Original Research Article

Efficiency of Different Quantities of Bio- Stimulant on growth and yield of Chilli (*Capsicum annum* L.)

ABSTRACT

The present experiment entitled "Efficiency of Different Quantities of Bio- Stimulant on growth and yield of Chilli" was conducted at Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during the session 2022 - 2024. The experiment was laid out in randomized block design with three replications, and the study consists of eleven treatment combinations including control. The best treatment was T7 (Amalgerol Essence 3.8 L /ha.) which shows highest values in all the parameters viz., day to germination (10.44), survival % (72.04%), plant height (cm) 90 DAT (77.39 cm), number of branches/plant 90 DAT (10.18), plant spread (53.07 cm), Days of 50 % flowering (56.38), days to first flowering (39.51), days of first harvesting (80.70). Increased growth, flowering might be due to the increased absorption of nutrients when given as foliar application.

Key words: Chilli, Amalgerol Essence, growth, yield, bio stimulant

INTRODUCTION

Chilli (*Capsicum annuum* L.) is a hot-tasting tropical berry with chromosome number 2n=2x=24, belongs to the family Solanaceae, native of Peru and Mexico. Pungency in chilli is present in placenta and pericarp of fruit due to alkaloid capsaicin. It is also used for industrial

purpose for extraction of oleoresin. The numerous races of chillies are broadly divided into the two species: *Capsicum annuum* L. and *Capsicum frutescens* L. **(Paul *et al*., 2013).**

Chillies are rich in vitamin C about twice that of citrus fruits even after cooking it only loses 30 percent of its vitamin C. Dried chillies contains high amount of vitamin A and also great source of β-carotene and bioflavonoids. The capsaicinoids present in chillies imparts flavor to foods, are also used as ingredients in pharmaceutical products because of their potential antibacterial, antioxidant and other related pharmaceutical properties. It is also effective in protective against cancer. The applications of capsaicinoids is not only limited to neuropharmacology but also beneficial in the painful conditions such as rheumatic diseases, diabetic neuropathy, cluster headaches, post-herpetic neuralagia and decreases the levels of myocardial and aortic cholesterol.

Plant bio-stimulants contain substances or micro-organisms whose function when applied to plants or the rhizosphere is to stimulate physiological processes to enhance nutrient uptake, tolerance to abiotic stress and crop quality. Bio-stimulants have no direct action against pests and therefore do not fall within the regulatory framework of pesticides **(Anon., 2012).** The plant growth regulators are known to enhance and stimulate the translocation of photo assimilates thereby helping in better retention of flowers and fruits. Besides this, the growth regulators have the ability to cause accelerated growth in plants. The novel organic fertilizer was prepared in our laboratory using organic raw materials. rice straw, neem cake, FYM, poultry waste, fish waste and press mud. As well as rock phosphate and basalt dust were used as phosphate source and potassium source respectively. Micronutrients like, Cu, Zn, Mg, Mn, Fe (all in sulphate form) and Boron were chelated separately (1g/liter) using seed amino acid.

MATERIALS AND METHODS

This experiment was laid out during the August 2023 to March 2024 at Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). The horticulture

research farm is situated at 25^0 39" 42" N latitude, 81^0 67" 56" E longitude and at an altitude of 98 m above mean sea level. The treatment consisted of T_1 - Untreated control, T_2 - Amalgerol Essence 0.8 L /ha. is added to the amount of water required for foliar spray, T_3 - Amalgerol Essence 1.2 L /ha. is added to the amount of water required for foliar spray, T_4 - Amalgerol Essence 1.5 L /ha. is added to the amount of water required for foliar spray, T_5 - Amalgerol Essence 2.3 L /ha. is added to the amount of water required for foliar spray, T_6 - Amalgerol Essence 3.0 L /ha. is added to the amount of water required for foliar spray, T_7 - Amalgerol Essence 3.8 L /ha. is added to the amount of water required for foliar spray, T_8 - Amalgerol Essence 4.5 L /ha. is added to the amount of water required for foliar spray, T_9 - Amalgerol Essence 5.3 L /ha. is added to the amount of water required for foliar spray, T_{10} - Amalgerol Essence 5.8 L /ha. is added to the amount of water required for foliar spray, T_{11} - Amalgerol Essence 6.2 L /ha. is added to the amount of water required for foliar spray. The experiment was laid out in a Randomized Block Design with 10 treatments and replicated thrice. Data recorded on different aspects of fruit crop, *viz.*, growth, yield were subjected to statistically analysis by analysis of variance method. (**Gomez and Gomez, 1976)** and economic data analysis mathematical method.

RESULTS AND DISSCUSION

Germination parameters:

No. of days for germination

The data on number of days to germination of chilli as influenced by bio- stimulant are summarized in Table number 1

The data reveals that the number of days to germination of chilli increased significantly by the application of amalgerol essence under experiment over the control. The minimum number of days to germination (10.44) was recorded with treatments 7 (amalgerol essence 3.8 L/ha to the amount or water required for foliar spray) while the maximum number of Days to germination (12.19) was recorded under control. Further, the interaction effect of amalgerol essence to the amount or water required for foliar spray significantly influenced the days to germination.

The minimum in number of Days to germination of Chilli due to treatment might be due to fact that bio stimulant is added to the amount of water required for foliar spray regulate the growth by causing cell division and cell elongation in plant system. These results are in

conformity with **Ruban *et al*. (2019).** While the maximum value in treatment T_1 (control) may owes to its inhibitory effect because this treatment occupy only recommended dose of fertilizers in Chilli. Increase in growth parameters number of days to germination use of bio stimulant may be due to its effect in cell division and cell enlargement **Ammar *et al*. (2020).**

Survival percentage (%)

The data on survival % of chilli as influenced by bio- stimulant are summarized in Table number 1

The data reveals that the survival % of chilli increased significantly by the application of amalgerol essence under experiment over the control. The maximum survival % (72.04) was recorded with treatments 7 (amalgerol essence 3.8 L/ha to the amount or water required for foliar spray) while the minimum survival % (45.38) was recorded under control. Further, the interaction effect of amalgerol essence to the amount or water required for foliar spray significantly influenced the survival%.

The minimum in number of Survival % of chilli due to treatment might be due to fact that bio stimulant regulate the growth by causing cell division and cell elongation in plant system. These results are in conformity with **Manas *et al*. (2014).** While the maximum value in treatment T_1 (control) may owes to its inhibitory effect because this treatment occupy only recommended dose of fertilizers in chilli. Increase in growth parameters Survival % use of bio stimulant may be due to its effect in cell division and cell enlargement **Farouk *et al*. (2015)**

Growth Parameter

Plant height (cm)

The data on plant height (cm) of chilli as influenced by bio- stimulant are summarized in table number 2

The data reveals that the plant height (cm) of chilli increased significantly by the application of amalgerol essence under experiment over the control. The maximum plant height 90 DAT (77.39 cm) was recorded with treatments 7 (amalgerol essence 3.8 L/ha to the amount or water required for foliar spray) while the minimum plant height 90 DAT (51.71cm) was recorded under control. Further, the interaction effect of amalgerol essence to the amount or water required for foliar spray significantly influenced the plant height (cm).

The minimum in plant height (cm) of chilli due to treatment might be due to fact that bio stimulant regulate the growth by causing cell division and cell elongation in plant system. These results are in conformity with **Fathima and Denesh 2013.** While the maximum value in treatment T_1 (control) may owes to its inhibitory effect because this treatment occupy only recommended dose of fertilizers in chilli. Increase in growth parameters number of plant heigh at last harvest use of bio stimulant may be due to its effect in cell division and cell enlargement **Dookie *et al*. (2021).**

No. of branches/plant

The data on No of branches/plant of chilli as influenced by bio- stimulant are summarized in table number 2

The data reveals that the no. of branches/plant of chilli increased significantly by the application of amalgerol essence under experiment over the control. The maximum No of branches/plant at (90 DAT) (10.18) was recorded with treatments 7 (amalgerol essence 3.08 L/ha to the amount or water required for foliar spray) while the minimum no. of branches/plant (90 DAT) (6.42) was recorded under control. Further, the interaction effect of amalgerol essence to the amount or water required for foliar spray significantly influenced the No of branches/plant.

The minimum in no of branches/plant of chilli due to treatment might be due to fact that bio - Stimulant regulate the growth by causing cell division and cell elongation in plant system. These results are in conformity with **Fathima and Denesh 2013.** While the maximum value in treatment T1 (control) may owes to its inhibitory effect because this treatment occupy only recommended dose of fertilizers in chilli. Increase in growth parameters number of no of branches/plant at last harvest use of bio - Stimulant may be due to its effect in cell division and cell enlargement **Dookie *et al*. (2021).**

Plant spread (cm)

The data on plant spread (cm) of chilli as influenced by bio - stimulant are summarized in table number 2

The data reveals that the plant spread (cm) of chilli increased significantly by the application of amalgerol essence under experiment over the control. The maximum plant spread (cm) (53.07 cm) was recorded with treatments 7 (amalgerol essence 3.08 L/ha to the amount or water required for foliar spray) while the minimum plant spread (cm) (40.93 cm) was recorded under control. Further, the interaction effect of amalgerol essence to the amount or water required for foliar spray significantly influenced the plant spread (cm).

The minimum in plant spread (cm)of chilli due to treatment might be due to fact that bio- stimulant regulate the growth by causing cell division and cell elongation in plant system. These results are in conformity with **Dookie *et al*. (2021)** While the maximum value in treatment T1 (control) may owes to its inhibitory effect because this treatment occupy only recommended dose of fertilizers in Chilli. Increase in growth parameters number of plant spread at last harvest use of bio- stimulant may be due to its effect in cell division and cell enlargement **Pohl *et al*. (2019).**

Yield parameters

Days of 50% flowering

The data on days of 50% flowering of chilli as influenced by bio- stimulant are summarized in Table number 3.

The data reveals that the days of 50% flowering of chilli increased significantly by the application of amalgerol essence under experiment over the control. The minimum days of 50% flowering (56.38) was recorded with treatments 7 (amalgerol essence 3.08 L/ha to the amount or water required for foliar spray) while the maximum days of 50% flowering (72.69) was recorded under control. Further, the interaction effect of amalgerol essence to the amount or water required for foliar spray significantly influenced the days of 50% flowering.

The minimum in days of 50% flower of chilli due to treatment might be due to fact that bio - stimulant regulate the growth by causing cell division and cell elongation in plant system. These results are in conformity with **Ruban *et al*. (2019).** While the maximum value in treatment T1 (control) may owes to its inhibitory effect because this treatment occupy only recommended dose of fertilizers in chilli. Increase in growth parameters to which days of 50% flower use of bio - stimulant may be due to its effect in cell division and cell enlargement **Mehdi *et al*. (2014).**

Days of first flowering

The data on days of first flowering of chilli as influenced by bio- stimulant are summarized in Table number 3

The data reveals that the days of first flowering of chilli increased significantly by the application of amalgerol essence under experiment over the control. The minimum days of first flowering (39.51) was recorded with treatments 7 (amalgerol essence 3.08 L/ha to the amount or water required for foliar spray) while the maximum days of first flowering (54.96) was recorded under control. Further, the interaction effect of amalgerol essence to the amount or water required for foliar spray significantly influenced the days of first flowering.

The minimum in days of first flowering of chilli due to treatment might be due to fact that bio stimulant regulate the growth by causing cell division and cell elongation in plant system. These results are in conformity with **Megha and Shailesh (2022).** While the maximum value in treatment T1 (control) may owes to its inhibitory effect because this treatment occupy only recommended dose of fertilizers in chilli. Increase in growth parameters days of first flowering use bio stimulant may be due to its effect in cell division and cell enlargement **Youssef *et al*. (2021).**

Days of first harvesting

The data on days of first harvesting of chilli as influenced by bio- stimulant are summarized in Table number 3

The data reveals that the days of first harvesting of chilli increased significantly by the application of amalgerol essence under experiment over the control. The minimum days of first harvesting (80.70) was recorded with treatments 7 (amalgerol essence 3.08 L/ha to the amount or water required for foliar spray) while the maximum days of first harvesting (91.57) was recorded under control. Further, the interaction effect of amalgerol essence to the amount or water required for foliar spray significantly influenced the days of first harvesting.

The minimum in day of first harvesting of chilli due to treatment might be due to fact that bio stimulants regulate the growth by causing cell division and cell elongation in plant system. These results are in conformity with **Fathima and Denesh 2013.** While the maximum value in treatment T1 (control) may owes to its inhibitory effect because this treatment occupy

only recommended dose of fertilizers in chilli. Increase in growth parameters no. of days of first harvesting use of bio stimulants may be due to its effect in cell division and cell enlargement **Pohl *et al*. (2019).**

CONCLUSION

According to the current research, the use of Amalgerol Essence had a significantly positive impact on the growth and development of chilies. Among the various treatments that were evaluated, T_7 yielded the most favourable results in terms of growth viz., plant height, number of primary branches, plant spread, early flowering and maturation.

Table 1. Effect of bio simulant on germination of chilli

Treatment Symbol	Treatment combinations	Days to Germination	Survival %
T_1	Untreated control	12.19	45.38
T_2	Amalgerol Essence 0.8 L /ha.	10.47	52.43
T_3	Amalgerol Essence 1.2 L /ha.	10.60	60.11
T_4	Amalgerol Essence 1.5 L /ha.	11.00	66.09
T_5	Amalgerol Essence 2.3 L /ha.	11.43	67.81
T_6	Amalgerol Essence 3.0 L /ha.	11.49	68.05
T_7	Amalgerol Essence 3.8 L /ha.	10.44	72.04
T_8	Amalgerol Essence 4.5 L /ha.	11.76	69.42
T_9	Amalgerol Essence 5.3 L /ha.	11.80	71.51
T_{10}	Amalgerol Essence 5.8 L /ha.	11.78	71.81
T_{11}	Amalgerol Essence 6.02 L /ha.	11.54	68.34
	F-test	**S**	**S**
	SEm(±)	0.33	1.87
	CD (p=0.05)	0.98	5.51

Table 2. Effect of bio simulant on growth of chilli

Treatment Symbol	Treatment combinations	Plant height 90 DAT	Branch/plant 90 DAT	Plant Spread (cm)
T_1	Untreated control	51.71	6.42	40.93
T_2	Amalgerol Essence 0.8 L /ha.	59.70	6.77	43.10
T_3	Amalgerol Essence 1.2 L /ha.	61.28	7.39	44.69
T_4	Amalgerol Essence 1.5 L /ha.	63.92	7.45	46.50
T_5	Amalgerol Essence 2.3 L /ha.	69.10	7.45	48.30
T_6	Amalgerol Essence 3.0 L /ha.	69.55	7.67	49.40
T_7	Amalgerol Essence 3.8 L /ha.	77.39	10.18	53.07
T_8	Amalgerol Essence 4.5 L /ha.	72.28	8.65	51.13
T_9	Amalgerol Essence 5.3 L /ha.	75.76	8.97	52.20
T_{10}	Amalgerol Essence 5.8 L /ha.	76.45	10.00	52.90
T_{11}	Amalgerol Essence 6.02 L /ha.	74.66	8.57	50.60
	F-test	**S**	**S**	S
	SEm(±)	2.14	0.31	1.45
	CD (p=0.05)	6.30	0.91	4.29

Table 3. Effect of bio simulant on flowering of chilli

Treatment Symbol	Treatment combinations	Days of 50% flowering	Days of first flowering	Days of first harvesting
T_1	Untreated control	72.69	54.96	91.57
T_2	Amalgerol Essence 0.8 L /ha.	68.48	52.27	95.48
T_3	Amalgerol Essence 1.2 L /ha.	68.31	52.83	93.93
T_4	Amalgerol Essence 1.5 L /ha.	64.55	50.32	95.48
T_5	Amalgerol Essence 2.3 L /ha.	62.53	45.54	90.41
T_6	Amalgerol Essence 3.0 L /ha.	64.42	40.99	81.01
T_7	Amalgerol Essence 3.8 L /ha.	56.38	39.51	80.70
T_8	Amalgerol Essence 4.5 L /ha.	59.63	42.70	87.72
T_9	Amalgerol Essence 5.3 L /ha.	58.41	42.20	87.78
T_{10}	Amalgerol Essence 5.8 L /ha.	56.80	45.29	90.20
T_{11}	Amalgerol Essence 6.02 L /ha.	60.26	43.58	87.45
	F-test	S	S	S
	SEm(±)	2.25	1.34	2.74
	CD (p=0.05)	6.62	3.95	8.09

REFERENCES

Ammar, A. S., Hayder, S. J. and Naseer J. R., 2020, Evaluation of eggplant via different drip irrigation intervals and foliar sprays with seaweed extract bio-stimulant. *Int. J. Agri.stat. Sci*., 16(2): 633-639.

Anonymous, 2012, european biostimulants industry report.

Dookie, M., Ali, O., Ramsubhag, A. and Jayaraman, J., 2021, Flowering gene regulation in tomato plants treated with brown seaweed extracts. *Scientia horticulturae*., 276: 109-115.

Farouk, S., 2015, Improving growth and productivity of potato (*solanum tuberosum* l.) By some bio-stimulants and lithovit with or without boron, *j. Pl. Prod*., **6**(12): 2187- 2206.

Fathima, P. S. and Denesh, G. R., 2013, Influence of humic acid spray on growth and yield of chilli (*capsicum annum* l.). *Int. J. Agril. Sci*., **9**(2): 542-546

Manas, D., P.K. Bandopadhyay, A., Chakravarty, S., Pal and A., Bhattacharya,2014, Effect of foliar application of humic acid, zinc and boron on biochemical changes related to productivity of pungent pepper (*capsicum annuum* l.). *Afr.j.plant sci*., 8(6): 320-335.

Megha P. Pandya and Shailesh K. Mehta, 2022, Effect of presoaking of brinjal (*solanum melongena* l.) Seed in laurencia obtusa seaweed extract on germination and growth parameter. *J. Emerging technol. Innov. Res*., **9**(2): 849-855.

Mehdi, S. F. and Baharam, A., 2014, Investigation of the effect of foliar application of seaweed extract as growth bio-stimulants (*Ascophyllum nodosum*) on quantitative and qualitative characteristics of three tomato cultivars (*Solanum lycopersicon* mill). *World j. Environ. Bio*., **8**(4): 19-22.

Paul, S., Das, A., Sarkar, N. C. and Ghosh, B., 2013, Collection of chilli genetic resources from different geographical regions of west bengal, india. *Int j bioresour stress manag*., **4**: 147-153.

Pohl, A., Grabowska, A., Akalisz, A., and Sekara, A., 2019, Bio-stimulant application enhances fruit setting in eggplant—an insight into the biology of flowering. *Agronomy*, **9**(9): 482.

Ruban, S. J., Priya, M. R., Barathan, G. and Suresh Kumar, S. M., 2019, Effect foliar application of bio-stimulants on yield of brinjal (*solanum melongena* l.). *Pl.arch*., **19**: 2118-2120.

Youssef, R., Formisano, L., Ciriello, M., Cardarelli, M., Luziatelli, F., Ruzzi, M., Ficca, A. N., Bonini, P. and Colla, G., 2021, Natural bio stimulants as upscale substitutes to synthetic hormones for boosting tomato yield and fruits quality, *Italus hortus*., **28**(1): 88-99.