J. Indian Soc. Coastal Agric. Res. 37(1): 92-95 (2019) **Short Communication**

Bio-efficacy of Opteine-seaweed Extract in Promoting Growth and Yield of Chilli and Tomato

Received: 26.08.2018 Accepted: 17.04.2019

Chilli (*Capsicum annuum* L.) and Tomato (*Solanum lycopersium*) belongs to the family Solanaceae and are high value crops. Their fruits are highly nutritious, rich in vitamins particularly pro-vitamin A, vitamin B, vitamin C and minerals such as Ca, P, K and Fe. The chilli fruits are pungent and are widely used in immature or green stage as vegetable for stuffing or for salads. With the increase in population, the demand for the crop has been increasing day by day and the traditional varieties due to their inherent low yield potential will not be able to fulfill the demand. Tomato is considered as major vegetable crop in many parts of the world and is a rich source of lycopene and vitamins. Lycopene may help counteract the harmful effects of substances called "free radicals", which are thought to contribute to age-related processes and a number of types of cancer, including, but not limited to, those of prostate, lung, stomach, pancreas, breast, cervix, colorectum, mouth and esophagus (Bramley, 2000; DeStefani *et al*., 2000). It is, therefore, highly desirable to explore possible ways and means to enhance the productivity of these important crops employing cost effective and easy to use techniques. The foliar application of biostimulant or physio activators have very important role in improving fruit set and thus the productivity of crops.

Present agricultural practice necessitates an increase in the use of inorganic fertilizers for higher yield. The adverse effect of chemical fertilizers on soil and environment is felt upon the identification of natural fertilizers in field crops (Metting *et al*., 1990). In recent years, seaweed extracts are marketed as liquid fertilizer since they contain many growth promoting substances like hormones, vitamins, minerals, trace elements, amino acids and other such substances and can be used as foliar spray to increase the amount of limiting nutrients leading to higher biomass (Abetz, 1980). Identification of organic sources for seed and foliar treatment for yield increment will be advantageous and the seaweeds become prominent since these marine resources in shallow and deep water remain under utilized for enhancing crop production (Kaliaperumal *et al*., 2004). In view of these, the present study intended to investigate the effect of Opteine (commercial seaweed bio-stimulant prepared from *Ascophyllum nodosum*, Arysta Life Science, Mumbai, India) on the growth and yield of chilli and tomato crop.

In order to determine, the effect of different sprays of Opteine on the growth and yield attributes of chilli and tomato, a study was carried out during the *rabi* season of 2015-16 at Vegetable Improvement Scheme, Central Experiment Station, Dr. B. S. Konkan Krishi Vidyapeeth, Wakawali, Maharashtra. The soil of the experimental field was lateritic in nature. Seeds of chilli cultivar *Konkan Kirti* and tomato cultivar *Arka Alok* were sown in the month of November 2015 and transplanted during the month of December, 2015 at a spacing 60 cm X 60 cm. The experiment comprised of six treatments including T_1: Water Spray (Control), T_2: Opteine @ 400 mL ha^{-1}, T_3: Opteine 500 mL ha^{-1}, T_4: Opteine @ 600 mL ha^{-1}, T_5: Opteine @ 750 mL ha^{-1} and T_6: Opteine @ 1250 mL ha^{-1}. Spraying was done three times, first at 1st flowering, second at 14 days after 1st spray and third at 14 days after 2nd spray. The plant height and yield attributing characters were recorded as per schedule and analyzed statistically following the standard procedure as given by Panse and Sukhatme (1985).

Our results showed that, the parameters *viz*., plant height, number of clusters, fruit weight and number of fruits per plant were significantly increased by foliar application of Opteine seaweed extract (Table 1).

In chilli, it was observed that, the treatment T_4 - Opteine @ 600 mL ha^{-1} recorded maximum plant height (59.64 cm), average fruit weight (2.98 g), number of fruits per plant (172.67) and fruit yield (14.31 t ha^{-1}) which was significantly superior over all other treatments (Table 1). The minimum plant height (56.73 cm), average fruit weight (2.82 g), no. of fruits per plant (153.67) and fruit yield (12.02 t ha^{-1}) were recorded in the treatment T_1, control where only water was sprayed on the crop. Babu and Rengasamy (2012) observed that when chillies were treated with 1% and 2% of seaweed liquid fertilizer of *K. alvarezii*, it increased the crop yield was increased by 23% and 15%, respectively when

Table 1. *Effect of different foliar sprays of Opteine on growth, yield and yield contributing characters of chilli and tomato*

Treatments	Chilli				Tomato				
	Plant height (cm)	Av. fruit weight (g)	No. of fruits plant^{-1}	Fruit yield (t ha^{-1})	Plant height (cm)	No. of clusters plant^{-1}	Av. fruit weight (g)	No. of fruits plant^{-1}	Fruit yield (t ha^{-1})
T_1 (Water spray)	56.73	2.82	153.67	12.02	74.97	13.11	31.59	38.01	33.39
T_2 (Opteine @ 400 mL ha^{-1})	56.82	2.87	161.00	12.82	72.91	14.45	32.11	41.91	37.36
T_3 (Opteine @ 500 mL ha^{-1})	58.10	2.96	169.33	13.92	67.50	15.58	32.85	45.18	41.22
T_4 (Opteine @ 600 mL ha^{-1})	59.64	2.98	172.67	14.31	62.11	15.54	35.33	45.07	44.22
T_5 (Opteine @ 750 mL ha^{-1})	57.37	2.97	165.00	13.62	73.19	14.89	33.61	43.18	40.31
T_6 (Opteine @ 1250 mL ha^{-1})	57.08	2.95	163.33	13.38	72.10	14.65	34.25	42.49	40.43
SE +	0.45	0.02	2.13	0.217	1.21	0.18	0.64	0.54	0.90
CD @ 5%	1.42	0.07	6.72	0.683	3.80	3.80	2.02	1.69	2.83

compared to control. Manna *et al*. (2012) also reported similar trend of increase in yield of chilli with use of biozyme prepared from *Ascophyllum nodosum* that contains nutrients in a naturally chelated form which helps to improve cell division and cell enlargement resulting into better chlorophyll content and increased production.

The data presented in Table 1, revealed that in tomato crop, T_1 (Control water spray) recorded maximum plant height (74.97 cm), which was significantly superior over all other treatments. As far as yield attributing characters are considered, treatment T_4-Opteine @ 600 mL ha^{-1} produced maximum average fruit weight (35.33 g) and fruit yield (44.22 t ha^{-1}) which was significantly superior over all other treatments. Treatment T_4 was followed by T_3 in terms of fruit yield (41.22 t ha^{-1}). The maximum number of clusters per plant (15.58) and number of fruits per plant (45.18) was also registered in the treatment T_4. The maximum yield of tomato had been observed when using foliar application of *K. alvarezii* extract (Zodape *et al*., 2011). Similar kind of result was observed by Pramanick *et al*. (2013) that the foliar application of seaweed sap improved the nutrient uptake capacity of crops. Karthikeyan and Shanmugam (2016) also observed similar trend in tomato with respect to number of flowers and yield.

It is clear from the above results that the seaweed extract increased the plant height as well as yield attributing characters in comparison with the control. This is attributed to the composition of the seaweed extract such as natural growth hormones (auxins and cytokinins) that promote plant growth via increasing a number of metabolic events, cell division and enlargement which in turn leading to increase plant height (Demir *et al*., 2006, Gollan *et al*., 2006; Prasad *et al*., 2010). In addition, the extract contains a considerable amount of macro and micro elements which play an important role in the activation of many enzymes and coenzymes which are involved in several biological processes leading to cell division and enlargement (Anantharaj, 2002; Murugalakshmi Kumari, 2002).

Significant increases in total yield were observed due to increase in associating characters *viz*., fruit weight and number of fruits. Seaweed liquid extract stimulate different aspects of plant like good health, development of root system, absorption of mineral, enlargement of shoot, increased rate of photosynthesis and crop yield (Sridhar and Rengasamy, 2010). Further, Zodape (2001) tried various modes of seaweed extract application such as a foliar spray, application to soil and soaking of seeds before sowing and reported that extract not only enhances the germination of seeds but also increases uptake of plant nutrients and gives resistance to frost

and fungal diseases. This could be the reason behind increased fruit yield in chilli and tomato.

Therefore it may be concluded that application of Opteine @ 600 mL ha^{-1} as foliar application could be successfully used for obtaining higher yields of chilli and tomato crops in the lateritic soils of Maharashtra.

P. B. SANAP, P. M. NIGADE* and B. G. THAWARE

Vegetable Improvement Scheme
Central Experiment Station
Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth
Wakawali, Maharashtra – 415 711

*_Corresponding Author_: E-mail: prashant1926@gmail.com

REFERENCES

Abetz, P. (1980). Seaweed extracts: have they a place in Australian agriculture or horticulture? *Journal of the Australia Institute Agricultural Science* **46**(1): 23-29.

Anantharaj, M. J. and Venkatesalu, V. Y. (2002). Studies on the effect of seaweed extracts on *Dolichos biflorus. Seaweed Research and Utilization* **24**(1): 129-137.

Babu, S. and Rengasamy, R. (2012). Effect of Kappaphycus alvarezii SLF treatment on seed germination, growth and development of seedling in some crop plants. *Journal of Academia and Industrial Research* **1**: 186-95.

Bramley, P. M. (2000). Is lycopene beneficial to human health? *Phytochemistry* **54**(3): 233-235.

Demir, N., Dural, B. and Kevser, Y. (2006). Effect of seaweed suspensions on seed germination of tomato, pepper and aubergine. *Journal of Biological Sciences* **6**(6): 1130-1138.

DeStefani, E., Oreggia, F., and Boffetta, P. (2000). Tomatoes, tomato-rich foods, lycopene and cancer of the upper aerodigestive tract: a case control in Uruguay. *Oral Oncology* **36**(1): 47-53.

Gollan, J. R. and Wright, J. T. (2006). Limited grazing pressure by native herbivores on the envasive seaweed Caulerba taxifolia in a temperate Australia estuary. *Marine and Fresh Water Research* **57**(7): 685-694.

Kaliaperumal, N., Kalimuthu, S. and Ramalingam, J. R. (2004). Present scenario of seaweed exploitation and industry in India. *Seaweed Research and Utilization* **26**: 47-53.

Karthikeyan, K. and Shanmugam, M. (2016). Development of a protocol for the application of commercial bio-stimulant manufactured from *Kappaphycus alvarezii* in selected vegetable crops. *Journal of Experimental Biology and Agricultural Sciences* **4**(1): 92-102.

Manna, D., Sarkar, A. and Maity, T. K. (2012). Impact of biozyme on growth, yield and quality of chilli (*Capsicum annuum* L). *Journal of Crop and Weed* **8**(1): 40-43.

Metting, B., Zimmerman, W. J., Crouch, I. J. and van Staden J. (1990). Agronomic uses of seaweed and micro algae. *In: Introduction to Applied Phycology*, I. A. Akatuska (ed), SPB Academic Publishing, The Hague, Netherlands. pp 269-307.

Murugalakshmi Kumari, R., Ramasubramanian, V. T. and Muthuchezhian, K. (2002). Studies on the utilization of seaweed as an organic fertilizer on the growth and some biochemical characteristics of black gram and cucumber. *Seaweed Research and Utilization* **24**(1): 125-128.

Panse V. G. and Sukhatme, P. V. (1985). *Statistical Methods for Agricultural Workers*, Fourth Edition, Indian Council of Agricultural Research, New Delhi, India.

Pramanick, B, Brahmachari, K. and Ghosh, A. (2013). Effect of seaweed saps on growth and yield improvement of green gram. *African Journal of Agriculture Research* **8**: 1180-1186. DOI: 10.5897/AJAR12.1894.

Prasad, K., Das, A. K., Oza, M. D., Brahmbhatt, H., Siddhanta, A. K., Meena, R., Eswaran, K., Rajyaguru, M. R. and Ghosh, P. K. (2010). Detection and quantification of some plant

growth regulators in a seaweed based foliar spray employing mass spectrometric technique. *Journal of Agricultural and Food Chemistry* **58**(8): 4594-4601.

Sridhar, S. and Rengasamy, R. (2010). Significance of seaweed liquid fertilizers for minimizing chemical fertilizers and improving yield of *Arachis hypogaea under field trial. Recent Research in Science and Technology* **2**(5): 73-80.

Zodape, S. T., Gupta, A., Bhandari, S. C., Rawat, U. S., Chaudhary, D. R., Eswaran, K., and Chikara, J. (2011). Foliar application of seaweed sap as biostimulant for enhancement of yield and quality of tomato (*Lycopersicon esculentum* Mill.). *Journal of Scientific and Industrial Research* **70**(3): 215-219.