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Efficacy of Bio-Stimulants on Fruit Yield of *Solanum melongena*

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Received: September 26, 2019; **Published:** December 04, 2019

Abstract

Pot experiment was conducted during the 20018 rainy season at the greenhouse of the Federal College of Horticulture, Dadin-Kowa, Gombe State, Nigeria to study the effect of some bio-stimulants on yield of *Solanum melongena*. The treatments which consisted of 3 types of applied bio-stimulants (*Moringa* leaf extracts, sea weed extracts and coconut water) with a check (no application) were laid out in a randomized complete design with 3 replications. Bio- stimulants significantly (P = 0.05) influenced number of fruits, fruit diameter and total yield. Pots treated with *Moringa* leaf extracts gave significant (P = 0.05) and higher number fruits, fruit diameter and total yield. Whereas, sea weed and coconut water gave significant (P = 0.05), but depressing number fruits, fruit diameter and total yield in an order of sea weed > coconut water. For maximum fruit production and quality yield, bio-stimulants, especially *Moringa* leaf extracts can be used in *S. melongena.* However, more studies need to be carried out in this area to further test the response of *S. melongena*.

Keywords: *Efficacy; Bio-Stimulant; Fruit and Fruit Yield; S. melongena*

Introduction

Solanum melongena is a fruit and leafy vegetable widely cultivated in West Africa [1] along with vegetable tomato and chili pepper [2]. The fruit contains 92.5% water, 6% sugars, 0.3% fat and 1% protein with 30 to 50% of potassium (K), iron (Fe), copper (Cu), fiber, manganese (Mn), vitamins; thiamine, (vitamin B1), B6, niacin, folate, and magnesium [3]. Owing to the fact that eggplant is widely consumed on a daily basis, the crop represents a very important source of income for many rural and urban households [4,5]. Although the crop is produced largely for the local market, small amounts are exported to Europe [2]. According to a report by the United States Agency for International Development and the West Africa Trade Hub [6], exports of *S. melongena* increased steadily from under 500 metric tons in 1996 to 1, 867 metric tons in 2003 [7]. Thus, whilst increased and year-round production of the crop has significant potential for poverty alleviation and livelihood diversification of poor rural and peri-urban households in Nigeria. Generally, *S. melongena* yield is still low owing to some production constraints. For instance, nutrient management is one of the most critical considerations in the organic *S. melongena* production system. So also, increasing cost of chemical fertilizers and their harmful effects on the soil health with inadequate and unbalanced fertilization [8].

Therefore, concept of adding bio-fertilizers as stimulants becomes necessary. Bio-stimulants have been introduced into the crop production system due to interest on high but sustainable yields and enhance quality among others. As Nardi., *et al.* [9] reported that bio-stimulants elevates crop capacity to nutrient uptake and/or resistance to biotic and abiotic stresses via enhanced activity of rhizosphere microbes and soil enzymes with resultant effect on photosynthetic process. Attempt to substitute synthetic bio-hormones with low cost and eco-friendly options including botanicals have been made elsewhere [10].

Objective of the Study

The objective of the present study is to assess the effect of *Moringa* leaf, sea weed and coconut as bio-stimulants on *S. melongena* in Dadin-Kowa, Nigeria.

Materials and Methods

The experiment was conducted in the greenhouse of the Federal College of Horticulture, Dadin-Kowa, Gombe State, Nigeria. Located approximately 260m above sea level between latitude 6°40"26' North and longitude 1°35" West. The climate of the area is semi-arid zone, which is characterized by a wet and dry season. The major rainfall season begins from May with a dry spell from mid-June to mid-July. November to March is the major dry season. The mean annual rainfall is 1,500 mm and the mean temperature is 35°C. Pots were arranged in completely randomized design (CRD) with three replications and treated with extracts of *Moringa* leaves, sea weed and coconut water and a control check (no application). Prior to transplanting of *S. melongena* seedlings in each pot, single dose of 600 gm of poultry manure was incorporated into the soil as basal application. Four pots representing a treatment were spaced in rows of 80 cm x 90 cm apart on floor.

Potting mixture for planting was prepared by collecting, sieving and heat-sterilizing of top soil using a metal container for an hour at 100°C and left overnight to cool. The sterilized soil was weighed at 12 kg/pot. Six hundred grams of poultry manure was added and treated with fungicide (2 g/l) and watered for two weeks before transplanting. *S. melongena* seeds were obtained from local vegetable market and raised in nursery beds by sowing in seed trays containing soil media in the greenhouse of the Department of Horticulture and transplanted three weeks after sowing (WAS). The seedlings were transplanted into the pots according to experimental treatments and watered *ad lib*. Weeds were generally controlled by careful handpicking and seedlings were staked at flowering stage to prevent lodging. Data on number of fruits, fruit diameter and total fruit yield were collected and subjected to analysis of variance (ANOVA) appropriate to CRD as described by Gomez and Gomez [11] using SAS Version 82 and means that are significantly different were separated using least significant difference (LSD) at P = 0.05 level of probability.

Results and Discussion

Results revealed that number of fruits, fruit diameter and total fruit yield of *Solanum melongena* were significantly (P = 0.05) influenced by applied bio-stimulants (Table 1). These fruit yield and quality properties, particularly, number of fruit counts and fruit diameter increase linearly due to *Moringa* leaf extracts, followed by Coconut water (in fruit counts) and Sea weed (in fruit diameter) respectively. The same parameters, even though significantly different (P = 0.05) within treatments mode yet were slightly depressed in a reverse order. Similarly, total fruit yield of *S. melongena* was significantly higher (P = 0.05) compared with control-treatment and depressed progressively with significant difference (P = 0.05) in an order of *Moringa* leaf extracts > sea weed > coconut water. *S. melongena* response to treated bio-stimulant in-terms of quality fruit production and yield for food and nutrition in this study was specifically anticipated, especially with use of *Moringa* leaf extracts. This finding corroborates with results in *Arachis hypogaea*, *Glycine max*, *Sorghum bicolor, Triticum spp, Telfairia occidentalis* and *Lycopersicum esculentum* previously reported by several workers [12-20]. Generally, *Moringa* leaf extracts has been reported as productivity enhancer in crops [12,21,22]. In this regard, Jason [23] reported that bio-stimulants such as *Moringa* leaf extract contains a plant growth hormone, called *Zeatin* which is known to enhance performance in crops. Probably in this study, species of bio-stimulants applied, especially, the sea weed and coconut water might have a kind of plant hormone factor less *Moringa* leaf extracts which contains *Zeatin* [23] and have mediated a significant but a slightly depressing responses in number of fruits, fruit diameter and total fruit yield within treatments.

Treatments	Number of fruit	Fruit diameter (cm)	Total yield (kg/ha)
Control	13.03	2.76	753.12
Moringa leaf extracts	18.87	4.25	1567.40
Sea weed	17.67	4.11	1372.24
Coconut water	18.20	3.69	1350.31
P < F	0.007	0.042	0.023
LSD (0.05)	2.722	0.448	464.1

Table 1: *Effect of bio-stimulants on the number of fruit, fruit diameter (cm) and total yield (kg/ha) of fruit garden egg.*

Conclusion

Based on the findings from this study, bio-stimulants (*Moringa* leaf extracts, sea weed and coconut water), particularly *Moringa* leaf extracts enhance yield performance in *Solanum melongena* whereas, sea weed and coconut depressed yield performance. For maximum productivity and better quality yield products, *Moringa* leaf extracts spray can be used in *S. melongena.* However, more studies need to be carried out in this area to further test the response of the crop species.

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Volume 15 Issue 1 January 2020