>) 145.69 mg/100 gm. Similar finding of using these bio stimulants, Fruit Taste values improved significantly, as evidenced by the increase in the 6 level to an average of Ascorbic acid content.

Among the treatment used T<sub>3</sub> treatment with (4.92) and have highest TSS °Brix which were significantly superior than T<sub>0</sub> (Control) and other treatment. The maximum TSS value in Chili was recorded in T<sub>3</sub> with 4.92 °Brix and the minimum was recorded in T<sub>0</sub> (Control) with 4.15 °Brix. Bio stimulant can affect a number of the chemical properties of fruits and vegetables, including dry mass, acidity or vitamin content. The chemical composition of the fruit directly affects their palatability. It is assumed that fruits with a content of dissolved solids (SSC) above 120 Brix are characterized by an excellent taste. In the first year of using bio stimulants containing the biopolymers of polysaccharides, humic and fulvic acids as well as carboxylic acids, the average value of SSC in apricots stood at 10.70 Brix. In the second year of using these bio stimulants, fruit taste values improved significantly, as evidenced by the increase in the SSC level to an average of 14.10 Brix.

**Table 2:** Effect of different quantities of bio stimulant on plant growth of chilli (*Capsicum annum L.*)

S. No.	Treatments	Days to Germination	Plant Height (cm)			
			30 DAT	60 DAT	90 DAT	At Harvest
T <sub>0</sub>	Untreated control (water spray) 10t FYM, 120:60:50 NPK kg/ha	11.40	48.55	83.53	106.56	85.73
T <sub>1</sub>	Amalgerol Essence 1.0 L/ha.	10.39	50.47	90.37	110.51	92.43
T <sub>2</sub>	Amalgerol Essence 2.0 L/ha.	9.44	50.49	90.50	111.36	93.44
T <sub>3</sub>	Amalgerol Essence 3.0 L/ha.	7.57	54.52	96.55	117.67	98.45
T <sub>4</sub>	Amalgerol Essence 4.0 L/ha.	8.55	53.57	95.57	117.17	97.50
	F-Test	S	S	S	S	S
	C.D. (5%)	0.240	0.314	0.314	0.339	0.28
	S.E. (d)	0.114	0.150	0.150	0.161	0.14
	CV	2.094	0.503	0.284	0.248	0.25

**Table 3:** Effect of different quantities of bio stimulant on plant growth of chilli (*Capsicum annum L.*)

S. No.	Treatments	Number of branches			Days to 1 <sup>st</sup> Flowering	Days to 50 <sup>th</sup> Flowering
		30 DAT	60 DAT	90 DAT		
T <sub>0</sub>	Untreated control (water spray) 10t FYM, 120:60:50 NPK kg/ha	6.36	17.24	26.30	37.39	57.49
T <sub>1</sub>	Amalgerol Essence 1.0 L/ha.	6.56	17.43	26.60	36.41	56.44
T <sub>2</sub>	Amalgerol Essence 2.0 L/ha.	7.41	17.72	27.31	35.36	55.57
T <sub>3</sub>	Amalgerol Essence 3.0 L/ha.	7.42	18.72	27.73	33.46	53.48
T <sub>4</sub>	Amalgerol Essence 4.0 L/ha.	7.19	18.31	27.40	34.89	54.30
	F-Test	S	S	S	S	S
	C.D. (5%)	0.283	0.230	0.284	0.290	0.294
	S.E. (d)	0.135	0.109	0.135	0.138	0.140
	CV	3.337	1.059	0.865	0.673	0.437

**Table 4:** Effect of different quantities of bio stimulant on plant growth of chilli (*Capsicum annum L.*)

S. No.	Treatments	Fruit Length (cm)	Fruit Weight (gm)	Fruit Diameter (cm)	Fruit Girth (cm)	No. of fruits per plant
T <sub>0</sub>	Untreated control (water spray) 10t FYM, 120:60:50 NPK kg/ha	20.00	68.09	2.5	8.57	11.44
T <sub>1</sub>	Amalgerol Essence 1.0 L/ha.	20.35	68.18	2.6	8.97	12.52
T <sub>2</sub>	Amalgerol Essence 2.0 L/ha.	20.48	70.96	2.7	9.51	13.54
T <sub>3</sub>	Amalgerol Essence 3.0 L/ha.	21.13	74.92	3.2	10.53	15.51
T <sub>4</sub>	Amalgerol Essence 4.0 L/ha.	20.69	73.14	2.9	9.83	14.55

F-Test	S	S	S	S	S
C.D. (5%)	0.49	3.29	0.22	0.42	0.13
S.E. (d)	0.21	1.43	0.11	0.18	0.05
CV	1.27	2.46	6.60	2.33	0.50

**Table 5:** Effect of different quantities of bio stimulant on plant growth of chilli (*Capsicum annum* L.)

S. No.	Treatments	Yield/ Plant (gm)	Yield/Hectare (kg/200 m <sup>2</sup> )	Ascorbic Acid (mg/100gm)	TSS (°Brix)
T <sub>1</sub>	Untreated control (water spray) 10t FYM, 120:60:50 NPK kg/ha	756.84	560	118.52	4.15
T <sub>2</sub>	Amalgerol Essence 0.4 L/ha.	859.29	636	129.49	4.36
T <sub>3</sub>	Amalgerol Essence 0.8 L/ha.	956.15	708	136.63	4.55
T <sub>4</sub>	Amalgerol Essence 1.2 L/ha.	1174.87	869	157.74	4.92
T <sub>5</sub>	Amalgerol Essence 1.6L/ha.	1044.24	773	145.69	4.73
	F-Test	S	S	S	S
	C.D. (5%)	22.99	0.35	0.23	0.30
	S.E. (d)	9.97	0.12	0.11	0.14
	CV	1.27	0.04	0.14	5.43

**Table 6:** Effect of different quantities of bio stimulant on plant growth of chili (*Capsicum annum* L.)

Treatment Notation	Treatment details	Fruit Colour
T <sub>0</sub>	Untreated control (water spray) 10t FYM, 120:60:50 NPK kg/ha	Dark green
T <sub>1</sub>	Amalgerol Essence 1.0 L/ha.	Dark green
T <sub>2</sub>	Amalgerol Essence 2.0 L/ha.	Dark green
T <sub>3</sub>	Amalgerol Essence 3.0 L/ha.	Dark green
T <sub>4</sub>	Amalgerol Essence 4.0 L/ha.	Dark green

## Conclusion

According to the current research, the use of Bio stimulant (Amalgerol Essence) had a significantly positive impact on the growth and development of chillies. Among the various treatments that were evaluated, T<sub>3</sub> yield the most favourable results in terms of growth viz., plant height, number of primary branches, early flowering and maturation and yield viz., fruit weight, length of fruit, fruit girth, number of fruits per plant, and yield per plant. Furthermore, T<sub>3</sub> had the highest benefit cost ratio of 2.50. T<sub>3</sub> consisted of Amalgerol Essence 3.0 L /ha.

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