

# INFLUENCE OF BIOZYME ON GROWTH, YIELD AND QUALITY OF ONION (*ALLIUM CEPAL.*) CV. SUKHSAGAR

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## ABSTRACT

Field experiment was conducted to study the influence of Biozyme on growth, yield and quality of onion. Application of Biozyme with or without fertilizer had significant effect on different growth and yield attributing characters like plant height, number of roots per plant, diameter of bulb and bulb weight as well as yield. Maximum total yield (31.89 t/ha) with marketable yield (31.27 t/ha) was obtained when the crop was treated with soil application of recommended dose of fertilizer (125:80:100) + seedling treatment with Biozyme Seed plus (@ 10 mL/l water) + Biozyme Veg. granules (@ 20 kg/ha) + Biozyme Veg. liquid (@ 500 mL/ha). The quality attributes like Pyruvic acid (4.45  $\mu$  mol/g) and Total soluble solid (13.95°B) were markedly influenced by the application of Biozyme. Bulbs obtained from different treatment had edge over control in relation to shelf life. An economic analysis revealed that application of Biozyme was more beneficial over control. The results led to the conclusion that for better growth, yield and quality of onion with higher economic return of the crop may be treated with soil application of recommended dose of fertilizer (125:80:100) + seedling treatment with Biozyme Seed plus (@ 10 mL/l water) + Biozyme Veg. granules (@ 20 kg/ha) + Biozyme Veg. liquid (@ 500 mL/ha), in the plains of New Alluvial Zone of West Bengal.

## INTRODUCTION

One of the most important strategies for sustainable agriculture is the integration of organic and inorganic sources of plant nutrient with eco-friendly bio products. Application of bio-regulators is common horticultural practice to improve yields (Latimer, 1992). Bio-regulators can affect rooting, flowering, fruiting and fruit growth, leaf or fruit abscission, senescence, regulation of some metabolic processes, and plant resistance to temperature or water stresses (Nickell, 1988). Biozyme is an organic storehouse of naturally occurring nutrients derived from Norwegian seaweed (*Ascophyllum nodosum*), known to be rich in cytokinins and auxin precursor, enzymes and hydrolyzed protein (Kumar et al., 2000). It is an eco-friendly, non-toxic, non chemical organic storehouse of naturally occurring substances which influences the plants physiological system at very low concentrations. It contains elements which help in cell growth and breakdown of complex molecules into simpler ones which can be easily utilized by the plant and improves soil microbial activities. It contains nutrients which are in a naturally chelated form and are readily assimilated by plants which help to improve cell division and cell enlargement thus resulting into better chlorophyll content and increased production. Manna et al. (2012) reported that application of Biozyme increase growth, yield and quality of chilli. Reeta et al. (2010) observed that soil and foliar spray of sea weed liquid fertilizer showed more significant increase in growth and reproductive parameters over other treatments in tomato. With these ideas in view, field experiments were planned to find out the effect of Biozyme on growth, yield and quality of onion.

## MATERIALS AND METHODS

Investigation on influence of Biozyme on growth, yield attributes and yields of onion (*Allium cepa* L.) cv. Sukhsagar was carried out for two consecutive years, during the Rabi seasons of 2010-2011 and 2011-2012 at farm of Bidhan Chandra Krishi Viswavidyalaya, Kalyani, West Bengal (23.5°N latitude, 89°E longitude having an average altitude of 9.75m from the mean sea level). The experiment was laid out in randomized block design with seven different combinations of Biozyme and recommended dose of fertilizer (RDF) replicated four times in a plot size of 3m  $\times$  2 m at a spacing of 15 cm  $\times$  10 cm. Biozyme and fertilizer are applied according to the schedule of the experiment. The treatment details are given below.

### Treatment details

Notations	Treatments	Time of application
T <sub>1</sub>	No fertilizer + No biozyme	
T <sub>2</sub>	Biozyme seed plus (10 ml/l water)	Seedling treatment
	Biozyme veg. granules (20 kg/ha)	Land preparation
	Biozyme veg. liquid (500 ml/ha)	30 DAT 60DAT 90DAT
T <sub>3</sub>	Recommended dose of fertilizer (125:80:100::N:P:K kg/ha)	1/3 N + full dose of P & K as Basal 1/3 N top dressed at 21 DAT 1/3 N top dressed at 45 DAT
T <sub>4</sub>	T <sub>3</sub> + biozyme seed plus	Seedling treatment

	(10 mL/l water)	
	Biozyme veg. granules (20 kg/ha)	Land preparation
	Biozyme veg. liquid(500 ml/ha)	30DAT
		60 DAT
		90 DAT
T <sub>5</sub>	T <sub>3</sub> + biozyme seed plus (10 mL/l water)	Seedling treatment
	Biozyme veg. granules (20 kg/ha)	Land preparation
		30DAT
T <sub>6</sub>	T <sub>3</sub> + biozyme seed plus (10 mL/l water)	Seedling treatment
	Biozyme veg. liquid(500 ml/ha)	30DAT
		60 DAT
		90 DAT
T <sub>7</sub>	T <sub>3</sub> + biozyme seed plus (10 mL/l water)	Seedling treatment

Ten plants were selected randomly and tagged in each plot for recording various growth, yield and yield attributing characters. Pyruvic acid content of bulb after harvest was estimated by spectroscopy method (Anthon and Barrett, 2003). Total soluble solids (TSS) were determined by using hand held Refractometer and keeping quality parameters were recorded regarding physiological loss of weight (%), sprouting percentage (%), rotting percentage (%) at one month interval for three month. 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

The results of the present investigation indicated that among the treatments soil application of recommended dose of fertilizer + seedling treatment with Biozyme seed plus + Biozyme vegetable Granules (soil application) + Biozyme Veg. Liquid (as foliar spray) recorded increased plant height (65.10 cm), number of leaves per plant (8.55) and number of roots per plant (88.86) followed by treatment T<sub>6</sub> (RDF + seedling

treatment with Biozyme seed plus + Biozyme Veg. liquid). This result is in conformity with the findings of Manna *et al.* (2012) who observed that application of Biozyme along with recommended dose of fertilizer was 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). Increased vegetative growth in terms of plant height, leaves number and root numbers were influenced by Biozyme application. These results were expected since Biozyme are complex of growth stimulant (consisting cytokinin and auxin precursors), which increase the cell division and cell enlargement resulting in to rapid vegetative growth in onion.

Biozyme has a significant role on the yield and yield attributing characters of onion. Treatment T<sub>4</sub> (RDF along with Biozyme Seed plus + Biozyme Veg. Granules + Biozyme Veg. liquid) recorded maximum diameter of bulb (64.75 mm), bulb weight (58.41 g) and dry matter percentage (14.65%) followed by treatment T<sub>6</sub>, whereas least was recorded in treatment T<sub>1</sub> (control). The increase in the diameter of fruits and individual fruit weight of tomato with the application of Biozyme was observed by Ofosu-animet *et al.*, (2007). Similarly, Adeline and Anburani (2006) reported that application of NAA increased dry matter in bhendi. The neck thickness of bulb was found no significant effect. However, maximum neck thickness of bulb (1.45 cm) was observed in treatment T<sub>4</sub>. The positive influence of Biozyme was also reflected in yield. Highest yield (31.89 t/ha), marketable bulb yield (31.27 t/ha) was obtained from treatment T<sub>4</sub>. The yield and marketable bulb yield was meagre of 16.95 t/ha and 15.21 t/ha, respectively in control (T<sub>1</sub>). The results are agreement with the findings of Manna *et al.* (2012) and kumar *et al.* (2000) who reported that application of Biozyme significantly increase the yield of chilli and bell pepper, respectively. Yield of onion depends on indirect components, a strong vegetative growth that comprises of plant height and number of leaves. In present investigation all the

**Table 1: Effect of biozyme on growth, yield and quality of onion (pooled data for two years)**

Treat.	Plant height(cm)	Number of roots/plant	Number of leaves/plant	Neck thickness (cm)	Diameter of bulb (mm)	Bulb weight (g)	Dry matter (%)	Total yield /hectare (tonnes)	Marketable bulb yield/hectare (tonnes)	Total soluble solids (TSS, °B)	Pyruvic acid (µmol/g)
T <sub>1</sub>	50.5	55.31	7.68	1.07	50.56	40.13	11.39(19.73)	16.95	15.21	9.5	2.19
T <sub>2</sub>	52.5	61.25	7.78	1.17	52.09	41.25	12.02(20.27)	18.72	17.18	10.15	2.74
T <sub>3</sub>	55.3	71.75	8.02	1.20	57.17	50.78	12.11(20.36)	21.85	20.37	10.9	3.46
T <sub>4</sub>	65.1	88.86	8.55	1.45	64.75	58.41	14.65(22.54)	31.89	31.27	13.95	4.45
T <sub>5</sub>	59.8	78.19	8.20	1.35	60.26	55.72	13.83(21.81)	27.24	26.28	11.8	4.11
T <sub>6</sub>	62.4	83.22	8.45	1.36	61.87	56.80	14.24(22.14)	29.47	28.63	12.7	4.31
T <sub>7</sub>	58.1	75.48	8.15	1.24	58.28	53.81	14.03(21.97)	25.26	24.29	11.4	4.03
S <sub>Em</sub> (±)	1.46	2.284	0.342	0.083	0.881	0.782	0.203	0.420	0.396	0.150	0.042
LSD (p = 0.05)	4.34	6.786	NS	NS	2.619	2.324	0.604	1.248	1.177	0.446	0.124

NS = NotSignificant.

Figures within parentheses indicate angular transformed data of bulb dry matter content

**Table 2: Effect of biozyme on economics of onion**

Treatment	Cost of cultivation per hectare (Rs./ha)	Gross return per hectare (Rs./ha)	Net return per hectare(Rs./ha)	Benefit and cost ratio
T <sub>1</sub>	56448.00	101685.00	45237.00	0.80
T <sub>2</sub>	58945.00	112342.50	53397.50	0.90
T <sub>3</sub>	58606.00	131100.00	72494.00	1.23
T <sub>4</sub>	61103.00	191355.00	130252.00	2.13
T <sub>5</sub>	60538.00	163425.00	102887.00	1.70
T <sub>6</sub>	60303.00	176805.00	116502.00	1.93
T <sub>7</sub>	58938.00	151560.00	92622.00	1.57

**Table 3: Effect of biozyme on keeping quality parameters of onion**

Treatments	Physiological loss in weight (%)						Rotting percentage (%)					
	Days after storage (DAS)						Days after storage (DAS)					
	15	30	45	60	75	90	15*	30	45	60	75	90
T <sub>1</sub>	4.23	7.34	10.29	13.96	15.22	19.35	-	2.23	3.11	5.41	6.77	8.21
T <sub>2</sub>	3.14	5.26	9.07	10.81	12.45	14.48	-	1.10	2.35	4.13	5.86	7.83
T <sub>3</sub>	3.01	4.80	6.78	9.98	11.46	13.75	-	1.21	2.40	4.91	6.10	7.54
T <sub>4</sub>	1.88	3.31	5.18	7.23	9.54	11.46	-	0.65	1.25	3.06	3.98	4.88
T <sub>5</sub>	2.08	3.32	5.24	8.33	9.96	12.03	-	0.82	1.77	3.52	5.17	6.55
T <sub>6</sub>	1.95	3.03	5.09	7.59	9.68	11.67	-	0.78	1.63	3.24	4.07	5.34
T <sub>7</sub>	2.10	3.64	5.61	8.77	10.24	12.67	-	0.94	1.82	4.08	5.49	6.72
SEm (±)	0.075	0.151	0.165	0.121	0.51	0.18	-	0.06	0.05	0.076	0.19	0.07
LSD (p = 0.05)	0.220	0.455	0.510	0.371	1.54	0.55	-	0.21	0.17	0.228	0.58	0.25

\*No rotting up to 15 days storage, in all the treatments

components contributing indirectly and directly towards yield viz, plant height, number of leaves per plant, bulb diameter and also bulb weight were superior in the treatment T<sub>4</sub> (recommended dose of inorganic fertilizers + Biozyme seed plus + Biozyme veg. granules + Biozyme veg. liquid). Thus, it is amply clear that the Biozyme which consist of precursors of auxins, enzyme, protein and micronutrients were responsible to improve vegetative growth and in turn yield of crop.

In case of production economics, application of RDF along with Biozyme Seed plus + Biozyme Veg. Granules + Biozyme Veg. Liquid resulted in higher benefit cost ratio (2.13) in onion as compare to other treatments (Table 2). This finding is supported by Manna *et al.* (2012) who reported that economic return to the grower indicated a significant benefit to using the Biozyme on chilli.

The total soluble solids content (13.95°B) and pyruvic acid content (4.45 µ mol/g) of bulb in treatment T<sub>4</sub> was statistically superior to all other treatments. The treatment T<sub>4</sub> was closely followed by treatment T<sub>6</sub> where the total soluble solids content was 12.7°B and Pyruvic acid content was 4.31µ mol/g (Table 1). This finding corroborates with the findings of Reeta *et al.*, (2010) who observed significant increase in total soluble sugars with the application of seaweed liquid fertilizer and Hariyappa, (2003) who reported that potassium increased Pyruvic acid content of onion bulb.

Keeping quality parameters of onion bulbs like physiological loss in weight (PLW, %) (Table 3) and rotting percentage (Table 3) were also influenced by Biozyme treatment. Least physiological loss of weight (1.88, 3.31, 5.18, 7.23, 9.54 and 11.46%) and least rotting percentage (0.00, 0.65, 1.25, 3.06, 3.98 and 4.88%) at 15, 30, 45, 60, 75 and 90 days after storage were observed in T<sub>4</sub> treatment. Whereas, Control (T<sub>1</sub>) showed the highest amount of physiological loss in weight (PLW, %) and rotting percentage during storage period. The results corroborate with the findings of Mukeshkumar *et al.* (2000) and Singh *et al.* (1998) in respect of maleic hydrazide treatment on onion.

From the present investigation, it may be concluded that for better growth, yield and quality of onion, the crop may be treated with different formulation of Biozyme, applied in different growth stages, in combination with the recommended

dose of fertilizer in the plains of New Alluvial Zone of West Bengal.

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