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EFFECT OF FOLIAR APPLICATION OF BIOSTIMULANTS ON YIELD OF BRINJAL (*SOLANUM MELONGENA* L.)

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Abstract

A field experiment on "Effect of foliar application of biostimulants on yield of brinjal" was carried out in our own field at Elaiyaperumal Patti village in Karur district, Tamilnadu during 2018-2019 to find out the suitable biostimulant for better growth and yield of brinjal. The study was established in completely randomized design with nine treatments and three replications. The nine treatments are panchagavya 5 percent (T_1), panchagavya 10 percent (T_2), seaweed extract 5 percent (T_3), seaweed extract 10 percent (T_4), humic acid 5 percent (T_5), humic acid 10 percent (T_6), vermiwash 5 percent (T_7), vermiwash 10 percent (T_8), control (T_9). Among the various biostimulants, humic acid 10 percent significantly increased the growth and yield attributes when compare to all other treatments. Yield parameters such as number of fruits plant^{-1} (55.75), fruit length (14.23 cm), girth (13.25 cm), weight (58.75 g), yield plant^{-1} (3.27 kg) and yield plot^{-1} (39.24 kg) were significantly influenced by humic acid 10 percent and this was followed by humic acid 5 percent.

Key words: brinjal, biostimulants, humic acid.

Introduction

Vegetables play an important role in protective food security, particularly in a country marked by malnutrition and under nutrition and providing good regular source of income and employment to farmers. Brinjal, commonly known as egg plant (*Solanum melongena* L.) is an often cross pollinated crop and belongs to the family Solanaceae and synonymously known as aubergine. It is a popular and principle vegetable crop widely grown in tropics and subtropics (Rao, 2011). In recent years, innovation in agriculture production have been evolving towards low-cost, organic, sustainable and environmental friendly system and at the same time increase the yield and quality of the crops. Organic biostimulants are such molecules useful in increasing productivity of crops. These biostimulants applied in small amounts, can promote plant development, increase yield and support plants to overcome from stress by acting directly or indirectly on plant physiology (Kauffman *et al*., 2007). Foliar fertilization is used as a means of supplying supplemental doses of macro and micro nutrients, plant hormones, stimulants and other beneficial substances (Haytova, 2013). Panchagavya is an organic product blended with five different cow products, commonly applied to crop plant in organic farming. It act as a growth promoter and immunity booster and also restricts the incidence of common diseases (Vallimayil and Sekar, 2012). Panchagavya is also known to contain growth regulatory substances such as IAA, GA and cytokinin. Marine algal seaweed species are often regarded as an underutilized bio resource, many have been used as a source of food industrial raw materials and in therapeutic and botanical applications for centuries. Seaweeds used for biostimulant production which contain cytokinins and auxins or other hormone-like substances (Hamza and Suggars, 2001). Humic acid was noted as another alternative for chemical fertilizer since it is economical and environment friendly bio fertilizer. Humic acid is formed by the breakdown of organic matter and can be obtained from coal, soil, peat and dystrophies lakes. Vermiwash is a liquid fertilizer collected after passage of water through a column of worm activation. It is a collection of excretory and secretory products of earth warms along with major micronutrients of the soil and soil organic molecules (Ansari, 2008).

Materials and Methods

The experiment was carried out at Elaiyaperumal patti village in Karur district of Tamil Nadu during 2018–2019. The trail was laid out in Randomized block design with nine treatments and three replications with the spacing of 60×60 cm. The nine treatments are panchagavya 5 percent (T_1), panchagavya 10 percent (T_2), seaweed extract 5 percent (T_3), seaweed extract 10 percent (T_4), humic acid 5 percent (T_5), humic acid 10 percent (T_6), vermiwash 5 percent (T_7), vermiwash 10 percent (T_8), control (T_9). Observations like number of fruits plant^{-1}, fruit length girth, fruit weight, yield plant^{-1} and yield plot^{-1} were recorded.

Results and Discussions

Effect of biostimulants on yield characters of brinjal are summarized in Table. All the biostimulants significantly influenced the yield characters. The maximum number of fruits plant^{-1} was observed in T_6 (humic acid 10 percent) with the values of 55.75. This was followed by T_5 (humic acid 5 percent) which recorded 51.54 and it was on par with seaweed extract 10 percent with the values of 49.80. Similar findings were reported by Manas *et al.,* (2014), who explained the maximum number of fruits per plant (9.80) was recorded in *Capsicum annum* due to the combined application of humic acid + Zinc + Boron. Such increments in flowering and fruit yield due to treating the plants with HA and Ca treatments might be connected with their effect on increasing the vegetative growth parameters, photosynthetic pigments and leaf-NK content, which affects plant growth and in turn increased its productivity.

Earlier reports by Shafeek (2016), in cucumber indicated that the application of humic acid increases the number of fruits per plant (20.67). Moreover, the favourable effectiveness of humic acid by the output and goodness of cucumber could likewise be primarily due to hormone-parallel vigour of the humic acid meanwhile them involvement in cell breathing, oxidative phosphorylation, photosynthesis, protein synthesis and different enzymatic response. (Chen and Avaid, 1990) found that handling carrots cells with humic substances improved those expansion and stimulate morphological major changes similar to these generated through auxins.

Kaya *et al.,* (2005) also reported that foliar application of humic acid + zinc increased the number of pods per plant (114.80) in common bean. With regard to the different biostimulants, T_6 (humic acid 10 percent) was judged as the best treatment with the maximum fruit length of 14.23 cm. This was followed by 5 percent humic acid (T_5) which recorded 13.28 cm and it was on par with 10 percent seaweed extract (T_4) with the value of 13.16 cm.

The minimum fruit length was observed in control (T_9) which recorded 8.28 cm and it was followed by panchagavya at 5 percent which registered the minimum fruit length of 9.19 cm. The results are in line with the reports of Manas *et al.,* (2014), who explained the maximum fruit length (7.30 cm) was registered in plants which received the foliar application of HA + Zn+ B. The result of the present study revealed that the maximum fruit girth was observed in the T_6 (humic acid 10 percent) with the value of 13.25 cm. The minimum fruit girth (7.31 cm) was recorded in control. Similar findings were reported by Salman (2015), who explained that the application of humic acid increased the fruit diameter by increasing the cell division and enlargement and resulted in more development and diameter of fruits in watermelon. The data recorded on fruit weight represented in Table 1 showed significant differences. With regard to the biostimulants, T_9 (humic acid 10 percent) was judged as the best treatment with the maximum fruit weight of 58.75 g. This was followed by 5 percent humic acid (T_5) which recorded 56.74 g and it was on par with

Table 1: Effect of foliar application of biostimulants on yield attributes of brinjal (*Solanum melongena* L.)

T. No.	Treatments	Number of fruits per plant	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Yield per plant(kg)	Yield per plot(kg)	Estimated yield per hectare(t)
T_1	Panchagava @ 5%	30.68	9.19	8.05	46.75	1.43	17.16	28.60
T_2	Panchagavya@10 %	38.54	10.63	9.75	50.44	1.94	23.28	38.80
T_3	Seaweed Extract @ 5 %	46.05	12.27	11.23	54.21	2.49	29.88	49.80
T_4	Seaweed Extract@10 %	49.80	13.16	12.18	56.19	2.79	33.48	55.80
T_5	Humic acid @ 5%	51.54	13.28	12.37	56.74	2.92	35.04	58.40
T_6	Humic acid @ 10 %	55.75	14.23	13.25	58.75	3.27	39.24	65.40
T_7	Vermiwash @ 5 %	34.89	9.91	8.89	48.62	1.69	20.28	33.80
T_8	Vermiwash @ 10 %	42.23	11.42	10.37	52.32	2.20	26.40	44.00
T_9	Control	24.10	8.28	7.31	44.92	1.07	12.84	21.40
	S.Ed	**1.67**	**0.21**	**0.19**	**0.78**	**0.09**	**1.19**	**1.96**
	CD(p=0.05)	3.55	0.45	0.41	0.36	0.20	2.53	4.16

T_4 (10 percent seaweed extract) with the value of 56.19g. Among the various treatments, the fruit weight was minimum (44.92g) in the treatment control (T_9) which followed by T_1 (panchagavya 5 percent) with the value of 46.75 g. Role of humic acid in increasing fruit weight by activating hormones like auxin and cytokinin. This was reported by Yuvan *et al.,* (2009) in Cucumber and Akinci *et al.,* (2009) in Beans. The results revealed that the foliar application of biostimulants brought variations in fruit yield plant^{-1}. Among the various treatments, T_6 (humic acid 10 percent) excelled other treatments by recording the highest fruit yield plant^{-1} as 3.27 kg plant^{-1} which was significantly superior to the next best treatment, T_5 (humic acid 5 percent) which recorded 2.92 kg plant^{-1}. It was on par with T_4 (seaweed extract 10 percent) which registered 2.79 kg plant^{-1}. The lowest fruit yield plant^{-1} was observed in T_9 (control) which registered the value of 1.07 kg plant^{-1}. The result of the present study revealed that the maximum fruit yield (39.24 kg plot^{-1}) was observed in plots which received humic acid at the concentration of 10 percent. This was followed by humic acid at the concentration of 5 percent with the values 35.04 kg plot^{-1}. Estimated yield per hectare (65.40 t ha^{-1}) also higher in humic acid 10 percent. The minimum fruit yield (12.84 kg plot^{-1}) was obtained in control. Similar findings were reported by Paramasivan *et al.,* (2015) who explained that the 75 percent RDF + soil application of 10 kg humic acid + 0.2 percent foliar application of humic acid increases the total yield in brinjal crop. The present results are in concordance with findings by Kasar *et al.,* (2010), indicated that foliar application of humic acid 100 ppm with soil application of FYM recorded maximum fruit yield in chilli. Shafeek *et al.,* (2013) reported that foliar application of humic acid increases the total pod yield in broad bean. The results are in line with the findings of El-Bassiony (2010), who reported foliar application of humic acid increases the total pod yield in snap bean.

Conclusion

It can be concluded from the results of this study that application of foliar sprays of humic acid and biostimulators can be safely used within the applied concentrations with a positive effect on yield parameters like number of fruits per plant, fruit length, fruit girth, fruit weight, yield per plant, yield per plot and estimated yield per hectare. From this study, I recommend humic acid @ 10% concentration can better enhances the growth and yield characters than other bio stimulants used.

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