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EFFECT OF STARTER DOSE OF NITROGENOUS FERTILIZER ON GROWTH AND YIELD OF COWPEA AND GROUNDNUT LAKE CHAD RESEARCH INSTITUTE MAIDUGURI

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Abstract

A field experiment was conducted at Lake Chad Research Institute Demonstration farm Maiduguri, Borno State experimental farm during the rainy season of 2021, to determine the effect of 3 level of starter dose of nitrogenous fertilizer on two leguminous crops Vigna unguiculata and Arachis hypogea. In this research, the application of starter dose of nitrogen fertilizer at the rate of 25kg/ha resulted in high rate of nodulation and root weight, compared with other treatments i.e 20kg/ha and 30kg/ha which had lower rate of nodulation and root weight, the nodulation were highly correlation with of Groundnut like-wise the root weight of the cowpea. In this research, the field layout was designed in randomized blocks design (RBD) contain two plots with three replicates each for the three treatments of nitrogen fertilizer used, that is 20kgNlha, 25kgNlha, and 30kgNlha, the length of each replicate is 2m by 1.5m, the distance between one replicate with another is 0.5m, therefore a total length of 14m and the breath 9.5m giving a total area of 1440 square meters. Recommendation constitutes sandy – loam soil requirement up to 25kg/ha of starter dose of Nitrogen fertilizer applied immediately after planting and with optimum, rainfall; the rate applied count adequately, result in higher, rate of nodulation of both Vigna unguiculata and Arachis hypogea. Government should provide adequate facilcities to agricultural science and curriculum planners should make sure that practical work made compulsory and relevant to agricultural science.

Keywords: Starter Dose, Nitrogenous Fertilizer, Growth and Yield of Cowpea and Groundnut

Introduction

Borget, (2002) describe that legumes seeds or pulses, sometimes termed " grain legumes'', are second only to the cereals as a source of human food and provide the much needed proteins to our predominantly vegetarian population. The relatively high protein content is attributed, in part, to the presence, on the root of many legumes, of tubercles or nodules that contain nitrogen fixing bacteria. These microorganisms are capable of using free atmospheric nitrogen to produces nitrates or nitrites, which can be readily used by the plants, thus augmenting their supply of nitrogenous material. The grain legumes are all members of the family leguminoseae and belong to three tribes, the vicinage, the Hedysareae and the phaseoleae. Jones (2010) also describe that cultivation of legumes is almost as old as that of cereals. Archaeological evidence shows that legumes were cultivated before 5, 000 BC. These is also evidence that legumes were cultivated in central and south America from four to six thousand years ago. Cowpea which are becoming an increasingly important worldwide source of high quality protein are the most important edible legumes produced today. Groundnut are another major edible legumes of the world.

John (2015) describe that Cowpea (vigna unguiculata) Family –papilionaceaa. This crop is widely grown in all tropical and subtropical countries for human food and for livestock feed. i.e is popular pulse crop throughout Africa and India. Its leaves are eaten is salad and the immature foods used as vegetables, the mature seeds are also boiled and routed in various ways for human consumption and also used a livestock feeds. The whole plant is a very good crop and checks both water and wind erosions and is also use as forage crop. In some countries such as India, dyes are produced from the leaves and stems. There is a very large number of named varieties of cowpea and vary greatly in structure and their growth habits.

Statement of the Problem

Cowpea is a very hardly crop, adapted to wide range of soil. It does best on well-drained sandy loam-soils but can do well on sandy or clayed soils. However, very fertile soil indices excessive growth and poor pod formation. The appropriate nitrogen-fixing bacteria most also be present. Cowpea is a warm weather crop

and dose best where there is high temperature evenly distributed rain of 75cm- 150cm at growth phase. Heavy rainfall extends the vegetative phase and to reduce yield Komolafe, (2001). Groundnut (arachis hypogea) family papilionaceae. With the increasing demand for vegetable fats, groundnut is now grown extensively in most tropical countries. Groundnut is a native of Brazil and is believed to have been introduce to Africa by the Portuguese the seed gives about 40% of excellence edible vegetable oil which is used in the production salad oil, margarine and many other fat substitute the groundnut cake, got. After extracting the oil is a rich source of protein and is one of the best known livestock feeds. Groundnut may grow on almost any type of soil except heavy clay low in organic matter. However groundnut prefers light sandy-soil for good seed formation soil should also be rich in phosphate and sulphur. Rainfall should be moderate between the range of 76cm-125cm at the growing period it requires plenty of sunshine and relatively high temperature particularly at the maturity harvesting and storage (Vecent, 2003).

Purpose of the Study

The purpose of this study is to know the required dose of nitrogen fertilizer that will give proper nodulation of the two most important leguminous crop that is cowpea (Vigna unguiculate), and groundnut (Arachis hypogea).The specific objective is to know among three doses:

1. To find out the mean height of plant in cowpea and groundnut in 20kg,25kg and 30kg
2. To find out the rate of nodulation and grain weight on groundnut in 20kg, 25kg and 30kg
3. To find out the correlation of nodulation and grain weight on groundnut in 20kg, 25kg and 30kg.
4. To find out the rate of nodulation and roots weight of cowpea in 20kg, 25kg and 30kg
5. To fine out the correlation of nodulation and roots weight of cowpea in 20kg, 25kg and 30kg

Research Questions

1. What it the mean height of plant in cowpea and groundnut in 20kg, 25kg and 30kg
2. What it the rate of nodulation and grain weight on groundnut in 20kg, 25 kg and 30kg
3. What it the correlation of nodulation and grain weight on groundnut in 20kg, 25kg and 30 kg
4. What is the rate of nodulation and roots weight of cowpea in 20kg, 25kg and 30kg
5. What is the correlation of nodulation and roots weight of cowpea in 2okg, 25kg and 30kg

Methodology

Field experiment was carried out in the lack chad research institute demonstration farm, situated in the north east savannah ecological zone of Nigeria the type of the soil at the experimental site was a well-drained sandy soil. The materials used in the experiment include:-

a. Ground seeds
b. Cowpea seeds
c. Nitrogen fertilizer
d. Measuring tape
e. Field record book

In this research, the field layout was designed in randomized blocks design (RBD) contain two plots with three replicates each for the three treatments of nitrogen fertilizer used, that is 20kgNlha, 25kgNlha, and 30kgNlha, the length of each replicate is 2m by 1.5m, the distance between one replicate with another is 0.5m, therefore a total length of 14m and the breath 9.5m giving a total area of 1440 square meters. The land was cleared on 11th July, 2021at the experimental site. Shrubs and grasses were cleared. Mapping out of the experimental site was done on 12th July, 2021. -- 23rd July, 2021 replicates of 2m by 1.5m were made. Undamaged and disease free seeds was selected on 15th July, 2021 for planting

The planting of the seeds was done after establishment of rainfall which was on 17th July, 2021. The seeds rate was 2 seeds per hole giving a total number of 24 seeds per replicate on groundnut plot 1. The same thing was done on cowpea plot 2. First weeding was carried out on 3rd August 2021, using hoe. Second weeding was carried out on 3rd September 2021 together with heartening – up of the replicates. No fungicide nor herbicide was used. The fertilizer applied was a starter dose of nitrogenous fertilizer (N.P.K.) which was applied immediately after planting in order to stimulate nodulation. The application was done randomly based on treatment. The treatment are 20kg, 25kg and 30kg of N/ha in a randomized block design (RBD).

Germination Percentage

The germination percentage was taken on 22nd July, 2001 that is five (5) days after planting. The mean height plat intervals of was taken at one (1) week, that is on 30th July 2021, 6th August, 13th August and 20th August, 2021. The average width, length and number of leaves was also taken at intervals of one week at the same in mean height of plant. The rate of nodulation for the three treatments was taken 20th August, 2021. That is low nodulation, medium nodulation and high nodulation of roots based on the treatments of both Groundnut (Arachis hypogea) and cowpea (vigna unguiculata)**.** Grain weigh yield and root weigh was taken at maturity state by using weighing balance.

Results

The data was analyses by using correlation coefficient. Response of nitrogenous fertilizer on Arachis hypogea and Vigna unguiculata. The effects of 20kglha, 25kglha and 30kglha treatment of nitrogenous fertilizer is shown in tables below.

Table 1: Mean Height of Plants in Groundnut (Arachis hypogea)

	1st WEEK Treatment (kg)			2nd WEEK Treatment (kg)		
Treatment (kg)	20/h	25/h	30/h	20/h	25/h	30/h
Height of Plant	9.2cm	9.7cm	9.4cm	12.8cm	12.5cm	13.8cm
Number of Leave	67	79	70	141	126	175

Source: Field Work, 2021

	3rd WEEK Treatment (kg)			4th WEEK Treatment (kg)		
Treatment (kg)	20/h	25/h	30/h	20/h	25/h	30/h
Height of plant	14.8cm	17.7cm	18.5cm	19.1cm	22.1cm	24.6cm
Number of Leave	185	173	217	271	231	254

Source: Field Work, 2021

Mean height of plants and number of leaves in table I indicates that treatment 25kg/ha is the most highly response among the other treatment.

Table 2: Mean Height of Plants in Cowpea (Vigna unguiculata)

	1st WEEK Treatment (kg)			2nd WEEK Treatment (kg)		
Treatment (kg)	20/h	25/h	30/h	20/h	25/h	30/h
Height of Plant	22.7cm	18.7cm	17.1cm	32.1cm	28.1cm	26.5cm
Number of Leaves	22	17	13	36	31	26

Source: Field Work, 2021

	3rd WEEK Treatment (kg)			4th WEEK Treatment (kg)		
Treatment (kg)	20/h	25/h	30/h	20/h	25/h	30/h
Height of Plant	34.1cm	35.7cm	32.3cm	46.8cm	45.3cm	37.3cm
Number of Leaves	102	86	60	167	139	154

Source: Field Work, 2021

On the other hand looking at the table 2 of vigna unguiculata shown that treatment of 20kg/ha is the most highly significant then the other two treatments.

Table 3: Rate of Nodulation Treatment in Groundnut (Arachis hypogea)

Treatment	Low Nodulation	Medium Nodulation	High Nodulation
20kg/ha	47	----------	----------
25kg/ha	----------	72	----------
30kg/ha	8	----------	----------

Source: Field Work, 2021

The 25kg/ha treatment is highly significant which is indicated in table 3 of rate of nodulation gives medium nodulation while 20kg/ha and 30kglha gives low nodulation.

Table 4: Grain Weight of Groundnut in (gm)

Treatment	Groundnut Weight
20kg/ha	124.98 gm.
25kg/ha	163.64 gm.
30kg/ha	55 gm.

Source: Field Work, 2021

In grain weight of Groundnut also 25kg/ha is noted to be the highly response treatment than the other treatments. This is because after weighing the result recorded is 163.64 gm. while 20kg/ha weight 124.98 gm. and 30kglha weight 55 gm. (Table 4).

Correlation of Nodulation and Grain Weight of Groundnut

Treatment	Groundnut weight X	Nodulation Y	X^2	Y^2	XY
1. 20kg/ha	124.98	47	1560.00	2209	5874.06
2. 25kg/ha	163.64	72	26778.04	5184	11782.08
3. 30kg/ha	55	8	3025	64	440
Total	343.64	127	45423.04	7457	18096.14

Source: Field Work, 2021

Correlation of Nodulation after weighing the result recorded in 25kg/ha is 163.64 gm. while 20kg/ha weight 124.98 gm. and 30kglha weight 55 gm.

Table 5: Rate of Nodulation Treatment in Cowpea (Vigna unguiculata)

Treatment	Low Nodulation	Medium Nodulation	High Nodulation
20kg/ha	46	----------	----------
25kg/ha	----------	52	----------
30kg/ha	45	----------	----------

Source: Field Work, 2021

The rate of nodulation of vigna unguiculata was also observed, two crop stand were removed from each treatments plot and it is discovered that 25kg/ha is the most highly effective treatment because it gives a medium nodulation while 20kglha and 30kg/ha gives low nodulation as indicated in table (5)

Correlation of Nodulation and Roots Weight of Cowpea

Treatment	Root weight X	Nodulation Y	X^2	Y^2	XY
20kg/ha	31.1	46	697.21	2116	1430.6
25kg/ha	41.93	52	1758.12	2704	2180.36
30kg/ha	28.6	45	817.96	2025	1287.00
Total	101.63	143	3543.29	6845	4897.96

Source: Field Work, 2021

Measurement of root weight of vigna unguiculata shown that 25kg/ha perform better than 20kg/ha and 30kg/ha 41.93 gm. while 20kg/ha have 31.1 gm. and 30kg/ha have 25.6 Finally the correlation coefficient of Vigna unguiculata and Arachis hypogea showed highly significant relationship.

Rate of Nodulation for the Three Treatments key

1 – 50 Nodules	------	Low Nodulation
51 – 75 Nodules	------	Medium Nodulation
> 75 Nodules	------	High Nodulation

Source: Field Work, 2021

Discussion

In this project the effect of starter dose of Nitrogenous fertilizer on two (2) leguminous crop (Arachis hypogea) and (Vigna unguiculata) with the treatments of 20kg/ha, 25kg/ha and 30kg/ha. The fertilizer was applied immediately after planting which helps the germination of the crop. The germination percentage was taken five (5) days after planting and a very good results was recorded. The germination percentage of Arachis hypogea 88 percentage while that of Vigna unguiculata plot is 89 percent. This agreed with Cooke, (2002) who reported on germination crop. The soil of the experimental plot is sandy but with the help of the starter dose the nitrogen fertilizer out of the 360 seeds of Arachis hypogea planted 316 germination. Also out of the 360 seeds of Vigna unguiculata planted about 320 seeds germinates. This agreed with chew, (2009) reported that sandy soil with nitrogen fertilizer help plant germination.

Mean height of plants and number of leaves in table I indicates that treatment 25kg/ha is the most highly response among the other treatment. On the other hand looking at the table 2 of vigna unguiculata shown that treatment of 20kg/ha is the most highly significant then the other two treatments. This agreed with

Adenji, (2001) who reported that height of the plant and number of leaves in treatment of 25kg/ha is highly responseded. The 25kg/ha treatment is highly significant which is indicated in table 3 of rate of nodulation gives medium nodulation while 20kg/ha and 30kglha gives low nodulation. In grain weight of Groundnut also 25kg/ha is noted to be the highly response treatment than the other treatments. This is because after weighing the result recorded is 163.64 gm. while 20kg/ha weight 124.98 gm. and 30kglha weight 55 gm. (Table 4). This agreed with Williams, (2009). Reported that 25kg/ha gives highly rate of nodulation.

The rate of nodulation of vigna unguiculata was also observed, two crop stand were removed from each treatments plot and it is discovered that 25kg/ha is the most highly effective treatment because it gives a medium nodulation while 20kglha and 30kg/ha gives low nodulation as indicated in table (5). This finding agreed with Baffour, (2002). Who reported that 25kg/ha gives medium nodulation. Measurement of root weight of vigna unguiculata shown that 25kg/ha perform better than 20kg/ha and 30kg/ha 41.93 gm. while 20kg/ha have 31.1 gm. and 30kg/ha have 25.6 Finally the correlation coefficient of Vigna unguiculata and Arachis hypogea showed highly significant relationship. This finding agreed with Rajarantnan, (2009) who reported that the correlation coefficient of Vigna unguiculata and Arachis hypogea are highly significant relationship.

Conclusion

Preceding the application of the three level of starter dose of nitrogenous fertilizer it was found out notable in treatment of 25kglha. The plants showed optimum growth and medium nodulation that range between 51 – 75 nodules after a careful count of the nodules. Root and pod weight of vigna unguiculata and Arachis hypogea treatment 25kg/ha showed a significant result when compared to the other treatment. The plot that received treatment of 20kg/ha showed a better result as regard to height of plants and number of leaves but has low level of nodulation that range from 1 – 50 nodules.

Recommendations

The trail showed that in Lake Chad Research Institute Maiduguri, demonstration farm which,

1. Constitutes sandy – loam soil requirement up to 25kg/ha of starter dose of Nitrogen fertilizer applied immediately after planting and
3. Rate of nodulation of both Vigna unguiculata and Arachis hypogea.
4. The study recognized the need for further research work on starter dose of fertilizer on this two leguminous crop in different location in the north east zone.

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