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RESPONSE OF HUMIC ACID AND ZINC FERTILIZATION ON THE YIELD CHARACTERS OF BRINJAL (*SOLANUM MELONGENA* L.)

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Abstract

In this study, the effects due to the application of humic acid and zinc sulphate on the yield characters of brinjal crop was experimented and studied. The main objective of the study was to determine the response of brinjal to soil application of humic acid and zinc sulphate at different concentrations. Humic acid and zinc sulphate are applied three weeks after planting. Soil application of both humic acid and zinc sulphate positively affected the yield characters *viz.,* number of fruits plant^{-1}, fruit length, single fruit weight, fruit girth and total fruit yield of brinjal crop when compared to control. The highest yield characters were observed with humic acid at 30 kg ha^{-1} and zinc sulphate at 50 kg ha^{-1}. This treatment rated efficient in increasing the yield comparing to control. The highest fruit yield was found to be 22.64 t/ha and control (10.87 t/ha). Hence the study shows that the soil application of HA@ 30 kg/ha + $ZnsO_4$@ 50 kg/ha concentration could be successfully used to obtain better yield in brinjal.

Key words: Humic acid, Zinc, brinjal, yield.

Introduction

Vegetables are the store house of the most of the vitamins, minerals, and also proteins. The nutritional value of vegetables is unsurpassed. Eggplant (Solanum melongena) or Aubergine (UK) or Brinjal (South Asia and South Africa) is a perennial tropical vegetable plant native to South and East Asia (China, India). The fruit is widely used for cooking. Humic acid is a result of organic matter decomposition and is beneficial to plant growth and development. Humic acid is naturally occurring polyphenolic and polyhydroxy compounds formed during the decomposition of organic matter. Application of this humic acid to the crops influences the growth and yield as well as quality of crops. Humic acid can influences the crop either directly as a growth regulator and indirectly as a chelating agent increases the growth of shoots and roots, absorption of nitrogen, phosphorous, potassium, calcium, magnesium by plants. Zinc is involved in most plant growth functions. Zinc helps produce auxin. Zinc is a growth promoting substance that controls the development of the shoot. Zinc also forms enzyme systems, which regulate plant life. Yet zinc is the most common micronutrient deficiency in agriculture today. Zinc deficiency can limit yields of corn, beans, wheat, cotton, sorghum, fruits, and vegetables. Micronutrients like boron, copper and zinc also play a positive role for increasing fruit as well as seed yield in brinjal. The deficiency of zinc indicates leaf discoloration, stunting reduced height, brown spots on upper leaves, distorted leaves, Interveinal chlorosis which spread later to younger leaves.

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Materials and methods

The study was carried out as a field experiment at Kavarapattu village, near Chidambaram, Cuddalore district, Tamilnadu. The experimental site is geographically located at 11^0 24' N latitude, 79^0 44' E longitude and altitude of 8 m above mean sea level (MSL). The experimental soil was sandy clay loam in texture and taxonomically classified as *Typic ustifluvent.* Brinjal variety Palur.2 was used as a test crop for the experiment. Seedlings were planted at 23rd January 2018 at a spacing of 60 × 60cm. Trials was carried out in randomized block design with three replication.

In the study, humic acid was applied at 20, 30, 40 kg ha^{-1} (T_2, T_3, T_4) and only RDF in control plot (T_1) and zinc sulphate at 25 and 50 kg ha^{-1} (T_5 and T_6). Combined application of humic acid and zinc sulphate were also given. Application of HA@ 20 kg ha^{-1} + $ZnsO_4$@ 25 kg ha^{-1} (T_7), HA@ 20 kg ha^{-1} + $ZnsO_4$@ 50 kg ha^{-1} (T_8), HA@ 30 kg ha^{-1} + $ZnsO_4$@ 25 kg ha (T_9), HA@ 30 kg ha^{-1} + $ZnsO_4$ + 50 kg ha^{-1} (T_{10}), HA@ 40 kg ha^{-1} + $ZnsO_4$@ 25 kg ha^{-1} (T_{11}), HA@ 40 kg ha^{-1} + $ZnsO_4$@ 50 kg ha^{-1} (T_{12}). The vegetables are harvested thrice at 60^{th}, 90^{th}, and 120^{th} days after planting.

Results and Discussion

In the study, the results showed that the soil application of humic and zinc significantly affected the yield characters of brinjal. Representative plants in each plots were labelled and the observations were taken at appropriate stages. In this study, the yield characters observed are given in table 1. Application of humic acid at 30kg ha^{-1} and $ZnsO_4$ at 50kg ha^{-1} has increased the yield characters of brinjal and the highest number of fruits $plant^{-1}$ (25.2), fruit length (11.98cm), single fruit weight (76.2 g), fruit girth (18.3cm) and total yield (22.64 t/ha).

The application of humic acid and zinc sulphate has increased the yield by 10-15%. The increase in yield characters by humic acid due to the increased nutrient uptake from soils which resulted in the improved growth and yield characters as explained by Ertan Yildrim (2007) and the zinc in addition to its role in chlorophyll synthesis and influence in cell division and active growth as suggested by Pandav (2016). The betterment in yield parameters of brinjal may be due to an abundant supply of nutrients with the application of humic acid and zinc. An adequate supply of plant nutrients applied through the basal dosage of NPK. Humic acid and zinc sulphate are applied as treatments which enhanced various metabolic activities in brinjal crop. The effect of humic acid as an additive to enhance the growth and yield of eggplant. Abd El-Aal (2005) reported the increase in yield in onion by the application of humic acid. There was a significant positive effect for all the treatment over control. The effect of micronutrient (zinc) on fruit set of brinjal revealed by Gogoi *et al.,* (2014). Raj *et al.,* (2001) who stated larger fruit weight with increasing zinc levels. The humic acid shows the highest yield parameters reported by Dursun (2002). Meanwhile the highest yield is recorded in brinjal to various zinc levels. The increase in fruit yield, fruits/cluster at 0.2%, 0.5% zinc sulphate application reported by Umekalson Afridi (2015). On the other hand, the lowest fruit yield recorded in the treatment without humic acid. Similar results were reported by Nardi *et al.,* (2002), Arancon *et al.,* (2006), and Obsuwan *et al.,* (2011). Arancon *et al.,* (2006) stated that the application of humic acid, the major component of soil has been reported to have a positive effect on plant growth. Response of brinjal to humic acid estimated and recorded the highest yield benefits like fruit length and weight revealed by Semida (2016).

The similar findings are reported by Mahmoud and Hafez (2010) that the application of humic acid can stimulate the yield of eggplant. Ibrahim and Ramadan (2015) stated that there was an increase in yield by 25-35% by the application of humic acid in field beans. Suh et al (2014) reported in potato about the yield increase

Table 1: Effect of HA and zinc sulphate on yield characters at different crop stages.

Treatments	Number fruits $plant^{-1}$ at 120 days	Fruit length (cm) at 90 days	Single fruit of weight (g) at 90 days	Fruit girth (cm) at 120 days	Total yield (t/ha)
T_1 – Control 18.4	7.21	32.8	12.08	10.87	
T_2 - Humic acid @ 20 kg ha^{-1}	19.8	9.86	52.8	14.9	19.23
T_3 - Humic acid @ 30 kg ha^{-1}	22.3	10.23	59.5	15.4	19.87
T_4 - Humic acid @ 40 kg ha^{-1}	21.1	10.05	57.2	15.1	19.64
T_5 - Zinc sulphate @25 kg ha^{-1}	19.5	9.56	51.7	14.7	18.96
T_6 - Zinc sulphate @ 50 kg ha^{-1}	18.9	8.22	50.2	14.3	18.64
T_7 - Humic acid @ 20 kg ha^{-1} + Zinc sulphate @ 25 kg ha^{-1}	22.8	10.42	60.2	15.9	21.06
T_8 - Humic acid @ 20 kg ha^{-1}+ Zinc sulphate @ 50 kg ha^{-1}	23.1	10.61	62.9	16.4	21.43
T_9 - Humic acid @ 30 kg ha^{-1}+ Zinc sulphate @ 25 kg ha^{-1}	25.1	11.97	76.1	18.2	22.63
T_{10}-Humic acid @ 30 kg ha^{-1} + Zinc sulphate @ 50 kg ha^{-1}	25.2	11.98	76.2	18.3	22.64
T_{11} -Humic acid @ 40 kg ha^{-1} + Zinc sulphate @ 25 kgha^{-1}	23.6	10.82	63.2	16.8	21.62
T_{12} - Humic acid @ 40 kg ha^{-1} + Zinc sulphate @ 50 kg ha^{-1}	24.5	11.19	65.7	17.2	21.94
S. Ed	0.432	0.201	1.209	0.304	0.397
CD (p=0.05)	0.89	0.41	2.50	0.63	0.82

using HA by 13%.

Conclusion

The present investigation clearly brought out the beneficial effects of soil application of humic acid and zinc sulphate on the growth of brinjal. Application of humic acid at 30 kg ha^{-1} and zinc sulphate at 50kg ha^{-1} was identified as the best treatment combination for the farmer's recommendation to realize the maximum profit in brinjal. However the results should be test verified under field conditions for recommendation to the farmers.

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