COMPARATIVE EFFECTIVENESS OF MANURE AND NPK (15:15:15) FERTILISER ON THE GROWTH AND YIELD OF PEPPER (*Capsicum annuum*L.)

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ABSTRACT
This study evaluated the comparative effectiveness of manure (poultry droppings) and NPK (15:15:15) fertiliser on the growth and yield of pepper (*Capsicum annuum*) during the dry season of 2018. The pot experiment was conducted at Faculty of Agriculture Complex, Kogi State University, Anyigba. The pot experiment was a Completely Randomised Design (CRD) with five treatments and four replicatesunder irrigation conditions. The treatments were Control, 3 t ha^{-1} poultry droppings, 30kg ha^{-1} NPK, 3 t ha^{-1} poultry droppings + 30kg ha^{-1} NPK, 4 t ha^{-1} poultry droppings + 30 kgha^{-1} NPK. The following growth and yield parameters were obtained: average numbers of leaves, plant height, stem girth, number of edible fruits and weight. Results of the research show that the amendments significantly ($P \leq 0.05$) influenced plant height, stem girth and yield parameters. It was also observed that all growth and yield characteristics increased with increased levels of nutrient application. The yield parameters were high in plots treated with high-rate combinations of organic and inorganic fertiliser and significantly ($P \leq 0.05$)different from either sole organic or inorganic nutrient sources or control. The results suggest that application of 4 t ha^{-1} poultry droppings + 30 kgha^{-1} NPK fertiliser is recommended for pepper (*Capsicum annuum*) in Anyigba.

Keywords: Poultry Droppings, Soil Fertility, Plant Height, Stem Girth, Treatment.

INTRODUCTION

Bell pepper (*Capsicum annuum*L.) is an important fruit vegetable in the tropics and the world second most important vegetable after tomatoes,(Olaniyi and Ojetayo, 2010). Pepper has increased in popularity, value and importance over a long period, thus making it an indispensable part of the daily diet for millions of Nigerians.

Nigeria produces 50% of the total production of pepper in Africa, (FAO 2008). The bulk production of pepper is in the drier savannah zones and derived savannah areas of South-western Nigeria, (Anon 2006). Pepper is an annual herb or shrub with many branches, belonging to the *Solanaceae* family. The unripe fruits are green or purple in colour but turn red, orange, yellow or brown in colour when ripe, (Udoh*et al.* 2005). Pepper is normally used as spices in the preparation of soup and stews when cooked with tomatoes and onions. It can also be used as condiments and exclusively in processed meat, colouring certain food preparation and also for medicinal purposes, (Alabi 2006).

However, there is a need to increase production as indicated by the demand for pepper throughout the year but this has been hampered as a result of low fertility of the tropical soils. In order to obtain high yield of pepper, there is need to augment the nutrient status of the soil to meet the crop needs and thereby maintaining the fertility of the soil. Organic material such as poultry manure, animal waste, compost and the use of inorganic fertilisers are ways of increasing the nutrient status of soil, (Dauda*et al*. 2008). In the past, inorganic fertiliser was advocated for crop production to ameliorate the low fertility of soils in the tropics. Despite the effectiveness of these chemical fertilisers, their uses have been characterised by several problems such as inadequate supply or even availability of fertiliser at the time of need, adulteration and high cost (Adeyinka&Agbede 2009). Also, cultivation with persistent application of mineral fertiliser increases soil acidity and soil physical degradation which may reduce crop yield (Ojeniyi*et al.* 2007).

The use of organic manure cannot be overemphasised because of its usefulness in the improvement of physical conditions of soil, microbial properties and the nutrients it supplies for soil productivity and also eliminating pollution of underground water.Organic manure is a storehouse for plant nutrients and a major contributor to cation exchange capacity (Akinfayose&Akanbi 2005).Pepper can be grown from the sea-levels of 3,000 m in the tropics preferably with rainfall of 600–1,200 mm. It is sensitive to waterlogging and excessive rain, (Udoh*et al.* 2005), and thrives best in a relatively warm climate with a temperature range of 18–27ºCand a sandy-loam soil is ideal for growth of pepper.

Pepper farmers in Anyigba apply inorganic fertilisers without knowing the optimum level that will minimise the cost of production, maximise yield, reduce wastage of manure and reduce soil toxicity. The extent farmers depend on inorganic fertilisers is affected and hampered by the inaccessibility of the right type of inorganic fertilisers, high cost, and lack of technical know-how. This has diverted the attention of soil scientists towards making use of organic materials (both organic manures as well as organic wastes) for improving the physical properties of soils that allow profitable crop production (Vijaya&Seethalashmi 2011). Knowing the optimum rate of manure and fertiliser application for pepper production could provide better agronomic and economic benefits to farmers. Thus, this research aims at comparing the effectiveness of organic (poultry manure) and inorganic fertiliser (NPK 15:15:15) on the growth and yield of pepper (*Capsicum annuum*).

The study was carried out to find out the effect of organic manure (poultry manure) and inorganic manure on the farm, which gives the optimum agronomic properties of pepper. The continuous use of inorganic fertiliser over a period of time leads to accumulation of nutrient which makes no difference in yield due to additional use of inorganic fertiliser. This, in turn, leads to decline in yield of the crop, increase soil toxicity and this together with the soaring cost of inorganic fertiliser makes it inevitable to search for an alternative. There is also a high quest for organic food the world over. This necessitates the use of organic (poultry manure) and NPK for optimum growth and yield.

The objective of this study is to compare the effectiveness of organic (poultry droppings) andinorganic fertiliser (NPK 15:15:15) on the growth and yield of pepper (*Capsicum annum*).

MATERIALS AND METHODS

Location of the Experiment

The pot experiment was conducted at the Faculty of Agriculture Complex, Kogi State University Anyigba, Kogi State (Lat. 7º 29' N and Long. 7º 11' E) in the Guinea SavannaZone during the dry season of 2018. Kogi State has a bimodal rainfall with peak patterns occurring in July and September. The mean annual rainfall is 1,808 mm at Anyigba (Amhakhian*et al.* 2012). The temperature shows some variation throughout the year. Average monthly temperature varies from 17ºC to 36.2ºC Relative humidity is moderately high and varies from an average of 65-85% throughout the year (Amhakhian*et al.* 2012), with a clear distinctive wet and dry season. There is usually a short dry spell in August which is referred to as "August Break". While the dry season commences in November through early March.

Planting materials:

Seedlings were grown in seedbed at Faculty of Agriculture Complex, Kogi State University. The seeds werecollected from Agricultural Development Project (ADP), Anyigba branch. Seedlings were transplanted into the pots after three weeks.

A composite soil was used, these were collected from the top soil samples (0-20 cm) around the University. The soil was sieved through 4 mm sieve and 10 kg soil was weighed for each of 20 plastic pots.Pots were randomly arranged at a spacing of 50 cm × 50 cm. Poultry droppings was incorporated into the soil according to treatments two weeks before transplanting in order to equilibrate properly with the soil. One seedling was transplanted per pot, giving a total of 20 seedlings in the pot experiment

Soil Analysis:

physical and chemical analyses ofsoil samples were done prior to application of experimental treatments. Particle size distribution was determined according to Gee &Bauder (1985) and textural classes of the soil was determined using textural triangle (Bouyoucos 1951). Total nitrogen (N)was determined using the Kjeldahl digestion method (Bremner&Mulvaney 1982).Available phosphorus (P) was determined using Bray & Kurtz (1945) extraction procedure.The organic carbon was determined using the Walkley-Black wet oxidation method,(Walkley& Black 1934). The Exchangeable bases (Ca, Mg, K, Na) were extracted with 1 MNH_4OAc buffered at pH 7.0 (Thomas 1982).The pH of the soil solution was measured by pH meter (Maclean 1982). Electrical conductivity was determined using the pH electron (Chen 1998).Exchangeable Acidity (Al^{3+} and H^+) were extracted with KCl(Thomas 1982).Percentage Base Saturationwas calculated by multiplying the quotient of Total Exchangeable Bases to Effective Cation Exchangeable Capacity by 100.

Poultry Dropping Analysis:

N, P, K, Ca, Mg, Na, and Organic carbon contentof poultry dropping werealso analyzed follow the procedures outlined for soil analysis.

Treatments and Experimental Design

A completely Randomiseddesign (CRD) was used with four replications. five different levels of inorganic fertilisers and poultry droppings(PD) wereused; and there were Control (No application of fertiliser, T_1), 3 t ha^{-1}PD (T_2), 30kg ha^{-1}NPK (T_3), 3 t ha^{-1}PD + 30 $kgha^{-1}$NPK (T_4) and 4 t ha^{-1}PD + 30 $kgha^{-1}$NPKT_5.

Poultry dropping was incorporated into the soil according to treatments and watered two weeks before transplanting of *Capsiumaannuum*in order to equilibrate properly with the soil. Then seedlings were transplanted one per pot, giving a total of 20 seedlings in the pot experiment.

NPK 15:15:15 was applied one week after transplanting using the ring method of fertiliser application at 2 cm away from the stand. Manual weeding was carried out throughout the period of the experiment by hand pulling.

The plant's growth parameters were collected at one (1) week interval until fruits were mature for harvesting.Data were collected on the following: number of leaveswere counted per pot, stem girth was determined by the use of veneer caliper multiplied by π, plant height, a measuring tape was used to measure the height of plant from the ground to the tip of the plant, the average yield components data were recorded; number of fruits per pot, weight of fruits per pot (g).

Statistical Analysis of Data:

The agronomic traits and yield of pepper were subjected to statistical analysis. Mean comparison was carried out using LSD and significant mean effects separated using Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Physical-Chemical Analyses of Soil and Poultry Droppings

The chemical and physical properties of soil used in the experiment are presented in Table 1. Available P was 10.71 mgkg^{-1} and was below the critical value of 15 mgkg^{-1} in soil (Enwezor*et al*. 1981) but good for the cultivation of vegetable crops. It was also noted that the soil had low pH values of 5.1 in water which means that the soil was acidic for the experiment. This pH value favours nutrient availability to crop plants since pH of most agricultural soils in Nigeria has been reported to range from 4.0–6.5 (Hartly 1988). Ec value was moderate with value of 0.25 dSm^{-1}. This value falls within the range of low salinity which agrees with USDA-SCS (1974). Organic carbon content was 0.34 gkg^{-1} which was below the critical value of 3.4 gkg^{-1} (Kemper & Koch 1986). Total N was 0.02 but was below the critical value of 0.15 g kg^{-1} (Sobulo&Osiname 1981). The values of organic carbon and total nitrogen reflect the amount of organic matter in soil considering the fact that these soils are below the critical value for optimum crop production. The low amounts of organic matter and total N contents could lead to low water retention capacity of the soil, yellowing of leaves and retarded plant growth.

Exchangeable Mg content was 2.63% but was above the critical value of 0.4% (Anon 1990). The Ca content was 4.04% and was above the critical value of 2.0% (Anon 1990). Potassium content was 2.17% and was above the critical value of 2.0% (Anon 1990). High amounts of Mg, Ca, and K are expected to help in the stabilisation of all membranes and cell wall, interaction among plant hormones and in photosynthesis as Mg serves as a component of chlorophyll. The results of the exchangeable acidity were 1.27%. This implies that the exchangeable acidity value was less than 4% in the soil. This value reflects the moderate acidity values of the soil. The ECEC was 11.28%. It had been suggested that the ECEC of a soil is a permanent characteristic and directly related to the soil texture (FAO 2000). The higher the clay content of any soil, the higher the ECEC of the soil. In general, the ECEC of most soils increases with an increase in soil pH (FAO 2000). The particle size analysis revealed that the soil was sandy loam for experiment.

Table 1.Initial physico-chemical properties of soil used in the experiment

Properties	Value
Sand (gkg^{-1})	**78.80**
Silt (gkg^{-1})	6.56
Clay (gkg^{-1})	14.64
Textural Class	Sandy loam
pH (H_2O)	5.1
Available P (mgkg^{-1})	10.71
EC dSm^{-1}	0.25
Organic Carbon (gkg^{-1})	0.34
Total nitrogen (gkg^{-1})	0.02
Exchangeable Cations	
Potassium (%)	2.17
Calcium (%)	4.04
Magnesium (%)	2.63
Sodium (%)	1.17
TEB (%)	10.01
EA (%)	1.27
ECEC (%)	11.28

From Table 2, the poultry droppings (organic nutrient source) used for the experiment, the contents of N, P, K, Ca, and Mg are important nutrients required for plant growth, development and yield formation. Therefore,it should be expected that poultry manure application will increase the fertility status of soil thereby improving the chemical and physical properties of any soil.

Table 2.Chemical Composition of poultry droppings used in the experiment.

Chemical	Value (%)
Nitrogen	2.13
Phosphorus	3.75
Potassium	3.04
Calcium	6.12
Magnesium	3.11

Effects of poultry droppings and NPK fertiliser on plant height.

From Table 3, at two weeks after transplanting (2 WAT), the application of 4 tha^{-1} poultry droppings +30 kgha^{-1}NPK (T_5) gave best plant height of 14.80 cm which was not significantly ($P \leq 0.05$) different from other treatments and control.

At 4 WAT, application of 3 t/ha poultry droppings +30 kgha^{-1}NPK (T_4) gave the best plant height of 20.70 cm which was not significantly ($P \leq 0.05$) different from 18.88 and 18.63 cm obtained from 30 kgha^{-1}NPK (T_3) and 4 tha^{-1} poultry droppings +30 kgha^{-1}NPK (T_5), respectively but was significantly ($P \leq 0.05$) higher than 17.50 and 13.0 cm obtained from 3 tha^{-1} poultry droppings (T_2) and control (T_1), respectively.

At 6 WAT, application of 4 tha^{-1} pm + 30 kgha^{-1}NPK (T_5) gave the best plant height of 27.83 cm which was not significantly ($P \leq 0.05$)higher than 27.73 and 25.90 cm obtained from 3 t/ha poultry manure +30 kgha^{-1}NPK (T_4) and 30 kgha^{-1}NPK (T_3), respectively, but was significantly ($P \leq 0.05$) different from 21.08 and 18.60 cm obtained from 3 tha^{-1} poultry droppings (T_2) and control (T_1), respectively.

At 8 WAT, application of 3 tha^{-1} poultry droppings +30 kgha^{-1}NPK (T_4) gave the best plant height of 38.10 which was not significantly ($P \leq 0.05$) different from30 kgha^{-1}NPK (T_3) with plant height of 30.95 cm but was significantly ($P \leq 0.05$) higher than 30.95, 29.53 and 28.45 cm obtained from T_2, T_5 and T_1respectively. However, 30.95 and 29.53 cm obtained from T_1 and T_5 were not significantly ($P \leq 0.05$) different from each other but significantly different from 28.45 cm obtained from the control (T_1).

Table 3.Effects of poultry droppings and NPK fertiliser on plant height (cm).

Treatments	2WAT	4WAT	6WAT	8WAT
T_1	10.30	13.00^{c}	18.60^{b}	28.45^{c}
T_2	13.08	17.50^{b}	21.08^{b}	30.95^{bc}
T_3	14.70	18.88^{ab}	25.90^{a}	36.40^{ab}
T_4	14.43	20.70^{a}	27.73^{a}	38.10^{a}
T_5	14.80	18.63^{ab}	27.83^{a}	29.53^{bc}
LSD($P \leq 0.05$)	4.12	3.06	4.10	6.91
CV %	14.09	16.29	17.21	13.16

Means followed by same letter(s) in a column are not significantly different ($P \leq 0.05$)
KEY: T_1 = Control, T_2 = 3 tha^{-1} poultry droppings, T_3= 30 kgha^{-1}NPK, T_4 = 3 tha^{-1} poultry droppings + 30 kgha^{-1}NPK, T_5 = 4 tha^{-1} poultry droppings + 30 kgha^{-1} NPK, LSD = Least Significant Difference.

Effects of poultry droppings and NPK fertiliser on Number of Leaves.

During the period of the statistical analysis of growth parameters, it was discovered that the various treatments had no significant ($P \leq 0.05$) effect on the number of leaves at 2, 4, 6 and 8 WAT. However, the highest number of leaves were recorded in the application of 4 tha^{-1} pm + 30 kgha^{-1}NPK (T_5) while the lowest in the control (T_1) in all the weeks after transplanting (WAT).

Table 4.Effects of poultry droppings and NPK fertiliser on Number of Leaves.

Treatments	2WAT	4WAT	6WAT	8WAT
T_1	8.00	14.75	35.25	55.75
T_2	9.00	16.00	51.00	82.25
T_3	9.50	16.50	49.50	73.75
T_4	9.50	15.75	53.25	101.25
T_5	10.75	17.25	70.75	103.00
LSD ($P \leq 0.05$)	3.13	3.51	40.05	68.05
CV %	10.93	5.95	17.05	23.75

Means followed by same letter(s) in a column are not significantly different ($P \leq 0.05$)
KEY: T_1 = Control, T_2 = 3 tha^{-1} poultry droppings, T_3= 30 kgha^{-1}NPK, T_4 = 3 tha^{-1} poultry droppings + 30 kgha^{-1}NPK, T_5 = 4 tha^{-1} poultry droppings + 30 kgha^{-1} NPK, LSD = Least Significant Difference.

Effects of poultry droppings and NPK fertiliser on Plant Stem Girth.

During the period of statistical analysis, it was discovered that the various treatments had no significant ($P \leq 0.05$) effect on the plant stem girth at 2, 4, and 8 WAT. At 6 WAT, application of T_2 and T_4 gave the best stem girth of 1.58 mm which was not significantly ($P \leq 0.05$) different from 1.55 and 1.53 mm obtained from T_5 and T_3 respectively, but was significantly ($P \leq 0.05$) higher than 1.33 mm obtained from control (T_1).

Table 5.Effects of poultry droppings and NPK fertiliser on Plant Stem Girth (mm).

Treatments	2WAT	4WAT	6WAT	8WAT
T1	0.60	0.78	1.33^b	1.60
T2	0.65	0.83	1.58^a	1.68
T3	0.60	0.73	1.53^a	1.78
T4	0.63	0.78	1.58^a	1.83
T5	0.63	0.73	1.55^a	1.73
LSD ($P \leq 0.05$)	0.51	0.74	0.13	1.52
CV %	3.49	5.43	6.95	5.11

Means followed by same letter(s) in a column are not significantly different ($P \leq 0.05$)
KEY: T_1 = Control, T_2 = 3 tha^{-1} poultry droppings, T_3= 30 kgha^{-1}NPK, T_4 = 3 tha^{-1} poultry droppings + 30 kgha^{-1}NPK, T_5 = 4 tha^{-1} poultry droppings + 30 kgha^{-1} NPK, LSD = Least Significant Difference.

Effects of poultry droppings and NPK fertiliser on Number and weight of Edible Fruits per Pot

From Table 6, application T_5 gave the highest number of edible fruits of 28.5 which was not significantly ($P \leq 0.05$) different from 25.8 and 24.5 obtained from $T_2$and T_4, respectively but was significantly ($P \leq 0.05$) higher than 14.5 and 12.0 obtained from T_3 and T_1, respectively. However, 14.5 number of edible fruits obtained from the application of T_3 was not significantly ($P \leq 0.05$) different from 12.0 obtained from the application of T_1.

Application T_5 gave the highest weight of edible fruits of 182.39 mm which was not significantly ($P \leq 0.05$) different from 161.34 and 156.69 mm obtained from $T_2$and T_4, respectively but was significantly ($P \leq 0.05$) higher than 108.35 and 80.11 mm obtained from T_3 and T_1, respectively. However, 108.35 weight of edible fruits obtained from the application of T_3 was not significantly ($P \leq 0.05$) different from 80.11 obtained from the application of T_1.

Table 6.Effects of poultry droppings and NPK fertiliser on average yield and yield components Pepper (*Capsicum annuum*L.).

Treatments	Number of Edible fruits	Fruits weight (g)
T_1	12^b	80.11^b
T_2	25.8^a	161.34^a
T_3	14.5^b	108.35^b
T_4	24.5^a	156.69^a
T_5	28.5^a	182.39^a
LSD($P \leq 0.05$)	6.8	46.20
CV %	34.8	30.57

Means followed by same letter(s) in a column are not significantly different ($P \leq 0.05$)
KEY: T_1 = Control, T_2 = 3 tha^{-1} poultry droppings, T_3= 30 kgha^{-1}NPK, T_4 = 3 tha^{-1} poultry droppings + 30 kgha^{-1}NPK, T_5 = 4 tha^{-1} poultry droppings + 30 kgha^{-1} NPK, LSD = Least Significant Difference.

DISCUSSION

Effects ofpoultry droppings and NPK fertiliser on growth and yield of pepper (*Capsicum annuum*).

From the results of the study, it was observed that number of leaves was not significantly influenced by increases in rates of manure and fertiliser applications in the experiment. The poor performance of crops in the controlmay be due to the low fertility status of the soil. When the soil is low in nutrients, it results in reduced performance of the crops. It was also observed that plant number of leaves increased with increased application of all nutrient sources(organic, inorganic and a combination of both)with combination of organic and inorganicfertiliser excelling above the other singular nutrient sources. These findings are similar to those of Akande*et al.* (2010), who foundthat the use of both organic and inorganic nutrient sources gave better vegetative growth in okra.

When the soil is deficient of N, it ultimately limits the production of chlorophyll and protein molecules which are essential for the production of new cells, hence reducing plant growth. The poor growth performance of fluted pumpkin under the control treatments was consistent with the fact that the soil was very low in nutrient contents. This resulted in the low values of stem girth in the control plots. Stem girth significantly increased with increased application of all the nutrient sources. Combined application of poultry droppings and NPK fertiliser generally increased stem girth in the experiment over either sole organic or inorganic. This might be due to the fact that the combination enhanced adequate uptake of available nutrients. The inorganic fraction of the combination releases its nutrients early enough for plant use while the organic portion could stimulate activities of microbes and prevent loss of nutrients. This was in line with the observation of Kawthar*et al*. (2005). Plants with thicker stem and girth are less likely to lodge during fruits production as a result of fruit carriage. Adeniyan&Ojeniyi (2003) stated that for healthy stem development, plants require adequate amounts of potassium and phosphorus. These nutrients are also available in poultry droppings and are released slowly throughout the growing season. Makinde*etal*. (2007) was also of the opinion that a mix of both organic and inorganic nutrient sources gives better growth performance for parameters such as plant height and stem girth.

In the research, it was observed that all yield characteristics (number and weight of fruits) increased with increased levels of nutrient application. The number of fruits per plant was lowest in the control and used the inherent nutrients available in the soil. The highest numbers of fruits were observed in pots treated with the combination of organic and inorganic sources and excelling over the inorganic and organic alone. It is worthy of note that with the increase in number of leaves, plants are more able to receive greater amounts of radiation which in turn increases the photosynthetic rate of the plant, thus, resulting in a greater quantity of fruits. This is in line with the observation of Dauda*etal.* (2008) who worked on melon and Aliyu (2003) who worked on pepper.

It was also observed that the combination of organic and inorganic sources of nutrients gave the highest weight of fruits and was significantly different from the control. This resulted in the development of the crop and its photosynthetic abilities and thereby enhancing assimilate production and accumulation. Assimilates produced during photosynthesis were moved to various sinks which resulted in the increase in the number and weight of fruits. This was in agreement with the findings of Eifediyi&Remison (2009).

The significant performance of pepper over the control in growth and yield parameters could be due to the fact that poultry droppingsin combination with NPK fertiliser contained essential nutrient elements associated with high photosynthetic activities and this promoted root and vegetative growth (Jahn*et al.* 2004, Dauda*et al.* 2008). The increase in average number and weight of fruits could be attributed to the ability of combined application of organic and inorganic fertiliser to promote vigorous growth, increase meristematic and physiological activities in the plants due to supply of plant nutrients and improvement in the soil properties, thereby, resulting in the synthesis of more photosynthetic apparatus which are used in producing fruits.

CONCLUSION

From the result obtained from the experiment;combined use of poultry manure and NPK fertiliser was superior to sole application of organic fertiliser (poultry droppings) or inorganic fertiliser (NPK 15:15:15) in improving growth and yield of Bell Pepper (*Capsicum annuum*). It was observed that the combined application of organic and inorganic fertiliser in the cultivation of Bell Pepper (*Capsicum annuum*) had a significant $P \leq 0.05$ effect on the plant height, at 4, 6 and 8 weeks after transplanting. The highest plant height of 38.10cm was recorded at eight weeks after transplanting in treatment T_4 (3 t ha^{-1} pm + 30 kg ha^{-1} NPK).

It was discovered that the various treatments had no significant ($P \leq 0.05$) effect on the number of leaves at 2, 4, 6 and 8 WAT. However, the highest number of leaves were recorded in the application of 4 tha^{-1} pm + 30 $kgha^{-1}$NPK (T_5) while the lowest in the control (T_1) in all the weeks after transplanting (WAT).

The stem girth was only significant ($P \leq 0.05$) at 6 weeks after transplanting with the application of T_4 (3tha^{-1} pm + 30$kgha^{-1}$ NPK). It was discovered that the various treatments had no significant ($P \leq 0.05$) effect on the plant stem girth at 2, 4, and 8 WAT. However, the highest stem girth was observed in treatment T_4 while the lowest in the control (T_1).

The number and weight of fruits were significant($P \leq 0.05$) during the period of the experiment with treatment T_5 (4tha^{-1} pm + 30 kg ha^{-1} NPK) yielding the highest and best number and weight of fruits. The control plot had the lowest values for all the growth and yield parameters.

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