Effect Of Compost And NPK Fertilizer On The Nutrient Uptake And Yield Of Millet

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Abstract: A field experiment was conducted to compare the effect of application of compost with or without inorganic fertilizer on nutrient uptake by millet at Department of Soil Science Teaching and Research Farm, University of Maiduguri. A randomized complete block design was adopted with five treatment replicated three times. The treatments consisted of. Control (no inorganic (fertilizer no compost), Compost alone at 7.5 tons/ha,.Compost + N.P.K (30:15:15), NPK (30:15:15), and NPK (60:30:30). The combined effect of application of compost with or without inorganic fertilizer on nutrient uptake by millet as given in table 1 At the end of tillering seven weeks after planting (7WAP), the mean values of N, P and K are 3.25, 0.28 and 3.14 respectively, which are invariable higher than that at the booting stage ten weeks after planting (10WAP) with the mean values of N, P, and K obtained as 2.16, 0.23 and 2.23 respectively, this decrease may be as a result of the nutrient being used up for physiological development of the plant. The treatment compost plus N,P.K(30.15.15) gave the highest grain yield with a mean value of 1548kg/ha, followed by plot applied with full recommended dose of N.P.K(60.30.30) with a mean value of 1323kg/ha while the control plot recorded the lowest value of 790kg/ha, there was no significant difference at 5% level of significant between plots applied with compost plus N.P.K (30.15.15) and full recommended dose of N.P.K (60.30.30), and compost plus N.P.K (30.15.15) and compost alone. Therefore application of compost, plus N.P.K (30.15.15) and N.P.K (60.3030) performed significantly better than the control, which directly reflects the nutrient uptake by millet.
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Key Word: Compost, Inorganic Fertilizer, Tillering and Booting

Introduction

Millet is an important cereal crop grown in arid and semi arid regions of the world. In Nigeria it is widely grown in northern areas where the incidence of rainfall is normally low, on relative sandy well drained soils.

The maintenance of soil fertility in the savanna region of northern Nigeria is the problem facing sustainable agricultural production. The savanna soils of northern Nigeria like most tropical soils are inherently very low in nutrient (Rayer 2000, Rayer 1986 and Kwari, 2005). This situation may however be corrected by the use of organic and inorganic fertilizer.

Inorganic fertilizers are of known composition and concentration and can be applied specifically according to particular crops need, it is easier to handle and give rapid response as they become almost immediately available to plant. However there are expensive and often unavailable to the peasant farmers, As a result of continued increase in the cost of inorganic fertilizer, coupled with unavailability, insufficient quantity at the right time and difficulty in obtaining them, attention is focused on search for an alternative source of plant nutrient, with which we arrived at the use of compost.

The purpose of this research therefore is to study how the nutrient uptake under sole or combine application of compost and NPK fertilizer affects the growth and yield of millet in Maiduguri, Northern Nigeria.

Materials And Methods

A field experiment was conducted at the Department of Soil Science Teaching and Research Farm, University of Maiduguri located at ($11^{0}5^{11}$ N, 13^{0} 1^{51} E) during 2006 cropping seasons. The treatments were arranged in randomized complete block design and replicated three times, treatments consisted of. i. Control (no NPK no compost), ii. Compost alone at 7.5 tons/ha, iii. Compost + N.P.K (30:15:15), iv. NPK (30:15:15), and v. NPK (60:30:30). The land was ploughed, harrowed and plots were laid out into plot sizes of 4 m long and 3 m wide. Three seeds were sown per hole according to BOSADP (1993) recommended spacing. Seedlings were thinned down to two per hole two weeks after sowing. The leaf samples were collected from each plot at two different critical growth stages, thus, at the end of tillering (7 weeks after planting) and at booting stage (10 weeks after planting). At each sampling, the youngest mature leaves were collected from 10

representative plants per plot, the leaves samples were analyzed using standard laboratory procedures. Available P was extracted using Bray-1 solution (Bray and Kurtz, 1945) and the phosphate in the extract was analyzed calorimetrically by the molybdenum blue color method as described by Murphy and Riley (1962). K and was determined by flame photometry. The total Nitrogen of the sample was determined by Micro- Kjedhal procedure as described by Jackson (1962). Data collected data were subjected to analysis of variance (ANOVA) and the means with significant difference between treatments were separated using LSD at 5% probability level (Gomez and Gomez, 1984).

Results And Discussion

Table 1 shows the effect of application of compost in sole and combination with inorganic fertilizer on the uptake of N, P and K by millet at two growth stage.

At the end of tillering (7WAP), the uptake was higher with the mean values of 3.25, 0.28 and 3.14% compared to 2.46, 0.23 and 2.23% respectively, recorded at the booting stage for N, P and K. Potassium uptake at 7WAP was significantly higher ($P \leq 0.05$) than 10WAP and no significant difference observed in the uptake of N and P at the two growth stages. The lower uptake at booting stage may be as a result of the available nutrient in plant being used up for physiological development and grain formation, these agrees with the findings of Duan et al 2005, Jiang et al 2005, that most of the absorbed nitrogen is stored in the leaves and may be transported to the grains during filling.

The N content in the plant sample ranged from 2.26% in the plot applied with compost alone, to 4.57% in the plot applied with compost plus N.P.K(30.15.15), at 7WAP (Table 2).The control has a value of 3.78% which is slightly above the plots applied with compost alone and N.P.K(30.15.15) with the values of 2.26 and 2.40%, respectively. However, the plot applied with full dose of recommended N.P.K (60, 30.30) fertilizer has a value of 3.22%. No significant difference was observed between the means of treatments. Comparing this with the sampling at 10WAP, a general decrease in available N in the plant was observed, with the lowest in plot applied with compost plus N.P.K (30.15.15) with a value of 3.17%. The supply of available N can be regarded as having two components, the initial N in inorganic fertilizer which is completely available and the potentially mineralized N in organic fertilizer which is partially available over a long period,

The uptake of P by millet at 7WAP was not significantly affected by the various treatments. The highest value (0.36%) was obtained from the plot applied with N.P.K (30.15.15) and the lowest value (0.21%) was obtained from the control plot. At (10WAP), uptake of P by millet was significantly affected by the treatments. The highest uptake (0.28%) was obtained in the plot applied with compost alone, while the lowest value of (0.11) was obtained in the control plot, the significant difference being noticed may be as a result of the treatment compost plus N.P.K (30.15.15).

The effects of different treatment on the uptake of potassium are shown in table 4.2. No significant difference was observed in KL uptake at both sampling times (7WAP and 10WAP).however the highest value (3.17%) was obtained in the plot applied with compost plus N.P.K (30.15.15), and lowest 3.08% in the control plot at (7WAP).

At the second sampling (10WAP), a significant decrease in K uptake was noticed with all the treatment. The decrease in K uptake by plant may be as a result of the nutrient being used for grain formation and other physiological development. The yield data shown in table 3 support the uptake of potassium at both stages of growth especially in plot treated with compost plus N.P.K (30.15.15).

The effect of compost with or without inorganic fertilizer on grain yield of millet is shown in table 3. Plant grown in the soil applied with compost plus N,P.K(30.15.15) gave the highest grain yield with a mean value of 1548kg/ha, followed by plot applied with full recommended dose of N.P.K(60.30.30) with a mean value of 1323kg/ha while the control plot recorded the lowest value of 790kg/ha.

When mean separation was carried out, no significant difference was noticed between plots applied with compost plus N.P.K (30.15.15) and full recommended dose of N.P.K (60.30.30), and compost plus N.P.K (30.15.15) and compost alone.Therefore application of compost, plus N.P.K (30.15.15) and N.P.K (60.3030) performed significantly better than the control, which directly reflect the nutrient uptake by millet as previously discussed.

Conclusion And Recommendation:

It can then be concluded that addition of compost with inorganic fertilizer could enhance crop yield, and application of full dose of recommended NPK (thou with the consequences of poor soil physical properties) perform better. The uses of compost alone show a fair result.

Based on the result obtained from this research, application of compost and inorganic fertilizer in mix is therefore recommended and the government should possibly help the peasant farmers by educating them on how to prepare and use compost, as inorganic fertilizer are expensive for the peasant farmers which constitute larger part of food production in Nigeria.

Table 1. *Effect of compost and NPK fertilizer on nutrient uptake by millet at two critical growth stages*.

Sampling Time	Mean Nutrient Content		
	N%	P%	K%
7WAP (end of tillering)	3.25	0.28	3.14
10WAP (Booting stage)	2.46	0.23	2.23
Mean	2.85	0.26	2.67
LSD (0.05)	NS	NS	0.39**

Table 2. Effect of compost and NPK fertilizer on nutrient uptake by millet

Sampling At End Of Tillering			
Treatment	**Nutrient Content (%)**		
	N	**P**	**K**
Control	**3.78**	**0.21**	**3.08**
Com (7.5 t/ha)	**2.26**	**0.27**	**3.16**
Com + N. P.K (30. 15. 15)	**4.57**	**N.D**	**3.17**
N. P. K (60. 30. 30)	**3.22**	**0.27**	**3.13**
N. P. K. (30. 15. 15)	**2.44**	**0.36**	**3.16**
Mean	**3.25**	**0.28**	**3.14**
LSD (0.05)	**NS**	**NS**	**NS**
Sampling At Booting Stage			
Control	**2.15**	**0.11**	**2.40**
Com (7.5 t/ha)	**1.87**	**0.28**	**1.90**
Com + NPK (30:15:15)	**3.71**	**N.D**	**2.23**
NPK (60:30:30)	**2.87**	**0.27**	**2.19**
NPK 30:15:15	**1.70**	**0.27**	**3.39**
Mean	**2.46**	**0.23**	**2.23**
LSD (0.05)	**NS**	**0.08****	**NS**

Table 3. Effect of compost and NPK fertilizer on grain yield of millet.

Treatment	**Grain Yield**
Control	**790.0**
Com.(7.5t/ha)	**1244.0**
Com.+N.P.K (30.15.15)	**1548.0**
N.P.K(60.30.30)	**1323.3**
N.P.K(30.15.15)	**1024.7**
Mean	**1186.0**
LSD(0.05)	**457.0**

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