

Impact of biozyme on growth, yield and quality of chilli [*Capsicum annuum* L.]

D. MANNA, A. SARKAR AND T. K. MAITY

Department of Vegetable Crops, Bidhan Chandra Krishi Viswavidyalaya
Mohanpur-741252, Nadia, West Bengal

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ABSTRACT

A field investigation was conducted at New Alluvial Zone of West Bengal, for two consecutive years (2009-2011) to study the effect of Biozyme on growth, yield and quality of chilli cv. Jalwa (BSS-414). Among seven different treatment combinations of fertilizer and different formulation of Biozyme, soil application of recommended dose of fertilizer (100:60:60 kg ha⁻¹ NPK) + seedling treatment with Biozyme seed plus (10ml l⁻¹ water) + Biozyme vegetable granules as soil application (20kg ha⁻¹) + Biozyme mirchi liquid as foliar spraying (500ml ha⁻¹) was found to be the best in terms of growth, yield (9.77t ha⁻¹) and quality (121.28mg 100g⁻¹ ascorbic acid) of chilli with higher benefit : cost ratio (2.19). Total chlorophyll content of green chilli was maximum (0.1643 mg g⁻¹) in recommended dose of fertilizer (100:60:60 kg ha⁻¹ NPK) + seedling treatment with Biozyme seed plus (10ml l⁻¹ water) + Biozyme mirchi liquid as foliar spraying (500 ml ha⁻¹).

Key words: Biozyme mirchi liquid, biozyme seed plus, biozyme vegetable granule

The use of eco-friendly bio-products has emerged as one of the important strategies for sustainable agriculture. Application of bio-regulators is common horticultural practice to improve yield (Latimer, 1992). Biozyme is an eco-friendly non-toxic commercial growth stimulants which influences the plants physiological system at low concentrations and known to be rich in cytokinins and auxin precursor, enzymes and hydrolyzed protein is a storehouse of naturally occurring nutrients derived from Norwegian seaweed *Ascophyllum nodosum* (Kumar *et al.*, 2000). It contains nutrients in a naturally chelated form which helps to improve cell division and cell enlargement resulting into better chlorophyll content and increased production. Chilli is one of the important vegetable crops grown throughout the country. It is rich source of crystalline colourless pungent principle known as "capsaicin". In addition to capsaicin, chilli fruits are also rich source of vitamin C or Ascorbic acid (Saimbhi *et al.*, 1972). Very little work has been done on the impact of

Ascophyllum nodosum based growth stimulator on chilli in Gangetic alluvial plains. The field experiment was undertaken to find out the effect of biozyme on growth, yield and quality of chilli.

MATERIALS AND METHODS

The field experiment was carried out at Horticultural Research Station, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal (23.5°N latitude, 89°E longitude having an average altitude of 9.75m from the sea level) for two consecutive years during autumn-winter seasons of 2009-10 and 2010-11. The experimental design was laid out in simple randomised block design with seven different combinations of biozyme and recommended dose of fertilizer (RDF) replicated four times in a plot size of 3.0 m × 3.0 m. Biozyme and fertilizers were applied according to the schedule of the experiment. The treatment details are as given below.

Treatment details

Notation	Treatments	Time of application
T ₁	No fertilizer + No Biozyme (control)	
T ₂	Biozyme seed plus (10ml l ⁻¹ water)	Seedling treatment
	Biozyme vegetable granules (20 kg ha ⁻¹)	Land preparation
	Biozyme mirchi liquid (500 ml ha ⁻¹)	Vegetative stage, flowering stage and fruit set stage
T ₃	Recommended dose of fertilizer (RDF) (100:60:60::N:P:K kg ha ⁻¹)	1/3 N + full dose of P and K as basal 1/3 N top dressed at 21 DAT and 45 DAT
T ₄	T ₃ + Biozyme seed plus (10 ml l ⁻¹ water)	Seedling treatment
	Biozyme vegetable granules (20 kg ha ⁻¹)	Land preparation
	Biozyme mirchi liquid (500 ml ha ⁻¹)	Vegetative stage, flowering stage and fruit set stage
T ₅	T ₃ + Biozyme seed plus (10 ml l ⁻¹ water)	Seedling treatment
	Biozyme vegetable granules (20 kg ha ⁻¹)	Land preparation and vegetative stage
T ₆	T ₃ + Biozyme seed plus (10 ml l ⁻¹ water)	Seedling treatment
	Biozyme mirchi liquid (500 ml ha ⁻¹)	Vegetative stage, flowering stage and fruit set stage
T ₇	T ₃ + Biozyme seed plus (10 ml l ⁻¹ water)	Seedling treatment

The uniform and healthy five weeks old seedlings were transplanted in experimental plot at 50 × 50cm spacing. Five plants were selected for each plot as a unit of all observation on growth aspect and ten fruits from the selected five plants randomly taken as a unit of all observation of yield and yield attributes. Chlorophyll content in the green chilli was estimated at harvesting stage by spectroscopy method (Sadasivam and Manickam, 1992). Ascorbic acid content in chilli green fruits at harvesting stage was estimated by using 2,6-Dichlorophenol indophenol titration method given by Sadasivam and Manikam (1992). Statistical analysis was done using standard procedure given by Panse and Sukhatme (1978). Benefit cost ratio was worked out taking into consideration the cost of cultivation and net return.

RESULTS AND DISCUSSION

Results obtained from the present investigation revealed that soil application of RDF + seedling treatment with Biozyme seed plus + Biozyme vegetable granules (soil application) + Biozyme mirchi liquid (as foliar spray) recorded maximum plant height (61.21 cm) and number of branches per plant (26.12) followed by treatment T₆ (RDF+ seedling treatment with Biozyme seed plus + Biozyme mirchi liquid) (Table 1). The present result corroborated the findings of Gore *et al.* (2007) who observed that foliar application of bio-enzymes were effective in enhancing growth of chilli. Positive responses with the application of seaweed liquid fertilizer in tomato were also reported by Reeta *et al.* (2010). The increased growth in different Biozyme applied treatments was probably due to presence of cytokinin and auxin precursors, which increase the cell division, cell enlargement with better utilization of chemical fertilizers resulting in to rapid vegetative growth.

In terms of number of flowers per plant, number of fruits per plant and fruit setting percentage, treatment T₄ was found to be superior (101.50, 88.18, 86.89, respectively) over other treatments (Table 1).

Reeta *et al.* (2010) observed increased number of flowers and fruits in tomato with application of seaweed liquid fertilizers. Similarly, increased number of fruits per plant and per cent fruit set in tomato with the application of biozyme was also observed by Ofosu-anim *et al.* (2007). Biozyme has a significant role on the production of maximum length of fruits but it did not show any significant marked impact on the diameter and average weight of fruits. However, maximum length, diameter of fruit and average fruit weight (11.19cm, 10.38mm, 2.78g, respectively) were associated with the treatment where plants received RDF along with Biozyme Seed Plus + Biozyme vegetable granules + Biozyme mirchi liquid (T₄). The present results are in conformity with the findings of Eris *et al.* (1995) who observed that fruit length and fruit diameter significantly increased with the increased application of seaweed extract in pepper. The positive influence of Biozyme was also observed on the fruit yield of chilli. Maximum fruit yield of 9.77t ha⁻¹ was recorded with treatment T₄ which was statistically significant to any other treatments. The results are in agreement with the findings of Gore *et al.* (2007) and Kumar *et al.* (2000) who reported that application of biozyme significantly increased the yield of chilli and bell pepper. Improvement in yield with different treatments over control was due to the direct or indirect effects of growth and yield attributes *viz.*, number of branches per plant, number of flowers per plants, fruit length, fruit setting percentage and number of fruits per plant and also fruit weight. Thus, it can be inferred that the biozyme which consist of precursors of auxin, enzyme, protein and micronutrients may have some beneficial role in improving growth and productivity of chilli.

Regarding production economics, application of RDF + Biozyme seed plus + Biozyme vegetable granules + Biozyme mirchi liquid resulted in higher benefit cost ratio (2.19) in chilli as compared 1.20 B: C ratio with RDF (Fig. 1).

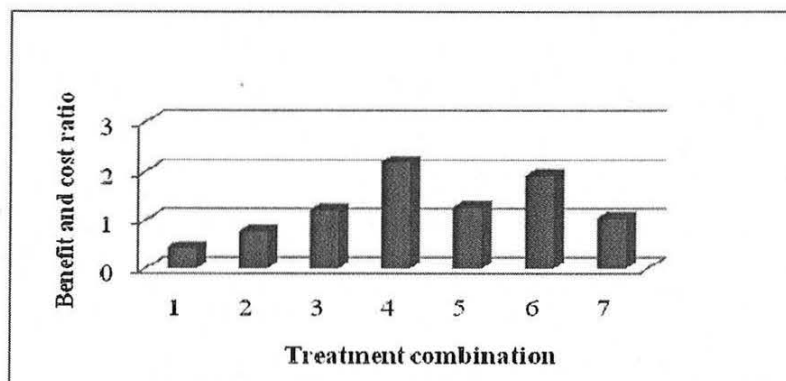


Fig. 1: Biozyme effect on benefit and cost ratio in chilli cultivation

Table 1: Effect of Biozyme on growth, yield, economics and quality parameters of chilli (Pooled of two seasons)

Treatments	Plant height(cm)	Branches plant ⁻¹	Flowers plant ⁻¹	Fruits plant ⁻¹	Fruit setting (%)	Fruit length (cm)	Fruit diameter (mm)	Avg. Fruit weight (g)	Fruit yield (t ha ⁻¹)	Ascorbic acid (mg 100 ⁻¹ g)
T ₁	43.96	14.37	47.15	33.675	45.69 (42.53)	9.87	9.77	2.45	3.30	91.15
T ₂	54.72	21.97	67.67	50.49	74.62 (59.74)	10.29	9.85	2.66	5.36	102.86
T ₃	56.95	23.17	82.60	61.88	74.93 (59.93)	10.27	10.06	2.62	6.48	101.51
T ₄	61.21	26.12	101.50	88.18	86.89 (68.78)	11.19	10.38	2.78	9.77	121.28
T ₅	57.18	25.15	80.35	61.92	77.05 (61.41)	10.53	10.24	2.76	6.83	111.22
T ₆	60.81	25.50	96.72	79.73	82.45 (65.27)	11.01	10.34	2.77	8.83	115.24
T ₇	56.45	23.87	79.90	58.56	73.27 (58.89)	10.31	10.17	2.59	6.04	108.53
SEm(±)	1.41	0.40	2.52	1.89	0.37	0.23	0.15	0.14	0.24	0.53
LSD (0.05)	4.18	1.20	7.50	5.63	1.09	0.67	NS	NS	0.70	1.58

Note: Figures within parentheses indicate angular transformed data of fruit setting percentage

Ascorbic acid content was also found to be highest under the treatment T₄ (121.28 mg 100⁻¹g) followed by the treatment T₆ (115.24 mg 100⁻¹g), whereas the minimum ascorbic acid content was noticed with treatment T₁ (91.15 mg 100⁻¹g). The present result are in conformity with the findings of Reeta *et al.*, (2010) who observed significant increase in ascorbic acid content in tomato due to application of seaweed liquid fertilizers. The biochemical parameter of green chilli like chlorophyll a,

chlorophyll b and total chlorophyll content were also influenced by Biozyme (Fig. 2). The high chlorophyll content in the leaf tissue treated with low concentration of seaweed liquid fertilizer may be due to the presence of betaines as reported by Blunden and Liu yan (1997). Christobel (2008) also reported that the low level of seaweed liquid fertilizer enhances the chlorophyll content (chlorophyll a, chlorophyll b and total chlorophyll) in *Phaseolus aureus*.

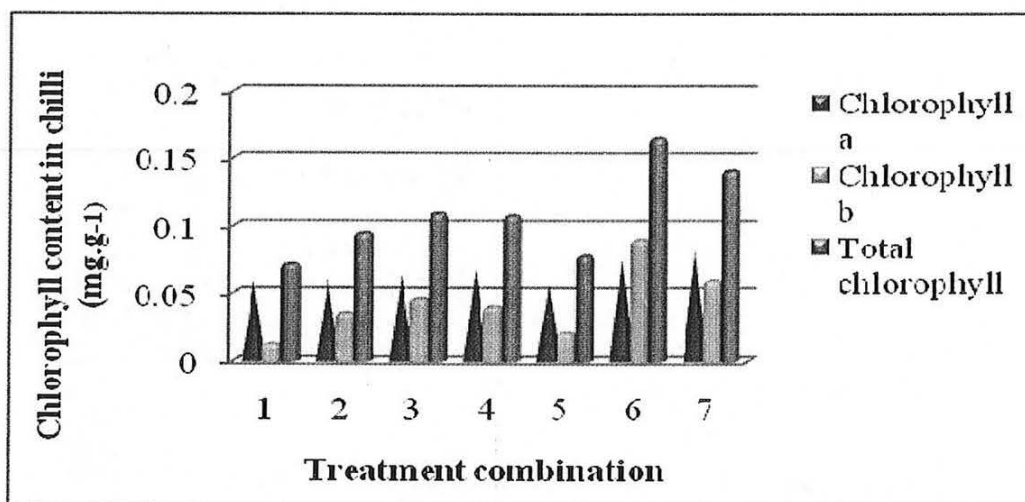


Fig. 2: Biozyme effect in chlorophyll content in green chilli

The results led to a conclusion that for better growth, yield and quality of chilli, the crop may be applied with different formulation of Biozyme in combination with the recommended dose of fertilizers, in three different growth stages *i.e.* vegetative stage, flowering stage and fruit setting stage under new alluvial zone of West Bengal.

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