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Short communication

Studies on influence of humic acid on growth and yield of brinjal var. KKM1 in Alfisols of Tamil Nadu

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ABSTRACT

Field experiment was carried out to study the influence of humic acid and inorganic fertilizers on yield and nutrient uptake of brinjal var. KKM1. The experiment was laid out in RBD with three replications having 11 treatments of both soil and foliar application of humic acid with different levels of inorganic fertilizers. The highest fruit yield (33.4 t/ha) and total dry matter production (10.08 t/ha) were recorded in treatment T_{10} (75% RDF of NPK with 10 kg of humic acid applied as soil application and 0.2% foliar application). The highest NPK content (1.44, 0.51 and 1.55%, respectively) and uptake (143.1, 33.0 and 148.6 kg/ha) were noted for the same treatment. The highest available N-P-K in soil (291.5, 25.4 and 293.7 kg/ha) was recorded in treatment (T_{10}) applied with 75% RDF of NPK with 10 kg of humic acid applied as soil application and 0.2% foliar application).

Key words: Alfisol, brinjal yield, humic acid, nutrient content, uptake, available nutrients.

Brinjal (*Solanum melongena* L.) is one of the most commonly grown vegetables of India. The area of cultivation is 0.68 million hectares with a production of 11.9 million tonnes with the average productivity of 17.5 t/ha (Anon,1). In Tamil Nadu, the cultivated area is 7,107 ha with an annual production of 75971 tonnes and the average productivity of 10.69 t/ ha. Soil fertility decides the yield targets of many crops. Sustaining of soil fertility by the use of humic acid is well recognized. Humic acid not only influence the crop yield but also improve the physico-chemical properties of soil (Sangeetha and Singaram, 6). Humic acid reduces other fertilizer requirements, increases yield in crops, improved drainage, increases aeration of the soil, increase the protein and mineral contents of most crops and establish a desirable environment for microorganism development (Sangeetha and Singaram, 6). Brinjal generally requires heavy manuring for its potential production. However, the use of expensive commercial fertilizers as per the crop requirement of the crop is not much affordable by the farmers. Therefore, the application of fertilizers combined with humic acid is the cost effective method in nutrient management for maintaining its sustainable production and productivity. The present study was conducted to find the influence of humic acid with graded levels of inorganic fertilizers on productivity and nutrient uptake in brinjal.

A field experiment was conducted at Agricultural College and Research Institute, Killikulam during 2010-11 to 2012-13. The soil of the experimental field was sandy clay loam in texture with a pH 6.65 and EC (0.18 dS/m), low in organic carbon (0.42%), medium in available nitrogen (266 kg/ha), available phosphorus (16.8 kg/ha) and high in available potassium (268 kg/ha). The experiment was laid out in randomized block design (RBD) with three replications consisted 11 treatments.

The brinjal variety KKM1 was taken as test crop. Planting was done at the spacing of 60 cm × 75 cm (22,222 plants/ha) during December of every season. The cultivation practices were followed as per the guidance of crop production guide of Tamil Nadu Agricultural University. The fertilizer sources used were urea for N (46% N), single super phosphate for P (16% water soluble P_2O_5), muriate of potash for K (60% of K_2O) and commercial form of humic acid (Humicil™). The foliar spray of humic acid was given on 60, 90 and 120 days after planting. Five representative samples of each plot were collected and observations of different characters such as plant height, number of branches, number of fruits per plant, fruit weight, fruit yield and dry matter production were statistically analysed. The nutrient content and uptake by plant were analysed through prescribed laboratory procedures. The post harvest soil pH and EC were estimated in 1:2.5 soil water suspension (Jackson, 4), organic carbon by wet-digestion method (Walkley and Black, 10), available nitrogen by alkaline permanganate method (Subbiah and Asija, 8), available phosphorus with 0.5M sodium bicarbonate method (Olsen *et al.*, 5) and available potassium with neutral normal ammonium acetate method (Jacson, 4). Data collected on various

parameters were statistically analysed as per the procedure given by Gomez and Gomez (3).

The growth and yield attribute parameters like plant height, number of branches per plant, number of fruits, weight of single fruit were significantly influenced by various treatments (Table 1). The tallest plants (112.0 cm), maximum number of branches (9.4/ plant), earliest 50% flowering (56.4 days), maximum number of fruits /plant (25.3), weight of the single fruit (69.9 g) were recorded in the treatment (T_{10}) with 75% RDF + 10 kg HA (SA) + 0.2% HA (FS) /ha followed by the height of 102.2 cm, 8.3 number of branches, 50% flowering (58.2 days), 22.4 fruits / plant and 68.1 g of fruit weight observed in treatment (T_9) with 75% RDF + 10 kg HA (SA) + 0.1% HA (FS) /ha. Both the treatments were at par. The increase in plant height is due to the humic acid application which resulted in better rooting and absorption of nutrients by plants (Satyabama and Selvakumari,7). Similar results were reported by Ebrahim Azarpour *et al.* (2) and Virgine Tenshia and Singaram (9). The shortest plant (69.6 cm), minimum branches (4.9/ plant), late 50 % flowering (67.7 days), minimum number of fruits /plant (12.7) and fruit weight (52.3 g) were recorded in control (T_1). The highest fruit yield and total dry matter production (33.4 and 10.08 t/ ha) were recorded with the application of 75% RDF + 10 kg HA (SA) + 0.2% HA (FS)/ha (T_{10}) followed by the treatment (T_9) with the application of 75% RDF + 10 kg HA (SA) + 0.1% HA (FS)/ha recorded the next maximum fruit yield and total dry matter production (30.8 and 9.45 t/ha), whereas lowest yield of fruit and total dry matter production (17.0 and 5.99 t/ha) was noticed with no application of fertilizer and humic acid (control).

The content and uptake of NPK significantly influenced by combined application of both soil and foliar application of humic acid (Table 2). Highest content of nitrogen, phosphorus and potassium (1.44, 0.51 and 1.55%) and the uptake (143.1, 33.0 and 148.6 kg/ha) were recorded in the treatment applied with 75% RDF + 10 kg HA (SA) + 0.2% HA (FS) /ha (T_{10}) followed by the content (1.38, 0.47 and 1.51%) and uptake (132.4, 29.1 and 136.7 kg/ ha) were noticed with treatment applied with 75% RDF + 10 kg HA (SA) + 0.1% HA (FS) /ha (T_9). This increase was mainly due to the increased fruit yield and dry matter production and combined application of humic acid with inorganic fertilizers (Virgine Tenshia and Singaram, 9). The lowest content of NPK (0.93, 0.18 and 1.2%) and uptake (67.4, 11.0 and 70.7 kg/ha) were observed in control (T_1). The available nutrient statuses at post-harvest soil were influenced for various treatments. The highest organic carbon (0.92%), nitrogen, phosphorus and potassium (291.5, 25.4 and 293.7 kg/ha) were recorded in treatment (T_{10}) with 75% RDF + 10 kg HA (SA) + 0.2% HA (FS). These results corroborate the findings of Sangeetha and Singaram (6). The lowest values of available NPK (0.41%, 185.3, 12.9 and 229.0 kg/ha) were recorded in control (T_1). Based on the study, it is concluded that the application of 75% RDF of NPK with humic

Table 1. Effect of humic acid with inorganic fertilizers on growth, yield attributes and fruit yield of brinjal (pooled data of three years).

Treatment	Plant height (cm)	No. of branches/ plant	Days to 50% flowering	No. of fruits/ plant	Fruit weight (g)	Fruit Yield (t /ha)	Total DMP (t/ha)
T_1 - Control	69.6	4.9	67.7	12.7	52.3	17.0	5.99
T_2 - 100% RDF	90.2	7.1	60.8	21.9	57.4	25.3	8.13
T_3 - 75% RDF	82.9	6.5	62.1	17.4	59.4	23.4	7.50
T_4 - 75% RDF + 10 kg HA/ha (SA)	79.4	6.5	63.8	15.8	61.9	25.7	8.25
T_5 - 75% RDF + 20 kg HA/ha (SA)	96.9	8.3	59.9	20.8	60.0	28.1	8.98
T_6 - 75% RDF + 0.1% HA/ha (FS)	75.2	6.6	63.0	16.4	58.7	25.7	8.23
T_7 - 75% RDF + 0.2% HA/ha (FS)	73.3	6.5	65.5	17.6	58.4	26.8	8.46
T_8 - 75% RDF + 0.3% HA/ha (FS)	73.9	7.4	65.0	16.3	60.3	25.5	7.85
T_9 - 75% RDF + 10 kg HA (SA) + 0.1%/ha HA (FS)	102.2	8.3	58.2	22.4	68.1	30.8	9.45
T_{10} - 75% RDF + 10 kg HA (SA) + 0.2%/ha HA (FS)	112.0	9.4	56.4	25.3	69.9	33.4	10.08
T_{11} - 75% RDF + 10 kg HA (SA) + 0.3%/ha HA (FS)	101.1	7.8	61.2	21.3	63.0	28.3	9.16
CD (P = 0.05)	4.26	0.65	2.36	1.94	6.40	1.64	1.81

RDF = Recommended dose of fertilizers, HA = Humic acid , SA = Soil application, FS = Foliar spray, DMP = Dry matter production

Table 2. Effect of humic acid with inorganic fertilizers on nutrient content, uptake and soil available nutrients (pooled data of three years)

Treatment	Nutrient content (%)			Nutrient uptake (kg/ha)			Soil available nutrients (kg/ha)			
	N	P	K	N	P	K	OC (%)	N	P	K
T_1 - Control	0.93	0.18	1.20	67.4	11.0	70.7	0.41	185.3	12.9	229.0
T_2 - 100% RDF	1.20	0.40	1.31	109.6	19.1	117.6	0.61	257.5	19.5	272.6
T_3 - 75% RDF	1.10	0.31	1.34	95.7	16.7	102.8	0.54	259.5	17.7	260.0
T_4 - 75% RDF + 10 kg HA/ha (SA)	1.16	0.32	1.39	109.9	17.3	122.3	0.56	270.7	17.2	262.8
T_5 - 75% RDF + 20 kg HA/ha (SA)	1.30	0.41	1.43	125.2	24.6	131.5	0.56	275.0	22.3	276.8
T_6 - 75% RDF + 0.1% HA/ha (FS)	1.20	0.33	1.30	100.1	18.0	109.2	0.57	261.3	20.7	273.5
T_7 - 75% RDF + 0.2% HA/ha (FS)	1.22	0.35	1.31	108.8	19.5	113.9	0.59	264.5	21.2	275.3
T_8 - 75% RDF + 0.3% HA/ha (FS)	1.22	0.33	1.29	100.0	17.4	108.7	0.57	262.3	21.4	264.0
T_9 - 75% RDF + 10 kg HA (SA) + 0.1% /ha HA (FS)	1.38	0.47	1.51	132.4	29.1	136.7	0.75	285.2	22.4	287.2
T_{10} - 75% RDF + 10 kg HA (SA) + 0.2% /ha HA (FS)	1.44	0.51	1.55	143.1	33.0	148.6	0.92	291.5	25.4	293.7
T_{11} - 75% RDF + 10 kg HA (SA) + 0.3% /ha HA (FS)	1.34	0.46	1.47	126.9	27.9	130.1	0.75	275.3	21.5	277.1
CD (P = 0.05)	0.080	0.036	0.037	4.58	1.99	5.50	0.077	7.78	1.78	14.80

RDF = Recommended dose of fertilizers, HA = Humic acid , SA = Soil application, FS = Foliar spray

acid application both in soil @ 10 kg/ha and foliar spray @ 0.2% is the right option not only improves the brinjal productivity but also soil fertility in Alfisols of Tamil Nadu.

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