

Full length Research paper

# Robustness of foliar application with Moringa extracts on Cucumber.

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Accepted 19 August, 2019.

Field performance of Moringa extracts at the rate of 5ml, 10ml, 15ml, 20ml, 25ml and 30ml was assessed on the growth and yield of cucumber using topsoil as the growing medium. The experiment was laid out on with five replicates each treatment replicates including the control. Data on vine length, number of leaves, number of branches, leaf area, days to flowering, fruit weight, fruit diameter and fruit length were collected and analyzed using Analysis of Variance (ANOVA) for Completely Randomized Design (CRD). The treatment means were separated using Least Significant Differences (LSD) at 5% probability level. The results showed that there were significant differences among the treatment in the parameters assessed with treatment 25ml having the superior effect on cucumber. Therefore, treatment with 25ml performed better than the other five treatments including the control in the study area. Hence, this study recommends that Moringa extract should be applied as foliar application and could be recommended to farmers for improved yield and production of Cucumber.

**Keywords:** Cucumber, Moringa, CRD, ANOVA , Foliar application.

## INTRODUCTION

*Cucumis sativus L.* (Cucumber) is a very good source of vitamins A, C, K, B<sub>6</sub>, potassium, pantothenic acid, magnesium, phosphorus, copper and manganese, fiber, and antioxidants (Vimala, *et al.*, 1999). Soft and succulent, the vegetable crop is cherished by man and eaten in salads or sliced into stew in tropical regions. Its juice is often recommended as source of silicon to improve the health and complexion of the skin (Duke, 1997). It helps in healing diseases of urinary bladder and kidney; digestive problems like heartburn, acidity, gastritis and ulcer (Garcia-Closes, *et al.*, 2004). The ascorbic acid and caffeine acid contained in cucumber help to reduce skin irritation and swelling (Okonmah, 2011). But according to reports by FAO (2017), half of the Sub-Saharan and Tropical rainforest countries were designated as having short of these crops. One of the constraints to sustained production of Cucumber in this region is lack of hormonal application. This leads to poor plant growth and increased disease pressure which

results in decline in agricultural food production.

Plant hormones can be used to increase yield per unit area because they influence every phase of plant growth and development (Culver, *et al.*; 2012). Traditionally, there are five groups of growth regulators which are listed: auxins, gibberellins, abscisic acid, ethylene and cytokines (Price, 2007). Cytokines enhances food production. Zeatin is one form of the most common forms of naturally occurring cytokine in plants. Fresh *Moringa oleifera* leaves have been shown to have high zeatin content. Moringa leaves gathered from various parts of the world were found to have high zeatin concentrations of between 5mcg and 200mcg/g of leaves (Makker and Becker, 1996).

Moringa leaf extract was sprayed onto leaves of onions, bell pepper, soya beans, sorghum, coffee, tea, chili, melon and maize and was shown to increase yields of these crops (Fugile, 2000). The effect of Moringa extract on other crops is unknown.

This research work is to evolve a package for the optimization of the production of cucumber in Nigeria agro-ecology through adequate fertilizer applications, complemented with organic fertilizer. (Obi and Nwanka, 2016). Hence, this study is based on the robustness of

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moringa extracts to improve soil fertility, growth and crop yield of Cucumber.

## MATERIALS AND METHOD

### Location

The experiment was carried out at the Forestry Research Institute of Nigeria (FRIN) ornamental garden, Jericho, Ibadan, Oyo State.

It is located in Ibadan North West Local Government. The area lies between Latitude 7°S and 9°N and Longitude 3°W and 58°E of Greenwich Meridian Time (G.M.T).

The climate of the area is dominated by rainfall pattern ranging from 1300mm – 1500mm. The average temperature is about 37.2°C and average relative humidity of about 85% – 100%. There are two distinct seasons namely: dry season usually commence November – March and rainy season from April – October (FRIN, 2018).

### Materials

Cucumber seed, moringa leaf, wheelbarrow, weighing balance, buckets (35), distilled water, aqueous ethanol, water, sensitive scale, stakes, cutlass, hoe, 1000ml measuring cylinder, 25ml measuring cylinder, Spatula, spraying bottle, exercise book, pen, shovel, topsoil, veneer caliper (mm), ruler (cm), Graph book.

### Method

Moringa leaves were collected, washed, air-dried and milled, 20g of the milled leaves was mixed with 525ml of distilled water for ordinary extraction and 20g of the milled leaves was mixed with 105ml of 20% aqueous ethanol diluted in distilled water at ratio 2:10 for ethanol extraction, moringa extract was sprayed at the rate of 0ml (control), 5ml, 10ml, 15ml, 20ml, 25ml and 30ml of each diluted in one week interval in five number of replicates (Makker and Becker, 1996). See Figures 1 and 2.

### Planting and Cultural Activities

The top soil for the experiment was collected within the premises of Federal College of Forestry, Ibadan. Each bucket was filled with 10kg of soil. The experimental soil was taken to the soil laboratory for physical and chemical analysis, the result of which is presented in table 3. Two seeds of cucumber were planted per bucket and were later thinned into one plant per stand after one week of emergence (WAE). Regular weeding was done around the base by hand picking, along and ahead of the vines using hoe.

### Treatments

- T<sub>0</sub> - Control with 10kg top soil
- T<sub>1</sub> - Cucumber plant sprayed with 5ml of moringa extract.
- T<sub>2</sub> - Cucumber plant sprayed with 10ml of moringa extract.
- T<sub>3</sub> - Cucumber plant sprayed with 15ml of moringa extract.
- T<sub>4</sub> - Cucumber plant sprayed with 20ml of moringa extract.
- T<sub>5</sub> - Cucumber plant sprayed with 25ml of moringa extract.
- T<sub>6</sub> - Cucumber plant sprayed with 30ml of moringa extract.

### Treatment Application

Treatments were placed in perforated bottles after the extractions of moringa and were applied on cucumber leaves as foliar application at weekly interval for four weeks with one treatment rate for each replicate.

### Statistical Analysis

The experiment was laid out in Completely Randomized Design (CRD) with five replicates, data were taken weekly on the vine length, number of leaves per plant, number of branches per plant, leaf area, days to flowering, number of fruit per plant, one week after application and before application of another moringa extracts. All data were subjected to Analysis of Variance (ANOVA) using Statistical Analysis System (SAS) and treatment means were separated by using Least Significant Difference test at 5% level of significance.

### Data Analysis

Data collected was subjected to Analysis Of Variance (ANOVA). The experimental design used is Completely Randomised Design since the plants were being potted.

The Statistical Model used is  $y_{ij} = \mu + \alpha_i + \varepsilon_{ij}$

Where  $y_{ij}$  = jth observation in group  $i$

$\mu$  = grand population mean

$\alpha_i$  = effects of group  $i$

$\varepsilon_{ij}$  = random error

(Samuel *et al.*, 2012)

## RESULTS AND DISCUSSION.

The result presented in the table above shows the effect of moringa extracts on Vine length development, Number of Branches, Leaf Production and Leaf Area of Cucumber. It was clearly shown that 25ml of moringa

**Table 1 :** Robustness of Moringa Extracts on Vine Length, Number of Branches, Leaf Production and Leaf Area (cm<sup>2</sup>) of Cucumber at the 7<sup>th</sup> week.

Treatment	Vine Length	Number of Branches	Leaf Production	Leaf Area
T <sub>0</sub>	123.50abc	14.75bc	20.00bc	129.25bc
T <sub>1</sub>	152.25ab	16.75ab	24.75ab	157.25ab
T <sub>2</sub>	121.50bc	14.75c	19.00c	126.00b
T <sub>3</sub>	145.75ab	15.75abc	21.00abc	157.00bc
T <sub>4</sub>	101.50c	13.75c	19.50c	148.00bc
T <sub>5</sub>	155.50a	17.50a	25.75a	170.00a
T <sub>6</sub>	124.00abc	15.00abc	20.00bc	149.50b
GM	132.00	15.46abc	21.43	149.14
L.S.D	33.39	3.09	5.20	35.53
%C.V	17.20	13.59	16.50	16.31

**NOTE:** Means with the same letter are not significantly different from each other

extracts had the best performance with an average mean of 155.50cm, 17.50, 25.75 and 170cm<sup>2</sup> respectively. Least Significant Difference was used to separate the means. The result also indicates that plants treated with 25ml of moringa extracts gave the highest significant effect on all the parameters by carrying the first letter 'a'. The application and use of moringa leaf extract as synthetic hormonal effect clearly showed that the higher the concentration of the treatment the higher the performance compared to other concentrations but with limited concentration of 25ml in this study. Moringa leaf extract is rich with growth hormones, especially zeatin that has been reported to increase the crop yield in the range of 5% -30% (Muhammad, *et al.*, 2014). Moringa leaf extract also contains micronutrients in sufficient and suitable proportions that increase the growth and yield of a variety of crops ranging from vegetables to all other crops (Price, 2007; Muhamman, *et al.*, 2013; Amirigbal *et al.*, 2014). Therefore, moringa extract is expected to affect the growth attribute of vine length (Rehman and Basra, 2010).

Table 2 shows that plants grown with 25ml application of moringa extracts flowered earlier than all other treatments with an average mean of 32.75 days. It also shows that plants with 25ml of moringa extract has the highest fruit weight, fruit diameter and fruit length with average mean of 4.80, 14.40 and 15.40 respectively. Least Significant Difference also established that 25ml application of moringa extracts had effect on days of flowering, fruit weight, fruit diameter and fruit length of

Cucumber. It was observed that the application gave the highest significant effects by carrying the first letter 'a' when compared with all other treatments.

The application and use of moringa leaf extract as synthetic hormonal effect clearly showed that the higher the concentration of the treatment the higher the performance compared to other concentrations but with limited concentration of 25ml in this study. Moringa leaf extract contains micronutrients in sufficient and suitable proportions that increase the growth and yield of a variety of crops ranging from vegetables to all other crops (Price, 2007; Muhammad, *et al.*, 2014; Amirigbal *et al.*, 2014). Moringa leaf extract being rich in zeatin, a cytokines maintained the green photosynthetic area, therefore contributed to higher fruit yield. Therefore, moringa extract is expected to affect the yield attribute of days of flowering, fruit weight, fruit diameter and fruit length. (Rehman and Baska, 2010; Yameen, *et al.*, 2012).

Table 3 shows that there is significant difference among the treatments at 5% level of probability. This implies that the use of varying quantities of moringa extracts gave significant effect on vine length of Cucumber.

Table 4 shows that there is no significant difference among the treatments at 5% level of probability. This indicates that moringa extracts applied varying quantities gave no significant effect on leaf production of Cucumber. The analysis of variance table presented above shows that there is no significant difference among the treatments at 5% level of probability which indicates that

**Table 2:** Effect of Moringa Extracts on Days of Flowering, Fruit Weight, Fruit Diameter and Fruit Length of Cucumber.

Treatments	Day of flowering	Fruit weight	Fruit diameter	Fruit length
T <sub>0</sub>	35.25c	3.80	8.80	10.60c
T <sub>1</sub>	34.75ab	3.20	12.00	14.20ab
T <sub>2</sub>	35.00b	3.00	10.20	11.60bc
T <sub>3</sub>	34.50ab	3.00	10.20	11.60bc
T <sub>4</sub>	33.50a	3.40	9.40	11.00c
T <sub>5</sub>	32.75a	4.80	14.40	15.40a
T <sub>6</sub>	33.25a	3.20	11.20	12.40abc
GM	34.14	3.49	10.89	12.40
L.S.D	1.06	2.38	3.58	3.16
%C.V	2.12	52.68	25.37	19.68

**Table 3:** Analysis of Variance for Vine Length Development of Cucumber.

SV	DF	SS	MS	F	P-VALUE
Treatments	6	9312.50000	1552.08333	3.0097*	0.0277
Error	21	10829.50000	515.69048		
Total	27	20142.00000			

**Table 4:** Analysis of Variance for Leaf Production of Cucumber.

SV	DF	SS	MS	F	P-VALUE
Treatments	6	174.3514	29.05952	2.3248ns	0.0704
Error	21	262.50000	12.50000		
Total	27	436.85714			

**Table 5:** Analysis of Variance for Number of Branches of Cucumber.

SV	DF	SS	MS	F	P-VALUE
Treatments	6	40.21429	6.70238	1.5175ns	0.2209
Error	21	92.7500	4.41667		
Total	27	132.96429			

varying quantities of moringa extracts applied gave no significant effect on number of branches of Cucumber. The analysis of variance table above shows that there no significant difference among the treatments at 5% level of probability. This implies that application of moringa

extracts at varying quantities gave no significant effect on leaf area of Cucumber.

The table above shows that there is significant difference among the treatments at 5% level of probability. This indicates that the use of varying

**Table 6:** Analysis of Variance for Leaf Area of Cucumber.

SV	DF	SS	MS	F	P-VALUE
Treatments	6	5952.92857	992.15476	1.7002ns	0.1704
Error	21	12254.50000	583.54762		
Total	27	18207.42857			

**Table 7:** Analysis of Variance for Days to Flowering of Cucumber.

SV	DF	SS	MS	F	P-VALUE
Treatments	6	22.42857	3.73810	7.1364*	0.0002
Error	21	11.00000	0.52381		
Total	27	33.42857			

**Table 8:** Analysis of Variance for Fruit weight of Cucumber.

SV	DF	SS	MS	F	P-VALUE
Treatments	6	12.34286	2.05714	0.6102ns	0.7201
Error	28	94.40000	3.37143		
Total	34	106.74286			

**Table 9:** Analysis of Variance for Fruit diameter of Cucumber.

SV	DF	SS	MS	F	P-VALUE
Treatments	6	105.94286	17.65714	2.3146ns	0.0611
Error	28	213.60000	7.62857		
Total	34	319.54286			

**Table 10:** Analysis of Variance for Fruit length of Cucumber.

SV	DF	SS	MS	F	P-VALUE
Treatments	6	93.60000	15.60000	2.6187*	0.0383
Error	28	166.80000	5.95714		
Total	34	260.40000			

quantities of moringa extracts had significant effects on days of flowering of Cucumber.

The Analysis of Variance table above shows that there no significant difference among the treatments at 5% level of probability. This implies that application of

moringa extracts at varying quantities gave no significant effect on leaf area of Cucumber.

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moringa extracts at varying quantities gave no significant effect on leaf area of Cucumber.

The table above shows that there is significant difference among the treatments at 5% level of probability. This indicates that the use of varying quantities of moringa extracts had significant effects on days of flowering of Cucumber.

## CONCLUSION

The application and use of moringa leaf extract as synthetic hormonal effect clearly showed that the higher the concentration of the treatment the higher the performance compared to other concentrations but with limited concentration of 25ml in this study. Moringa leaf extract is rich with growth hormones, especially zeatin that has been reported to increase the crop yield in the range of 5% -30% (Muhammad, *et al.*, 2014). Moringa leaf extract also contains micronutrients in sufficient and suitable proportions that increase the growth and yield of a variety of crops ranging from vegetables to all other crops (Price, 2007; Muhammed, *et al.*, 2013; Amirigbal *et al.*, 2014).

In the face of declining soil productivity occasioned by climate change impact, this study clearly indicates that production of cucumber can be enhanced with the use of moringa leaf extracts as a growth hormone which increases crop growth and yields as foliar application. The extracts also showed potential of increasing vine length, number of leaves per plant, number of branches per plant, leaf area and days to flowering. Moringa leaf extracts has proved to be effective in supplying the required nutrients for growth and yields of cucumber, see plate 4, 5, 6, 7 and 8.

Moringa leaf extracts is an organic technology which increases growth of most vegetable and field crops. This phenomenon is analogous to synthetic hormonal effect because the extract contains the most common form of naturally occurring cytokine in plants called Zeatin (Culver *et al.*, 2013). Therefore, it was zeatin, cytokines related hormone in the extracts, which was responsible for the improved growth and yields.

From the results of all the parameters assessed, it is therefore concluded that increase in crop yields in response to moringa extracts treatment depends on the rate of foliar application. The appropriate rate at which moringa extracts can be most effective for the growth and yield of Cucumber is at 25ml of application.

## RECOMMENDATION

Therefore, this study recommends that moringa extracts should be applied as foliar application at the rate of 25ml to acquire a great result in growth and yield of Cucumber.

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Fig. 1



Fig. 2



Fig. 3



Fig. 4





Fig. 7



Fig. 8