

Performance of Pepper to Different Levels of Nitrogen Fertilizer

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Abstract: A field experiment was carried out to evaluate the response of pepper to different levels of Nitrogen using urea. Three rate [30, 60, 90kgN/ha] of fertilizer were applied to different plot in a completely randomized design experiment with three replicate. Growth and yield parameters were measured. The result revealed that optimal growth of the plants and production of fruit was obtained at 60kgN/ha with values of 56.79cm and 37.50g/plant.

Keywords: Pepper, fertilizer, Nitrogen, urea, etc.

Introduction

Pepper is a widely cultivated crop in Nigeria. There are different species of this crop but two main species; *Capsicum annum* (sweet pepper) and *Capsicum frutescence* (hot pepper) are widely grown. Pepper is utilized mostly for culinary purpose. It also has medicinal uses, internally as a stimulant and carminative and externally as a counter irritant (Tindal 1987). Pepper (*Capsicum spp*) grown in temperate region are herbaceous perennials where temperature does not drop below freezing point. These plants are grown for the edible fleshy fruit produced by this dichotomous growth. Peppers are non-diametric which means they do not produce ethylene, the need to stay on the vine to continue the ripening process. Although, pepper is widely cultivated through Nigeria but the yields obtained by peasant farmers are often very low (Adigun 2001). Production constraint such as low soil fertility, weed and disease are the major problems. Comparatively, the yield in the developing countries is about 10-30% of that in the developed countries (Erinle 1998). Poor soil fertility occur as a result of soil degradation which usually result from high degree of weathering, sandiness, credibility, rapid rate inorganic matter, high level of soil acidity, high tendency of phosphorous fixation, susceptibility of multiple nutrients deficiencies and toxicities under increasing intensity of cultivation (Hedge, 1987). Soil which is commonest medium used in Nigeria for raising vegetables has a number of limitations which include low fertility of soil, water holding capacity, low inorganic matter content, poor structural stability of the soil and low actively of clay content . All these factors therefore call for the need to look inward. The objectives of this study are to investigate the response of pepper to different levels of Nitrogen fertilizers and establish optimum application rate fertilizer of pepper.

Material and Method

Experiment was conducted at Emmanuel Alayande College of Education, Oyo, Lanlate Campus, (EACOED) Teaching and Research Farm, Lanlate, South West Nigeria. Lanlate lies between latitude 7^o 30^oN and Longitude 3^o 52 E in the tropical rainforest belt. There are two rainy seasons; one from April to July (early season) and the other from mid-August to November (late season). Annual average minimum and maximum temperatures are 24.80^oC and 28.10^oC respectively. The mean relative humidity is about 75%.

The treatments were namely; Urea at the rate of 30 kg N/ha, Urea at 60 kg N/ha, Urea at 90 kg N/ha and the control (No Urea). All the treatment was applied before and after transplanting. Treatments were replicated three times on manually cleared land using Randomized Complete Block Design (RCBD). Each of the 12 plots was 3m by 3m in size and seedlings were transplanted from nursery at 0.60m X 0.60m on the field. Urea treatments were applied on soil surface three weeks after planting in ring form. Weeding was done. Plant growth parameters taken at 3,6,9 and 12 weeks after treatments (WAT) included plant height, stem girth, number of flowers, number of fruit and fruit weight. Collected data of all growth and yield parameter were subjected to analysis of variance (ANOVA). Least significance difference (LSD at 0.05%) was used to compare means of various parameters.

Results and Discussion

Table 1 shows the physical and chemical properties of the soil before planting. The soil is a loamy sandy with a pH value of 6.5. The total Nitrogen of the soil is moderate (0.32%) as classified by Enwezor (1989).

The available phosphorus (P) is medium (8.8ml/kg), Exchangeable potassium (K) has a value of 0.3cmol/kg

Plant Height

The height of pepper plant at different weeks of growth is presented in table two 2. At 8weeks after planting (WAP) the height of plant ranged from 11.46 to 14.83cm, there was no significance difference in tallness of pepper plant. Similar trend of insignificance difference in height of pepper plants was also observed at 9 (WAP) with range of value 16.60 to 20.45cm, the least height were obtained from unfertilized plants at both 8WAP and 9WAP, While the tallest plants were recorded from plant fertilized with 60kg/ha of urea. At 10WAP, plant fertilized with 60kg/ha of urea as a height of 33.92cm which was not in any way significantly higher than that of plant fertilized with 90kg/ha which as a height value of 25.51cm. the unfertilized plants and plant fertilized with 30kg/ha did not differ from each other with respective value of 21.93cm and 23.37cm, but, both are significantly lower than plants fertilized with 60 and 90kg/ha of urea. At 11WAP, values of height range from 26.45cm(control) to 33.31cm (plant fertilized with 60kg/haof urea), while at 12WAP the plant fertilized with 60kg/ha of urea (T3) have the highest records of tallness of 40.33cm which not significantly higher than that of plant fertilized with 90kg/ha(T4) which as a height of 37.33cm, the unfertilized plant(T1) (the control) and plant fertilized with 30kg/ha (T2) did not differ from each other with respective value of 30.83cm and 30.79cm but are both significantly lower than T3 and T4. at 13WAP the same trend was obtained, the T3 has the highest height of 47.60cm follow by the T4 with 41.73cm and the T1 and T2 have similar height value of 35.55cm and 34.80cm. While at 14WAP T3 has the highest record of 53.33cm followed by T4 with 45.11cm while T1and T2 are not different from each other with values of 39.23and 40.00cm respectively. But at 15WAP plant height range from 41.44 to 56.79cm there was significance in tallness of pepper plants among various fertilizer treatments.

Stem Girth

The stem girth of pepper plant at different weeks of growth is presented in table 3. At 8WAP the stem girth of pepper plant range from 0.32 to 0.61cm there was no significant difference in width of pepper plant while at 9WAP the stem girth of T3 has the highest width of 0.86cm but the T4 has the lowest record of stem girth of 0.54cm but

there was no significance in control plants (T1) and T2 with value of 0.69 and 0.65cm. Similar trend of significance different in stem girth (width) of pepper plant was also observed. At 10WAP width of pepper plants range from 1.08 to 1.40cm the T3 has the width of 1.40 and T1 (control) has 1.25cm T2 and T4 are having similar value of 1.14 and 1.08cm. At 11WAP the T3 plant have records of stem girth of 1.91cm which was of the fattest width but was not in any way significantly fatter than that of T2 and T4 which have a width value of 1.74 and 1.67cm, they are not in any way significantly differ from each other (T2 and T4) but lower than T3, while the unfertilized plants is having the lowest value of width 1.50cm. Similar trend of differences was also observed at 12WAP where T3 plants have a width of 2.37cm which was significantly different from plant fertilized with 90kg/ha (T4) 30kg/ha (T2) and the control (T1) with value of 2.03cm, 2.02cm and 1.94cm but T4 and T2 are similar to each other. At 13WAP there was trend of insignificance in width of pepper plants with the range value of 2.28cm to 2.92, the least width are obtained from T2 plants and the top was obtained from the T3. At 14WAP the T3 has a high width value of 3.41cm while the T4 has the value of 2.94cm follow by the T1 (control) with 2.82cm and the least record is T2 2.66cm value which shows that T1 and T2 are similar while T3 differ from them but not in any way significantly higher than that of T4. But at 15WAP the width of pepper plants range from 2.97 to 3.74cm there was no significant difference in stem girth of pepper plants.

Number of Flowers

Number of flowers of pepper plants at different weeks of growth is presented in Table 4. At 9WAP, number of flowers ranged from 0.33 to 0.77 there was significance in the difference of the number produce per pepper plant. But at 10WAP there was significant difference in the number of flower produced per pepper plant. The T1 (control) has high number of flower of which value is 4.33 which was not in any way significantly higher than T2 which has a value of 1.89 and T4 is 1.77 (T2 and T4 are similar), unlike the T3 which was significantly different from others with value of 1.53. But at 11 WAP, there was no significant difference because the number of flowers range from 2.77 to 5.33 according to LSD which is 3.42 shows that there was no significant different in the number of flower of pepper plant. The least was observed in T4 which value is 2.77. Similar trend of insignificant difference in number of flowers of pepper plant was also observed at 12WAP down till 15WAP, where by the T1 is the 1st follow by T3 follow by T2 follow with the lowest value according to the value of least significance difference (LSD).

Number of Fruits

Table 5 present the number of fruits at successive growth periods. At 10WAP down to the 15WAP, it was observed that there was no significant different in the number of fruits per pepper plants, it shows that the T1 has the highest number follow by T2 the next to it is T4 and the least is T3.

Weight of Fruits

Table 6 Present the weight of fruits. The weight of pepper plant fruits has no significant difference. The T1 unfertilized had a value of 46.88g the T2 and T3 had the same value of 37.50g while the T4 had the value of 25.00g which is the least weight of pepper plant.

Summary

The performance of pepper plants under different nitrogen regime was evaluated in this study. Various rates (0, 30, 60, 90, kg/ha) were applied using urea (45%N) as fertilizer material. Growth and yield parameters were recorded. The growth parameters include height and stem girth, while yield parameters include numbers of flower, number of fruits and fruits weight. The result obtained revealed that fertilizer additions influenced height and stem girth of pepper plants. The fruits weight was not significantly influenced.

Conclusion

From the experiment, the following conclusion could be made.

- Plant height was affected by different levels of nitrogen application at different weeks of growth with significant differences and similarities observed depending on week of growth.
- Nitrogen application boost growth at the expense of fruits development
- Fruit weights were statistically similar among both unfertilized and fertilized pepper plants.
- The optimal rate of nitrogen application for all measured parameters was 60kgN/ha.

References

1. Adigun (2001) Critical Period of weeds Competition in Transplanted Sweet Pepper, In Proceeding of the 5th Annual Conference of the Horticultural Society of Nigeria Pp 83-93.
2. Erinle I.D (1989) Present Status and Prospect for increased Production of Tomato and Pepper production in the Tropics (esdo) Griggs T.D and Mclean B.T 543-545
3. Hedge D.M (1987), Growth analysis of bell pepper (*Capsicum annum* L) in relation to soil moisture and nitrogen fertilizer, Singapore journal of primary industries 14: 64-75.
4. Tindall H.D (1987) Vegetable in the tropics Macmillan press Pp347-354
5. Tindall H.D, Rice R.P and Rice L.W (1987), Fruits and vegetable production in Africa Pp 231-232; 347-52.

Table1: Pre-Planting Soil Analysis

Soil Parameter	Values
PH (H ₂ O)	6.5
Organic compound (%)	1.63
Total nitrogen (N) g/kg	3.2
Available phosphorous (P) (mg/kg)	8.88
Exchangeable calcium (cmol/kg)	7.31
Exchangeable magnesium (mg) (cmol/kg)	2.5
Exchangeable sodium (Na) (cmol/kg)	1.6
Exchangeable potassium (K) (cmol/kg)	0.3
Sand (%)	87.8
Silt	5.4
Clay	6.8
Texture	Loamy sand

Table 2:

Plant Height	8WAP	9WAP	10WAP	11WAP	12WAP	13WAP	14WAP	15WAP
T1	11.46a	16.60a	21.93b	26.45a	30.83b	35.55b	39.23b	41.44d
T2	13.15a	17.95a	23.37ab	28.61a	30.79b	34.80b	40.00b	41.89c
T3	14.83a	20.45a	31.92a	33.31a	40.83a	47.60a	53.33a	56.79a
T4	13.40a	19.21a	25.51a	31.72a	37.33ab	41.73ab	45.11ab	50.39b
LSD	6.24	6.34	6.91	9.09	9.43	9.09	11.7	0.15

Table 3. Stem Girth of Pepper Plant at Successive Weeks of Growth

Stem Girth	8WAP	9WAP	10WAP	11WAP	12WAP	13WAP	14WAP	15WAP
T1	0.39a	0.69ab	1.25a	1.50b	1.94b	2.48a	2.82b	3.07a
T2	0.45a	0.65ab	1.14ab	1.74ab	2.02ab	2.28b	2.66b	2.92a
T3	0.61a	0.86a	1.40a	1.91a	2.37a	2.92a	3.41a	3.74a
T4	0.32a	0.54b	1.08b	1.67ab	2.03ab	2.33a	2.94a	3.23a
LSD	0.31	0.30	1.18	0.38	0.40	0.51	0.55	0.00

Table 4. Number of Flower of Pepper Plant at Different Weeks of Growth

Number	9WAP	10WAP	11WAP	12WAP	13WAP	14WAP	15WAP
T1	0.75a	4.33a	5.33a	6.33a	7.11a	10.66a	15.77a
T2	0.33a	1.89ab	4.11a	5.11a	7.22a	12.86a	18.22a
T3	0.77a	1.53b	4.11a	7.31a	10.32a	20.55a	28.33a
T4	0.55a	1.77ab	2.77a	5.44a	6.89a	12.67a	19.55a
LSD	1.04	2.63	3.42	3.18	7.97	12.78	0.00

Table 5. Number of Fruits of Pepper Plant at Successive Growth Periods

Number of fruits	10WAP	11WAP	12WAP	13WAP	14WAP	15WAP
T1	0.11a	2.44a	3.33a	7.78a	16.55a	29.44a
T2			2.22a	4.88a	12.66a	23.33a
T3			3.11a	5.89a	12.89a	16.78a
T4		0.55a	4.67a	6.11a	12.11a	20.33a
LSD	0.14	2.42	5.33	5.59	10.34	17.77

Table 6: Fruits Weight (g/plant) At Harvest, 16 Weeks after Planting (WAP)

Fruit weight	Values in grams
T1	46.88a
T2	37.50a
T3	37.50a
T4	25.00
LSD	25.47

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