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EFFECT OF ORGANIC MANURE AND N.P.K FERTILIZER ON GROWTH AND YIELD PERFORMANCE OF ONION (*ALLIUM CEPA L.)* IN IN SAHELIAN ZONE OF NIGERIA.

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ABSTRACT

Field experiment was conducted during the 2018/2019 dry season at Teaching and Research Farm Faculty of Agriculture University of Maiduguri, to determined the effect of organic manure and NPK fertilizer on growth and yield components of onion (Allium cepa L.). The experiment was laid out in a Randomize Complete Block Design (RCBD) and replicated three times. The treatment consist of cow dung, poultry manure, sheep manure, NPK fertilizer and control. Growth and yield parameter collected are; number of leaves per plant, plant height, bulb diameter, bulb weight per plot, bulb weight per plant and bulb yield. Results showed both the vegetative and reproductive parameters were greater at NPK treatment and the lower parameters were produced at zero fertilizer application than the other treatments.

Introduction:

Onion (*Allium cepa L.)* belongs to the family Alliaceae (Hanelt, 1990), it exhibit particular diversity in the eastern Mediterranean countries through, Turkmenistan, Tadikistan to Pakistan and India, as centre of its origin (Astley *etal.,* 1982; and Brewster, 2008). Allium is a typical plant of open, sunny, dry sites in fairly arid climate , with, many species found in the steps, dry mountain slopes, rock or strong open sites or summer dry, open, scrubby vegetation (Hanelt, 1990). World production of onion increased from about 62 million metric tons produced on nearly 3.09 million hectares in 2004 to over 66.8 metric tons

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Produced on an area above 3.7 million hectares. (FADSTAT, 2009). This presents a 51.6% increase, with Nigeria producing 618,000 tons (FAO, 2010). The leading producing state in Nigeria include Borno, Jigawa, Sokoto, Kebbi, Zamfara, and Kaduna (AERLS, 1985). Onion is one of the most popular vegetation crop that form part of the daily diet, According to the United Nation Food and Agricultural Organization, there are estimated 6.7million acres of the world land total cultivated to produced 742.51 million tons, with United State of America 33.21, Egypt 22.08 million tons, Iran 19.23, Turkey 19.00 million tons, Russia 15.36, Brazil 15.56, Russia 15.36, and republic of korea 14.12 (FAO, 2012). Onion successfully accept to a wide range of climatic conditions, but high performance was recorded on mild climate without the excess of heat and cold condition with adequate moisture supply for suitable growth followed by warm drier condition for maturation, harvesting and curing. These requirement possibly explain why the crop fail in humid southern part of the Nigeria (Lombin, 1988).

Use of organic fertilizer can improve the soil structure and both micro and macro fauna in the soil. As a result, farmers are currently changing from conventional to organic farming system which used no synthetic fertilizers. (Colla *et al,* 2002). The high cost of fertilizer, increasing concern for ecological stability and sustainable soil productivity as well as increasing soil degradation and pollution risks arising from use of inorganic fertilizers have therefore led to renewed interest in organic manure with richer composition. The objective of this study was to determine the effect of organic manure and NPK fertilizer on growth and yield component of onion. The application of NPK fertilizer can also increase the growth and production of onion. The application of balanced macro nutrients (N, P and K) is very much needed by younger plants because those macro nutrients can stimulate plant's vegetative growth such as roots, stems and leaves which improve the height of the plants. This is in accordance with the research of Rauf et al (2000).

A strong relationship between nitrogen fertilizer supply and onion bulb development was observed by Brewster and Buther (1989) and Hahorson et al (2002). They found that the lower the nitrogen, the later bulb scale initiation occurred and an initial period of low nitrogen delayed bulb scale development and ripening relative to high nitrogen through out same results were observed on cotton and sorghum by Blaise et al 2003, on wheat by Ahmed and Ali 2005 and on sorghum by Bayu *et al* 2006.

Materials and methods

The experiment was conducted during the dry season of 2018 at the Teaching and Research Farm Faculty of Agriculture University of Maiduguri latitude 11^0 47, 840^N, elevation of 319 mm above the sea level. The climate is hot from March to May and dusty; to cold during the period of November to February. The temperature ranged from 27^{o}c to 42^{o}c during the cold and heat period (seasons) respectively. The soil is sandy, loam loose with high water infiltration capacity. The land was cleared using hoe, rake, rope, rake, measuring tape, peg, garden and cutlass to prepare the land and to remove debris, plot were marked out in to 2m×2m with an alley of 1m between row and 0.5m between the subplots. The plot were tilled to ensure sufficient and even distribution of moisture, organic manure was also incorporated in to the soil and watered for two weeks before transplanting. Five kilogram (5kg) each poultry manure, cow dung, sheep manure and 150 gram of NPK 15:15:15 was incorporated in to the beds as their respective treatment and mixed very well for five days.

The experiment consist of four source of fertilizer; cow dung ,poultry manure, , sheep manure, NPK fertilizer and control (no application), laid out in a Randomized Complete Block Design (RCBD) and replicated three times plot size 2m×2m (4m^2). Onion seedling was obtained from Borno State College of Agriculture, Maiduguri. Borno white it is an early maturity local verity at the age of 5 weeks after broadcasting from nursery and the seedlings were transplanted at a recommended spacing of 25 cm×30 cm at a depth of 3-4 cm in the evening hours. Weeding was done after seedling establishment and repeated at interval of two weeks each to control weed

infestation. Data obtained were subjected to statistical analysis using analysis of variance (ANOVA) at 5 % level of probability.

Results and Discussion

Effect of Organic Manure and NPK Fertilizer on Onion Growth and Development Parameters

Result showed that effect of NPK fertilizer produced taller plants at 2, 4, and 6 weeks after transplanting (WAT) compared to poultry manure or cowdung (Table 1). Similar trends was observed at 8 and 10 WAT when NPK treatments produced the taller plants than the other treatments,. onion produce shorter plant with the application of sheep manure than cowdung and poultry manure at all sampling stages. However, the shortest plant were recorded under the control plots compared to all the treatments at 2, 4, 6, 8 and 10 WAT (Table. 1). The result showed that there was significant difference among the onion plant height at 2, 4, 6, 8 and 10 WAT, application of NPK fertilizer significantly produced the taller plant height at all the ages compared to cow dung, poultry manure and sheep manure, however the shortest plant was observed under the control plots compared to other treatment at 2, 4, 6, 8 and 10 WAT (Table 1).

Table 1. Effect of organic manure and NPK fertilizer on onion plant height (cm) at different ages

Treatments	2 WAT	4 WAT	6 WAT	8 WAT	10 WAT
Cowdung	22.22^{b}	26.86^{c}	34.41^{b}	41.70^{c}	46.04^{b}
Poultry manure	23.99^{a}	28.68^{b}	36.58^{b}	44.67^{d}	46.24^{b}
Sheep manure	21.78^{b}	24.50^{d}	29.10^{c}	43.46b^{c}	50.17^{b}
N.P.K	24.78^{a}	38.53^{a}	56.43^{a}	66.99^{a}	69.22^{a}
Control	17.77^{c}	21.08^{e}	26.72^{c}	35.17^{d}	37.51^{c}
SE(±)	0.73	0.59	1.09	1.26	1.89

WAT = Week after transplanting

Means followed by the same letters in the same column are not statistically significant according to DMRT at (P≤0.05%).

The performance of onion revealed that onion produced greater number of leaves per plant with the application of poultry manure at 2 WAT (Table 2). Similar to other trends observed at 4, 6, 8 and 10 WAT when NPK fertilizer promoted greater number of leaves compared to all other treatments. The lower number of leaves were produced at the application of sheep manure than NPK or poultry manure however, the zero application produce the least number of leaves at 2, 4, 6, 8 and 10 WAT compared to other treatments (Table 2).

Table 2. Effect of organic manure and NPK fertilizer on onion number of leaves per plant

Treatments	2WAT	4 WAT	6WAT	8WAT	10WAT
Cowdung	3.99^{ab}	5.7b^{c}	8.11^{b}	10.66^{b}	12.33^{b}
Poultry manure	4.33^{a}	6.44^{b}	7.89b^{c}	9.99^{bc}	10.44^{d}
Sheep manure	3.44^{b}	5.77^{bc}	7.11^{cd}	9.67^{bc}	11.33^{c}
N.P.K	4.77^{a}	4.48^{a}	11.33^{a}	13.77^{a}	16.11^{a}
Control	3.32^{b}	5.11^{c}	6.44^{d}	9.22^{c}	10.33^{d}
SE (±)	0.38	0.45	0.38	0.49	0.32

WAT = Week after transplanting
Means followed by the same letters in the same column are not statistically significant according to DMRT at (P≤0.05%).

The effect of organic manure and NPK fertilizer showed that, there was significant difference observed among the treatments (Table 3). Results showed that, application of NPK fertilizer produced the greater bulb weight per plot compared to poultry manure. Similarly, application of cow dung produced the greater bulb weight compared to zero application (control). Lowest bulb weight was observed under the zero application. The effect of organic manure and NPK fertilizer showed that, greater bulb diameter was observed under the application of NPK fertilizer and cow dung compared to poultry manure and sheep manure. The lowest bulb diameter was produced under the zero or control plots. (Table 3). Similar trend was observed with the application of NPK fertilizer compared to cow dung and

poultry manure that produced statistically similar value the lowest bulb weight was observed in the control plots (Table 3).

Table 3. Effects of organic manure and NPK Fertilizer on bulb diameter, bulb weight per plant and bulb weight per plot.

Treatments	Bulb weight (kg)	Bulb diameter (cm)	ulb weight (g)
Cow dung	6.03^{bc}	22.10^{a}	68.11^{b}
Poultry manure	7.00^{b}	17.54^{b}	68.34^{b}
Sheep manure	5.73^{c}	15.70^{c}	65.14^{b}
N.P.K	8.77^{a}	23.10^{a}	201.89^{a}
Control	5.00^{c}	15.21^{c}	61.85^{b}
SE (±)	0.54	0.69	2.83

Means followed by the same letters in the same column are not statistically significant according to DMRT at (P≤0.05%).

There was significant differene observed among the treatments (Table 4). The result revealed that application of NPK fertilizer produced the greater bulb yield per plot compared to either poulty manure or cowdung. Similar to treatments observed whn sheep manure produced the lowest value compared to poultry manure, cowdung or NPK fertilizer (Tabel 4). The lowest bulb yield was produced under the zero or control plots.

Table 4. Effects of organic manure and NPK fertilizer bulb yield per plot (t/ha)

Treatments	yield (t/ha)
Cow dung	17.50^{a}
Poultry manure	15.08^{a}
Sheep manure	14.33^{a}
N.P.K	21.94^{a}
Control	5.83^{b}
SE (±)	3.63

Means followed by the same letters in the same column are not statistically significant according to DMRT at (P≤0.05%).

Conclusion

In this study, application of NPK fertilizer had proved to be the best to improve the onion growth and yield components compared to other treatments, while poultry manure can also use as substitute in the absence of NPK Fertilizer. It could be concluded that farmers can be adopt the use of NPK fertilizer for higher bulb production in the sahelian zone..

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