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Response of foliar application of micronutrients, novel organic liquid fertilizer and sea weed extract on growth of okra [*Abelmoschus esculentus* L. (Moench)]

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Abstract

The experiment entitled "Response of foliar application of micronutrients, Novel organic liquid fertilizer and Sea weed extract on okra [*Abelmoschus esculentus* L. (Moench)]" was carried out during *kharif* season of 2016-17 and 2017-18 at the Vegetable Research Scheme, Regional Horticultural Research Station, Navsari Agricultural University, Navsari, and Gujarat. The experiment was conducted on fixed plot site with a set of nine treatments *viz.*, the treatments comprising of two level of micronutrient mixture (Grade - I) (T₁: Micronutrient mixture (Grade I) 1% and T₂: micronutrient mixture (Grade I) 2%); three level of Novel organic liquid fertilizer (T₃: Novel organic liquid fertilizer 0.5%, T₄: Novel organic liquid fertilizer 1% and T₅: Novel organic liquid fertilizer 1.5%); three level of Sea weed extract (T₆: Sea weed extract 2%, T₇: Sea weed extract 4% and T₈: Sea weed extract 6%) and control (T₉). The experiment was evaluated in Randomized Block Design (RBD).

Foliar treatment had a significant impact on almost all parameters included in the study. Among the different foliar treatments, Novel organic liquid fertilizer 1.5% had significantly the higher values of growth parameters *viz.*, plant height at 25, 50 and 75 DAS *i.e.* 41.13, 90.66 and 123.45 cm respectively, number of flowering nodes (18.10) on main stem at final harvest, number of primary branches per plant at 25, 50 and 75 DAS (2.78, 3.29 and 4.10 respectively), length of internodes at final harvest (6.92 cm) and leaf area index (1.44).

Keywords: okra, growth, micronutrients, novel organic liquid fertilizer and sea weed extract

Introduction

India has extremely varied and diverse physiography and agro-climatic condition, so there is wide variation in the types of vegetables that are grown in different seasons and parts of the country.

Okra [*Abelmoschus esculentus* (L.) Moench] is a member of the family Malvaceae and native to South Africa and Asia. Earlier, its botanical name was [*Hibiscus esculentus* (L.) Moench] under the section *Abelmoschus* of *Hibiscus*, established by Linnaeus in 1737. Okra is known by many local names in different parts of the world. For example, it is called *lady's finger* in England, *gumbo* in the United States of America and *bhindi* in India. Okra pods are considered nutritious. It provides some human supplementary vitamins such as vitamin C, A, B- complex and minerals like calcium, potassium, iron and others (Adebooye and Opunta, 1996) [3].

Micronutrients disorder appears to be the most widespread and frequent problem in crop production worldwide, resulting in severe losses in yield and nutritional values. Micronutrients like, copper (Cu), zinc (Zn) and iron (Fe) are important for proper functioning of biological systems of plant but their deficiency and toxicity lead various disorders.

Sea weeds have been used as manure, cattle feed, food for human consumption and as a source of phycocolloids such as agar, alginic acid and carrageenan. Besides their application as farm yard manure (FYM), liquid extracts obtained from seaweeds have recently gained importance as foliar sprays for several crops because the extract contains growth promoting hormones (IAA and IBA), cytokinins, trace elements (Fe, Cu, Zn, Co, Mo, Mn, Ni), vitamins and amino acids (Sivasankari, 2006 and Verkleij, 1992) [5, 6].

While, separating fibers from the banana pseudostem, the liquid available is known as banana pseudostem sap which contains sufficient amount of essential macro and micro plant nutrients.

The application of sap saving of about 20 to 40 per cent RDF could be achieved without affecting the yields of banana, sugarcane and other crops.

Materials and Methods

The present investigation entitled “RESPONSE OF FOLIAR Application of Micronutrients, Novel Organic Liquid Fertilizer and Sea Weed Extract on Okra [*Abelmoschus esculentus* L. (Moench)]” was carried out at Vegetable Research Scheme, Regional Horticultural Research Station (R.H.R.S.), ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during *kharif* 2016-17 and 2017-18. The experiment was taken on the okra crop. Okra variety “GAO- 5” was selected for experiment. The treatments were given by foliar application. The experiment was laid out in a Randomized Block Design (RBD) with four replications. Five tagged plant from each net plot were selected for recording observations of growth parameters.

Results

All the important attributes related to growth were significantly affected by various foliar applications. The Table 1 clearly indicated that among the various foliar spray, significantly the maximum plant height (at 25, 50 and 75 DAS *i.e.* 41.13, 90.66 and 123.45 cm respectively), maximum number of flowering nodes (18.10) on main stem at final harvest, highest number of primary branches per plant (at 25, 50 and 75 DAS *i.e.* 2.78, 3.29 and 4.10 respectively), highest length of internodes at final harvest (6.92 cm) and significantly maximum leaf area index 1.44. was noticed under Foliar spray of Novel organic liquid fertilizer 1.5 % (T₅).

Discussion

Plant height is considered to be an important factor to judge the vigour in okra crop. The robust vegetative growth is an

essential prerequisite for higher yield. The results related to plant height (Table 1) revealed significant difference due to different foliar treatments. It was also indicated that plant height was increased numerically with increase in dose of novel organic liquid fertilizer during the both year and in pooled analysis. The results clearly revealed that okra plants sprayed with novel organic liquid fertilizer @ 1.5 % (T₅) had recorded maximum plant height at 25, 50 and 75 DAS, and minimum plant height was observed with control. Same trend of treatments was observed for other growth parameters *viz.* number of flowering nodes on main stem at final harvest, number of primary branches, length of internodes at final harvest and leaf area index

This could be attributed to nitrogen stimulation of plant growth. Besides, nitrogen being the major constituents of chlorophyll, protein and amino acid, their synthesis could have been accelerated by the adequate supply of nitrogen from the novel organic liquid fertilizer and from the soil.

An interesting result pertaining to above growth attributes was that plants supplemented with novel organic liquid fertilizer (T₄ and T₅) exhibited better results than the plants treated separately with different treatments. This might be due to nitrogen which present in novel organic liquid fertilizer increased the rate of vegetative growth, which resulted in maximum leaves and leaf area. Moreover, nitrogen increases the cation exchange capacity of plant roots and that makes them efficient in absorbing other nutrients ions like phosphorus, potassium etc. Nitrogen which present in novel organic liquid fertilizer is responsible for the formation, growth and development of the cells and accelerating the synthesis of chlorophyll and amino acid which are associated with major photosynthesis process of plants, it causes an increased in the formation of meristematic tissues. The findings of the present study are in concurrence with the results reported by Anon. (2012), ^[1] Anon. (2014) ^[2] in banana and Deore *et al.* (2010) ^[4] in chilli.

Table 1: Effect of different level of micronutrient mixture, Novel organic liquid fertilizer and Sea weed extract on growth and growth parameters of okra

Treatments	Plant height (cm) at 25, 50 and 75 DAS			Number of flowering nodes	Number of primary branches at 25, 50 and 75 DAS			Length of internodes (cm)	Leaf area index
	25 DAS	50 DAS	75 DAS		25 DAS	50 DAS	75 DAS		
T ₁ : Micronutrient mixture (Grade I) 1 %	34.08	82.21	110.17	12.35	1.56	1.96	2.68	5.07	1.26
T ₂ : Micronutrient mixture (Grade I) 2 %	35.12	84.71	113.59	13.16	1.65	2.06	3.05	5.46	1.28
T ₃ : Novel Organic Liquid Fertilizer 0.5 %	36.14	85.99	114.52	14.08	1.82	2.25	3.28	5.82	1.30
T ₄ : Novel Organic Liquid Fertilizer 1%	38.51	88.72	120.38	17.04	2.46	2.66	3.68	6.61	1.42
T ₅ : Novel Organic Liquid Fertilizer 1.5 %	41.13	90.66	123.45	18.10	2.78	3.29	4.10	6.92	1.44
T ₆ : Sea weed extract 2 %	37.50	87.20	115.65	15.01	2.30	2.45	3.42	6.26	1.34
T ₇ : Sea weed extract 4 %	30.99	81.36	107.62	11.58	1.36	1.55	2.28	4.83	1.21
T ₈ : Sea weed extract 6 %	30.12	79.18	106.17	11.19	1.23	1.35	1.90	4.57	1.19
T ₉ : Control	28.02	77.74	103.44	10.31	1.06	1.05	1.80	4.30	1.14
S.Em. ±	0.98	1.85	2.70	0.47	0.05	0.05	0.08	0.14	0.03
C.D. at 5 %	2.77	5.25	7.64	1.32	0.15	0.14	0.22	0.38	0.09
C.V. %	8.61	6.70	7.30	10.41	8.52	7.02	8.22	7.43	7.20

Conclusions

On the basis of present investigation on the Response of foliar application of micronutrients, Novel organic liquid fertilizer and sea weed extract on okra [*Abelmoschus esculentus* L. (Moench)], it could be concluded that foliar spray with Novel organic liquid fertilizer @ 1.5 % (T₅) found to be beneficial to plant height at 25, 50 and 75 DAS, number of flowering nodes, number of primary branches per plant at 25, 50 and 75 DAS, length of internodes and leaf area index.

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