EFFECTS OF FERTILIZER TYPES ON THE GROWTH AND YIELD OF *CUCUMIS SATIVUS* VAR. NAGANO F1

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Abstract
Cucumber (Cucumis sativus L.) is an important vegetable crop which is thought to be one of the oldest vegetable crops. A field experiment was conducted at the botanical garden of the University of Ilorin located at longitude 4^0 38.920^1 E and 4^0 39.971^1 E and latitude 8^0 27.810^1 N and 8^0 28.230^1 N. The aim of the experiment was to determine the effects of different concentration of fertilizer types on the growth and yield of Cucumber (variety Nagano F1). The study was a complete randomized block design with four treatments and three replicates including control plants, Organic fertilizer (poultry manure), Inorganic (NPK 15:15:15 and Urea 64:0) all of which were applied at the rate of 5, 10, 15 and 20 g/ bag. Data collected include vine length; number of leaves, leaf area, as well as yield parameters. The result depicts a significant increase in the vine length; numbers of leaves, leaf area, as well as yield parameter in the plant treated with poultry manure when compared to the control plants as well as all other fertilizers considered in the study. In conclusion, poultry manure application should be adopted for soil nutrient amendment in cucumber cultivation if optimum yield is to be achieved.

Key words: manure, NPK, urea, poultry droppings, cucumber, growth and yield

Received: 28.02.2020 Reviewed: 28.04.2020 Accepted: 15.05.2020

INTRODUCTION

Cucumber (*Cucumis sativus* L.), a very important member of the Cucubitaceae family (Eifediyi and Remison, 2010) and a day neutral annual climbing herbaceous plant cultivated for its fruits (Poincelot, 2004). The fruit is eaten fresh in salads alongside with other vegetables due to its richness in vitamins and minerals (Eifediyi and Remison, 2009). In Nigeria, cucumber production is often limited by several constraints including pest and diseases, inappropriate agronomic practice and poor soil fertility amongst other factors however, declining soil fertility is a major production constraint (Oladotun, 2002) as the crop requires several nutrients such as nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), sodium (Na) and sulphur (S) in a sufficient quantity to mention but a few for proper growth and plant nourishment (Akinrinde, 2006). The savannah region of Nigeria is characterized with numerous grass land and scattered forest vegetation which gave room for poor soil fertility on account of soil leaching and erosion. These have constituted a constraint to the production of cucumber in this region. There is an urgent need to augment the soil nutrient status to meet the crops need if it must be planted in the region. Attempts made by researchers to solve the problem of poor soil fertility in cucumber crop production have been well documented including the use of organic fertilizers such as poultry manure, animal waste and composts (Dauda *et al*., 2005), inorganic fertilizers such as NPK 15:15:15, NPK 150:90:90 (Choudhari *et al*., 2002; Dauda *et al*., 2005), complementary use of organic and inorganic fertilizers (Ipinmoroti *et al*., 2002) to mention but a few however, researches comparing the efficacy of inorganic and organic or organomineral fertilizer is scanty. Thus the present study is aimed at comparing the growth and yield attributes of cucumber under three different fertilizer (Poultry litter,

NPK 15:15:15: and Urea 64:0) at four different concentration.

MATERIALS AND METHODS

The experiment was carried out at University of Ilorin Botanical garden which lies in the southern guinea savanna belt of Nigeria with an annual rainfall of 1200 mm and temperature range of 33-34 °C and a distinct dry season. The experiment was a complete randomized block design with three replications per treatments. Thirty nine polythene bags, each with a dimension of 15×7×25cm were filled with 5 kg of sandy-loamy soil each. Thereafter, 5, 10, 15 and 20g of poultry droppings, NPK 15:15:15: and Urea 64:0 fertilizers was weighed and mixed in the polythene bag in triplicates. The polythene bags were then perforated randomly to allow water percolation; they were then watered to field capacity for a period of two weeks to give room for mineralization of the fertilizer especially that of the organic source. Five viable seeds of *Cucumis sativus* Var. Nagano F1 were sown at a depth of 2 – 3 cm and the bags were watered to field capacity at an interval of 48 hrs throughout the study. Growth parameters such as vine length (cm), number of leaves, leaf area (cm^2) as well as component yield attributes were collected at an interval of 2 weeks throughout the study. Data collected were subjected to analysis of variance (ANOVA) using Statistical Package for Social Science (SPSS) version 23.0 and means were separated using Duncan's Multiple Range Test (DMRT) at 5% level of probability. Data collected were presented in table format as means of three replicates.

RESULTS AND DISCUSSION

The result obtained for vine length leaf number leaf area is shown in Tables 1, 2 and 3. At 2 weeks after planting (WAP) a significant highest ($p<0.05$) vine length, leaf number and leaf area was observed in NPK treated plants when compared to all other treatments considered including the control. Beyond 2 WAP, significant highest leaf number, vine length and leaf area was recorded in the poultry manure treatment irrespective of the concentration (Tables 1, 2 and 3). It is worthy of note that plants treated with urea at all concentration considered recorded significant lowest values for the aforementioned parameters. Significant highest vine length and leaf number in NPK treated plant at the initial stage of the study (2 WAP) could be attributed to the fact that NPK fertilizer is readily available for plant absorption in contrast to poultry manure which must go through a phase of mineralization before it can be available for plant absorption. Significant highest vine length leaf number and leaf area in poultry manure treated plants beyond 2 WAP could be attributed to the availability of the nutrient upon mineralization of the manure in the soil. The result aligns with the findings of Aduloju *et al*., 2010 who attributed the enhancement of morphological growth attributes in cucumber to nutrient from mineralization of organic matter. John *et al*., (2004) also reported an increase in the vegetative growth of cucumber plant with the application of organic fertilizers. Similar observation was also made by Ayinla *et al*., 2018 in a study on the effects of fertilizers forms on the growth, yield and nutrient composition of *Cochorus olitorius.* The yield parameters considered during the experiment revealed that poultry manure and NPK recorded significant highest ($p<0.05$) number of fruits, fruit weight, length and circumference when compared to the urea application rates as well as the control plants (Table 4) significant highest component yield in poultry manure treated plants could be adduced to the fact that the plants were exposed to greater light interception on account of a greater leaf area which lead to a higher accumulation of photosynthetic assimilates which contributed immensely to the higher component yields when compared to all other fertilizer types as well as control. This observation agrees with the findings of Eifediyi and Remison, 2010 who reported that the application of fertilizer would led to better utilization of carbon and subsequent synthesis of assimilates. The poultry dropping had a

better enhancement effect on growth and yield parameters of cucumber than inorganic fertilizers considered in this study. This could be as a result of nitrogen content of poultry dropping. This was in agreement with Ewulo (2005) who opined that poultry dropping contains high percentage of nitrogen and phosphorus for the healthy growth of plant when compared to other forms of fertilizers. The superiority and richness of poultry dropping over other fertilizers have been confirmed in many experiments (De-Lannoy and Romain, 2001).

Table 1: Effect of different fertilizer types on vine length of cucumber

Treatments	Conc. (g)	WEEKS AFTER PLANTING			
		2	4	6	8
NPK	Control	4.00^{cd}	16.67^{bc}	30.33^{cd}	36.00^{ef}
	5	26.67^{a}	46.67^{a}	57.67^{bc}	68.33^{bcde}
	10	17.67^{abc}	37.67^{ab}	56.00^{bc}	62.00^{bcde}
	15	20.00^{abc}	40.00^{ab}	50.67^{bc}	62.67^{bcde}
	20	25.33^{ab}	41.83^{ab}	56.33^{bd}	60.67^{bcde}
UREA	5	1.00^{d}	6.33^{c}	11.00^{d}	24.67^{f}
	10	5.00^{cd}	16.00^{bc}	30.00^{cd}	37.10^{def}
	15	2.67^{cd}	20.00^{abc}	29.40^{cd}	50.00^{cdef}
	20	5.67^{cd}	12.33^{bc}	17.50^{d}	22.83^{f}
POULTRY DROPPINGS	5	0.67^{d}	18.33^{abc}	74.00^{ab}	84.67^{ab}
	10	20.00^{abc}	35.33^{abc}	89.33^{a}	101.67^{a}
	15	11.67^{cd}	18.50^{abc}	73.33^{ab}	83.67^{ab}
	20	0.67^{d}	16.50^{bc}	52.00^{ab}	80.33^{abc}

Values carrying the same letter (s) within the same column are not significantly different at $p<0.05$

Table 2: Effect of different fertilizer types on leaf number of cucumber

Treatments	Conc. (g)	WEEKS AFTER PLANTING			
		2	4	6	8
NPK	Control	5.00^{ab}	6.33^{b}	11.00^{abc}	11.67^{abcd}
	5	8.67^{a}	14.33^{a}	16.00^{a}	13.67^{abcd}
	10	4.67^{ab}	8.00^{ab}	15.00^{ab}	12.67^{abcd}
	15	3.33^{b}	8.67^{ab}	10.00^{abc}	15.00^{abcd}
	20	4.00^{ab}	8.00^{ab}	16.00^{a}	11.67^{abcd}
UREA	5	1.00^{b}	2.00^{b}	2.67^{c}	5.00^{d}
	10	3.00^{b}	6.33^{b}	10.00^{abc}	9.33^{bcd}
	15	1.00^{b}	7.67^{ab}	15.33^{ab}	20.33^{a}
	20	1.33^{b}	2.33^{b}	5.67^{bc}	8.00^{cd}
POULTRY DROPPINGS	5	1.33^{b}	4.67^{b}	20.00^{a}	21.33^{a}
	10	3.67^{b}	7.67^{ab}	19.33^{a}	19.67^{ab}
	15	1.33^{b}	3.67^{b}	20.00^{a}	18.67^{ab}
	20	0.67^{b}	7.00^{ab}	11.67^{abc}	17.33^{abc}

Values carrying the same letter (s) within the same column are not significantly different at $p<0.05$

Table 3: Effect of different fertilizer types on leaf area of cucumber

Treatments	Conc. (g)	WEEKS AFTER PLANTING			
		2	4	6	8
NPK	Control	3.43^{c}	7.53^{c}	10.18^{c}	29.77^{bc}
	5	8.25^{bc}	42.06^{abc}	39.92^{abc}	51.68^{abc}
	10	14.51^{abc}	49.35^{a}	42.57^{abc}	49.97^{abc}
	15	15.98^{abc}	46.68^{ab}	49.25^{abc}	58.44^{abc}
	20	27.95^{ab}	44.76^{ab}	43.53^{abc}	58.23^{abc}
UREA	5	3.47^{c}	15.56^{abc}	11.28^{c}	15.95^{c}
	10	9.15^{bc}	18.23^{abc}	55.21^{ab}	59.49^{abc}
	15	10.87^{bc}	20.03^{abc}	53.73^{ab}	63.02^{ab}
	20	5.38^{c}	10.70^{bc}	14.53^{bc}	48.21^{abc}
POULTRY DROPPINGS	5	17.87^{abc}	28.27^{abc}	39.95^{abc}	48.38^{abc}
	10	24.18^{abc}	44.31^{abc}	59.10^{a}	78.00^{a}
	15	14.93^{abc}	27.07^{abc}	29.33^{abc}	64.33^{ab}
	20	33.79^{a}	52.65^{a}	56.78^{ab}	69.52^{ab}

Values carrying the same letter (s) within the same column are not significantly different at $p<0.05$

Table 4: Effect of different fertilizer types on yield parameters of cucumber

Treatments	**Concentration**	**Number of fruit**	**Fruit weight**	**Fruit circumference**	**Fruit length**
	Control	0.00^{b}	0.00^{b}	0.00^{a}	0.00^{b}
NPK	5	2.00^{a}	17.98^{b}	4.15^{a}	3.183^{ab}
	10	2.00^{a}	95.23^{ab}	9.57^{a}	9.23^{ab}
	15	0.00^{b}	0.00^{b}	0.00^{b}	0.00b
	20	0.00^{b}	0.00^{b}	0.00^{b}	0.00^{b}
UREA	5	0.00^{b}	0.00^{b}	0.00^{a}	0.00b
	10	2.00^{b}	107.80^{a}	11.00^{a}	12.53^{ab}
	15	2.00^{a}	49.57^{ab}	4.33^{a}	5.67^{ab}
	20	0.00^{b}	0.00^{b}	0.00^{a}	0.00^{b}
POULTRY DROPPINGS	5	2.00^{a}	33.52^{ab}	4.17^{a}	4.80^{ab}
	10	3.00^{a}	121.09^{a}	9.31^{a}	11.75^{ab}
	15	3.00^{a}	151.90^{a}	12.00^{a}	14.83^{a}
	20	2.00^{a}	52.90^{ab}	4.50^{a}	4.50^{ab}

Values carrying the same letter (s) within the same column are not significantly different at $p<0.05$

CONCLUSION

Despite the fact that mineralization is a prerequisite to the availability of nutrients for plants in poultry manure treated plants at all concentration considered, it still had the highest enhancement effect on the growth performance and yield of cucumber when compared to other fertilizer types considered

ACKNOWLEDGMENTS

Authors are thankful to the Department of Plant Biology, University of Ilorin for providing the necessary facilities for this work.

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