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# Yield and nutrient quality of peanut (*Arachis hypogaea* L.) as influenced by mudpress and vermicast as organic fertilizers

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**Key words:** Mudpress, Vermicast, Peanut, Organic fertilizer, Yield

**Abstract**

The study was conducted to evaluate the influenced of organic fertilizer using vermicast and mudpress on the yield and nutrient quality (protein and fat) of peanut from July 18, 2018 to October 20, 2018 at Cagayan State University, Lal-lo, Cagayan, Philippines. The different treatment used were: $T_1$ –10-40-0 NPK (Recommended Rate of fertilizer based on soil analysis), $T_2$–5-20-0 NPK (50% RR) + 2300kg mudpress/hectare+ 650kg vermicast/hectare, $T_3$ – 7.5-30-0 NPK (75% RR) + 2300kg mudpress/ha.+ 650kg vermicast/ha., $T_4$ – 2300kg mudpress/ hectare + 650kg vermicast/hectare, $T_5$ – 5-20-0 NPK (50% RR) + 2300kg mudpress/ hectare, $T_6$ – 75% RR + 2300kg mudpress/hectare, $T_7$- 7.5-30-0 NPK (75% RR) + 650kg vermicast/hectare, $T_8$–5-20-0 NPK (50% RR) + 650kg vermicast/hectare, $T_9$ – 2300kg mudpress/hectare and $T_{10}$– 650kg vermicast/ hectare. The experiment was laid out in Randomized Complete Block Design. Based from the result of the study, Treatment $_1$, Treatment $_2$ and Treatment $_3$ produced the highest pod yield of 2.69 tons per hectare, and 2.68 tons per hectare with a Return on Investment of 628.64%., 569.30% and 561.69%. The highest protein content of the peanut seeds was obtained in Treatment $_2$ and Treatment $_1$ with a mean of 33.11% and 32.97% while the lowest fat content was produced in Treatment $_9$ (vermicast) with a mean of 25.74%. Therefore, Treatment $_1$, Treatment $_2$, and Treatment $_3$ are recommended for the farmers to improve their yield and nutrient quality of peanut.

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**Introduction**

Peanut is beneficial as its processing yield several products that have the important industrial applications (Bressani *et al.,* 2004) resulting in its increased demand. There are several factors that play dominant role in enhancing its yield; proper and balance fertilization is one of the important factors in increasing the yield and quality of the crop. Nowadays, peanut dependent on the usage of inorganic fertilizer leading to the depletion of available nutrients and organic matter. Moreover, inorganic fertilizer cost going up causing significant increase in production cost.

On the other hand, Cagayan Valley is one of the top producers of peanut in the country. Because of insufficient production, local production in the Philippines has not been sufficient to meet the increasing demand for domestic needs, necessitating imports. From 1987 to 1996, there was an increase of over 341% on peanut imports (Galvez *et al.*, 2002). In 2010, the country's peanut supply amounted to 60,000 to 70,000 tons, with over 50% of this supply coming from imported sources. While the production areas for peanut in the country planted to peanut have slowly increased in 2011 after declining in the 1990s (BAS, 2011), various challenges have cropped up, such as the presence of cheap imports, low interest at present to diversify into cereal production, weak link between local production and processors in urban areas, and relatively low seed multiplication rates that limit rapid expansion (Enicola, 2009). Hence, due to chemical fertilizer used in peanut production, the soil becomes acidic which lead to a low yield, and peanut is required a friable soil for better growth and development of the crop. In this regard, organic fertilizer improves the soil carbon sequestration which leads to become the soil friable and help to hold water capacity and improve the soil pH. Furthermore, recycling of organic wastes of animal and plant origin is being advocated, along with chemical fertilizers, as a part of integrated plant nutrition management system. Use by- products in agriculture plays a great role in recycling essential plant nutrients, sustain oil security as well as protect the environment from unwanted hazards. They also reduce toxicity of some heavy metals resulting increase yield of crops. One of the by-products is mudpress came from a sugar cane waste that serve as a good source of organic matter (Bokhtiar *et al.*, 2001), an alternate source of crop nutrients and soil ameliorant (Razzaq, 2001).

It is also known as filter cake or filter mud, and used as fertilizer in soils (Barry *et al.*, 2001). It contains much of the colloidal organic matter anions that precipitate during clarification, as well as certain non-sugar occluded in these precipitates. It is the residue obtained from sedimentation of the suspended materials such as fiber, sugar, wax, ash, soil and other particles from the cane juice. The organic fraction of mudpress is 15-30% fiber, 5-15% crude protein, 5-15% sugar, 5-15% crude wax and fats and 10-20% ash comprising oxides of Si, Ca, P, Mg and K (Partha and Sivasubramanian, 2006). This organic matter is highly soluble and readily available to the microbial activity and to the soil (Rangaraj *et al.*, 2007; Gaikwad *et al.,* 1996).

Vermicomposts have been shown to increase plant growth and crop yields in managed and natural ecosystems (Pascal *et al.* 2010; Gutiérrez-Miceli *et al.* 2007; Edwards 2004; Arancon *et al.* 2003). Organic wastes converted to VC have beneficial effects on plant growth and development that are unrelated to increases observed only from soil nutrient transformation and availability. Vermicomposts improve seed germination, seedling vigor, and plant productivity more than what would have been possible from inorganic mineral nutrient sources, while using as little as 10–40% of the total plant rooting volume (Alsina *et al.* 2013; Gopalakrishnan *et al.* 2012; Subler *et al.* 1998;). These increases in plant productivity have been attributed to improved soil structure and soil microbial populations with higher levels of activity and greater production of biological metabolites, such as plant growth regulators (Roberts *et al.* 2007; Atiyeh *et al.* 2002; Canellas *et al.* 2002; Pascual *et al.* 1997). Therefore, this study was conducted to evaluate the influence of organic fertilizer using vermicast and mudpress on the yield and nutrient quality in terms of protein and fat content and assess the profitability of peanut under Cagayan State University - Lal-lo, Cagayan condition.

## Materials and methods

*a) Procurement of Seeds*

The seeds of peanut (NSIC Pn 09) were secured at Cagayan Valley Research Center, Ilagan, Isabela.

*b) Soil Sampling and Analysis*

Soil samples were collected before land preparation and after harvesting. This was air dried, pulverized and inert matter was removed. A One kilogram composite soil sample was brought at the Department of Agriculture-Integrated Laboratory Division, Regional Soils Laboratory, Tuguegarao City. The result of the analysis in terms of NPK, and pH of the soil was the basis for fertilizer recommendation. After harvesting, a one kilogram soil sample was again collected into individual plot to see the effects of the different treatments applied in the area. This was air dried; pulverized and inert matter was removed and brought at the Department of Agriculture-Integrated Laboratory Division, Regional Soils Laboratory, Tuguegarao City for soil analysis.

*c) Hauling of Mudpress*

Decomposed sugarcane mudpress was hauled at the dump site area of Ecofuel Land Development Corporation, San Mariano, Isabela.

*d) Mudpress and Vermicast Sample Analysis*

Before the start of the study, a one kilogram of air dried and pulverized mudpress and vermicast were submitted to the Department of Agriculture-Integrated Laboratory Division, Regional Soils Laboratory, Tuguegarao City. The result of the analysis in terms of NPK, and pH of the soil was the basis for the recommended application.

*e) Experimental Layout and Design*

After the land preparation, an area of 646 square meters was divided into three blocks, each block measuring 5.0 meters by 38 meters with an alleyway of one meter between blocks. Each block was further subdivided into ten plots, each plot measuring 3.0 meters by 5 meters with an alleyway half meter between plots. The treatments were arranged following the procedure in the form of Randomized Complete Block Design (RCBD).

*f) Experimental Treatments*

The following treatments used in the study are the following: $T_1$ – 10–40–0kg NPK ha$^{-1}$ (Recommended Rate based on soil analysis), $T_2$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg mudpress ha$^{-1}$+ 650kg vermicast ha$^{-1}$, $T_3$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg mudpress ha$^{-1}$+ 650kg vermicast ha$^{-1}$, $T_4$ – 2300kg mudpress ha$^{-1}$ + 650kg vermicast ha$^{-1}$, $T_5$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg mudpress ha$^{-1}$, $T_6$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg mudpress ha$^{-1}$, $T_7$ –7.5 – 30–0kg NPK ha$^{-1}$ (75% RR) + 650kg vermicast ha$^{-1}$, $T_8$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg vermicast ha$^{-1}$, $T_9$ – 2300kg mudpress ha$^{-1}$, $T_{10}$ – 650kg vermicast ha$^{-1}$.

*g) Land Preparation*

The land was initially plowed and harrowed using a 4 wheel drive tractor. The area was left idle for two weeks to allow weeds to decay and allow weed seeds to germinate before the final plowing. Final harrowing was done using the rotavator before planting until the soil was thoroughly pulverized.

*h) Seed Testing*

At least 20 seeds were test using a ragdoll method to make sure the germination percentage of the seeds before planting.

*i) Planting and Thinning*

ii) The rhizobia at the rate of 200 grams were mixed to five kilograms of seeds following the slurry method. The seeds were wet with enough water and the inocculant was thoroughly mixed and set aside until the seeds are dried and planted immediately after drying. The seeds were planted as soon as the furrows are made at 25cm between hills and 50cm between rows. Planting was done manually using drill method at four seeds per hill but thinning was done one week after seed emergence leaving two plants per hill.

*j) Application of Inorganic and Organic Fertilizers*

Inorganic fertilizer at the rate of 10–40–0 NPK per hectare based on soil analysis was used as fertilizer reference for the study. The mudpress and vermicast based on the imposed treatments were applied evenly along the furrows as basal. The amount of inorganic fertilizer was followed on their corresponding plots.

*k) Care and Management*

*Cultivation and Weeding*. Hilling-up was done 15 days after planting to prevent the plants from excessive moisture and to control weeds. *Crop Protection*. The occurrence of insect pests was controlled by spraying bio-pesticide. *Irrigation*. Watering of the plants was done as the need arises.

*l) Harvesting*

Sample plants were harvested manually. Care was done to avoid dropping of pods.

*m) Post-Production Practices: 1.) Stripping/ Threshing.* Strippimg was done immediately after harvesting. Picking was done in such a way that the peduncle does not go with the pod. 2.) Drying. After stripping, the harvested peanut was sundried until the 14% moisture content was attained. 3.) Shelling. The harvested peanut were shelled carefully to avoid scratching, splitting and rupturing of the seed coat, breaking of the cotyledon, or separating one or both of the cotyledons from the embryonic axis. 4.) Sorting. After shelling, the peanut was cleaned and sorted manually into reject, broken whole nut and unshelled nut. The common practice to winnow peanut by using circular bamboo tray "bilao" and hand pick the nuts. Substandard kernels and other impurities are manually sorted from good kernels done by separating the split, damaged, moldy and other defective kernels.

*n) Data Gathered*

Physical Properties of the Soil. 1.) pH and N P K Content of the Soil before after Harvest. Composite soil sample was randomly collected before land preparation and one kilogram of soil was collected for every plot after harvest for the NPK and pH content of the soil. The composite soil samples were brought to the Regional Soil Laboratory, Tuguegarao City, Cagayan for analysis. 2.) Bulk Density. The bulk density of the soil was taken before land preparation and the bulk density of every plot was detemined after harvest. The soil samples were collected through core sampling technique. The bulk density of the soil was computed following the formula (Miller and Donahue, 1990):

$$\text{Bulk Density } (g/cm^3) = \frac{\text{Mass of dry soil (dry weight of soil sample with tare – tare weight)}}{\text{Fresh Soil Volume } (cm^3)}$$

Where: Fresh Soil Volume = A cylinder with inside radius $r$ units and height $h$ units has a volume of $V$ cubic units given by $V= \pi r^2 h$

*3. Pore Space or Porosity*

Soil porosity or pore space refers to the volume of soil voids that can be filled by water and/or air. It is inversely related to bulk density. Porosity was calculated as a percentage of the soil volume (PERM Inc., TIPM Laboratory, 2016).

$$\text{Bulk Density Porosity } (\%) = \frac{1 - x\ 100}{\text{Particle Density}}$$

*Growth and Yield Parameters*

*1. Plant Height at 30, 60 and 90 Days after Planting.*

The plant height of the ten representative plants were randomly taken and measured from the base up to the tip of the meristem by using a meter stick at 30, 60, and 90 days after planting.

*2.) Number of Root Nodules*

The number of root nodules was determined at the peak of flowering stage of the plants. Three (3) sample plants from each plot were dug and roots were washed carefully to remove soil particles and organic debris. Nodules were counted and the average of ten plants was computed.

*3.) Number of Leaves per Plant.*

The leaves of three sample plants were counted and recorded at 30, 40,60 and 90 days after planting.

*4.) Leaf Area.*

The mean leaf area of the plant ($cm^2$ $leaf^{-1}$) derived by the sum of the LA of all leaves divided by the number of leaves in each plant. The fully expanded leaf on the main axis of each plant at the second nodal position below the apex were collected for leaf area determination.

*5.) Leaf Area Index.*

This was determined by taking a statistically significant sample of foliage from a plant canopy, measuring the leaf area per sample plot and dividing it by the plot land surface area. This was gathered at the peak of flowering stage of the plants (Breda, 2003). The leaf area index was calculated using the following formula:

$$\text{Leaf area index (LAI)} = \frac{\text{Leaf area per sample plant}}{\text{Ground area (m}^2\text{)}}$$

*6. Total Dry Matter.*

Destructive sampling was done for calculating dry matter accumulation. Three sample plants were taken per plot at 20, 40, 60 and 90 days after planting. Thereafter, the samples were wrapped with foil and placed in an oven at 70°C±5°C after which the samples were weighed using the digital weighing balance.

*7.) Number of Developed and Undeveloped Pods.*

The developed and undeveloped pods per plant were counted and recorded.

*8.) Pod Weight per Plant and Pod Weight from 6 $m^2$ Sampling Area.*

The pods were weighed after drying. The weight of pods per 6 square meters sampling area was used as the basis for the computation of yield per hectare.

*9.) Weight of 100 Seeds.*

The weight of 100 seeds per treatment were weighed and recorded upon harvesting.

*10. Pod Yield per Hectare*

The yield per hectare was computed based on the formula:

$$\text{Yield per Hectare} = \frac{\text{Pod Yield/Sampling Area (kg)}}{\text{Sampling Area (m}^2\text{)}} \times 10{,}000\text{m}^2$$

*Cost and Return Analysis*

Considering various assumptions, this was obtained by dividing net income with cost of production multiplied by 100.

$$\text{ROI (\%)} = \frac{\text{Net Income}}{\text{Total Costs of Production}} \times 100$$

*Protein Quality and Fat Content Analysis*

The seeds samples weighing 250 grams per treatment were brought at the Isabela State University, Echague, Isabela Feed Mill Laboratory for protein and fat analysis.

*Statistical Analysis*

The data collected were analyzed using the Analysis of Variance for Randomized Complete Block Design using the STAR (Statistical Tool for Agricultural Research) software. The treatments with significant result were compared using the Tukey's Honest Significant Difference.

**Results**

*Observation and Discussion of Results*

*General Observation*

*Description of the Soil Used in the Study*

The experimental area is under Bugues soil series which had medium soil texture and composed of 2.27% OM, 6.00 ppm P and 225 ppm K and a pH of 5.78. The initial bulk density of the soil was 2.28 ($g/cm^3$) and porosity was 14.28 percent. Seed Germination and Seedling Emergence. The seeds had 100 percent germination as manifested on their seedling emergence which was observed seven days after sowing. Stand and Vigor of the Crop. The plants showed vigorous growth from vegetative to early reproductive growth however, there was an apparent differences at pod development. The plants applied with inorganic singly or combined with organic fertilizer had dark green color leaves, and vigorous growth despite of the occurrence of Typhoon "Ompong" at 59 days after planting. The signal No. 5 typhoon did not show any adverse effect of the growth and development of the plants in all the treatments. The plants applied with mud press alone showed yellowing of the older leaves at 70 days after planting.

The rest of the treatments showed senescence period at 75 days after planting. Occurrence of Insect Pests and Diseases. Common cutworms (*Spodoptera litura)* was the most common insect pest that ate the leaf margins of the young leaves and shoots and spotted lady beetle *(Coleomegilla maculata)* that damaged the flowers. Pod rot (*Rhizoctonia solani*) was also observed as manifested on punctured pods that damaged the developing seeds. It was also noticed that few plants were infected with stem rot (*Sclerotium rolfsii*) after the heavy rainfall caused by Typhoon "Ompong" and high temperature on the following days. The infected plants were eradicated immediately and also the application of Fungicide was done to minimize the multiplication of this disease.

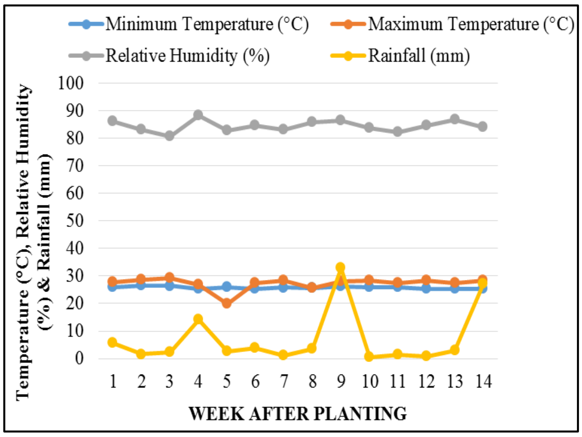


**Fig. 2.** Climatic Data during the Conduct of the Study. Source: Philippine Atmospheric, Geophysical and Astronomical Services Administration, Aparri, Cagayan.

**Table 1.** Bulk Density (g/cm³) and Porosity (%) of the Soil after Harvest of Peanut (NSIC Pn 09) as Influenced by Organic Fertilizers.

| Treatment | Bulk Density (g/cm²) | Porosity (%) |
|---|---|---|
| $T_1$ – 10–40–0kg NPK ha⁻¹ ( RR based on soil analysis) | 1.91 | 28.35 |
| $T_2$ – 5–20–0kg NPK ha⁻¹ (50% RR) + 2300kg Mudpress ha⁻¹ + 650kg Vermicast ha⁻¹ | 1.42 | 46.62 |
| $T_3$ – 7.5–30–0kg NPK ha⁻¹ (75% RR) + 2300kg Mudpress ha⁻¹ + 650kg Vermicast ha⁻¹ | 1.52 | 42.95 |
| $T_4$ – 2300kg Mudpress ha⁻¹ + 650kg Vermicast ha⁻¹ | 1.65 | 38.07 |
| $T_5$ – 5–20–0kg NPK ha⁻¹ (50% RR) + 2300kg Mudpress ha⁻¹ | 1.50 | 43.59 |
| $T_6$ – 7.5–30–0kg NPK ha⁻¹ (75% RR) + 2300kg Mudpress ha⁻¹ | 1.56 | 41.34 |
| $T_7$ – 7.5–30–0kg NPK ha⁻¹ (50% RR) + 650kg Vermicast ha⁻¹ | 1.42 | 46.77 |
| $T_8$ – 5–20–0kg NPK ha⁻¹ (50% RR) + 650kg Vermicast ha⁻¹ | 1.57 | 41.14 |
| $T_9$ – 2300kg Mudpress ha⁻¹ | 1.66 | 37.56 |
| $T_{10}$ – 650kg Vermicast ha⁻¹ | 1.69 | 36.55 |
| ANOVA RESULT | ns | ns |
| C.V. (%) | 10.45 | 15.49 |

ns – not significan

Number of Days to Fifty Percent Flowering. The plants in all the treatments had fifty percent flowering at 30 days after planting. Number of Days to Maturity. All the plants in the differnt treatments reached their maturity stage at 90 days after planting. Climatic Data during the Conduct of the Study. The data on weather parameters such as rainfall (mm), mean maximum and minimum temperature (°C) as well as relative humidity (%) during the conduct of the study was collected from the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Aparri, Cagayan as presented in Fig. 2. The average minimum temperature was ranged from 20.88°C to 25.33°C and the average maximum temperature ranged 25.54°C to 30.22°C. The weekly average relative humidity ranged from 80.58 to 88.14 percent.

The average weekly rainfall ranged from 0.45mm to 32.82mm. Occasional rains had contributed to the growth of the plants during its vegetative stage. The highest rainfall occurred at 9th week after planting where Super Typhoon Ompong (Signal No. 5) devastated the Province of Cagayan but it did not affect the growth and development of the plants. Rain towards the maturity stage did not affect the pod development.

## Discussion

*Physical and Chemical Properties of the Soil after Harvest*

Bulk Density and Porosity of the Soil after Harvest. The bulk density and porosity of the soil after harvest as influenced by the application of organic fertilizer is presented in Table 1.

The bulk density of the soil after harvest obtained insignificant result with mean values ranging from 1.42 to 1.91g/cm³.

The porosity of the soil after harvest also obtained insignificant result with mean values ranging from 28.35 to 46.77 percent. The result showed that the application of mudpress and vermicast did not affect the bulk density and porosity of the soil after harvest.

*pH, Nitrogen, Phosphorus, and Potassium Content of the Soil after Harves*

The soil analysis in terms of pH, nitrogen, phosphorus and potassium content of the soil after harvest is presented in Table 2. The pH of the soil in the different plots after harvest did not show any significant differences with mean values ranging from 5.43 to 6.63. It means that the organic fertilizers applied did not show any adverse effect in the soil.

**Table 2.** pH, Nitrogen (%), Phosphorus (ppm), and Potassium (ppm) Content of the Soil after Harvest of Peanut (NSIC Pn 09) as Influenced by Organic Fertilizer.

| Treatment | pH | N (%) | P (ppm) | K (ppm) |
|---|---|---|---|---|
| $T_1$ – 10–40–0kg NPK ha$^{-1}$ ( RR based on soil analysis) | 6.63 | 2.30c | 3.47b | 183.33b |
| $T_2$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 6.02 | 3.80a | 176.13a | 580.00ab |
| $T_3$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 6.14 | 3.86a | 166.23a | 583.33ab |
| $T_4$ – 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 6.14 | 2.59b | 5.97b | 233.33b |
| $T_5$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ | 5.53 | 3.18a | 29.00b | 463.33ab |
| $T_6$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ | 5.43 | 2.83b | 36.20b | 370.00ab |
| $T_7$ – 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ | 6.18 | 3.98a | 224.73a | 690.00a |
| $T_8$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ | 6.17 | 3.99a | 234.50a | 700.00a |
| $T_9$ – 2300kg Mudpress ha$^{-1}$ | 6.22 | 2.95b | 10.30b | 258.33b |
| $T_{10}$ – 650kg Vermicast ha$^{-1}$ | 6.19 | 2.81b | 35.27b | 231.67b |
| ANOVA RESULT | Ns | ** | ** | ** |
| C.V. (%) | 7.48 | 10.50 | 33.49 | 32.63 |
| HSD | | 0.99 | 90.38 | 410.06 |

Note: Means with common letter/s are not significantly different with each other using Tukey's Honest Significant Difference (HSD) Test.

ns – not significant

** – significant at 1% level

Significant result was obtained in the nitrogen content of the soil after harvest. The plots applied with 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_8$), 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_7$), 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_3$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_2$) and 5––20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ ($T_5$) had the highest nitrogen content of the soil after harvest with mean values 3.99, 3.98, 3.86, 3.80 and 3.18 percent. It was followed by 2300kg Mudpress ha$^{-1}$ ($T_9$), 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_6$), 650kg Vermicast ha$^{-1}$ ($T_{10}$) and 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_4$) with mean values of 2.95, 2.83, 2.81 and 2.59 percent. The least was obtained by 10–40–0kg NPK ha$^{-1}$ (RR based on soil analysis) ($T_1$) with 2.30 percent.

Significant result was obtained in terms of the phosphorus content in the soil after harvest. Highest phosphorus content was observed in plots applied with 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_8$), 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_7$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_2$), 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_3$) with mean values of 234.50, 224.73, 176.13 and 166.23 ppm. The least was observed in the application of 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_6$), 2300kg Mudpress ha$^{-1}$ ($T_{10}$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ ($T_5$), 650kg Vermicast ha$^{-1}$ ($T_9$), 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_4$) and 10–40–0kg NPK ha$^{-1}$ (RR based on soil analysis) ($T_1$) with means ranging from 3.74 to 36.20 ppm.

The potassium content of the soil after harvest varied significantly among treatments. Highest content of potassium were observed in plots applied with 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_8$), 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_7$), 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_3$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_2$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ ($T_5$) and 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_6$) with mean values ranging from 370.00 to 700 ppm. While $T_2$, $T_3$, $T_5$, and $T_6$ had comparable K content with that of the plots applied with 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_4$), 2300kg Mudpress ha$^{-1}$ ($T_9$), 650kg Vermicast ha$^{-1}$ ($T_{10}$), and 10–40–0kg NPK ha$^{-1}$ (RR based on soil analysis) ($T_1$) with means ranging from 183.00 to 258.33 ppm.

*Plant Height (cm) at 30, 60 and 90 Days after Planting*

The height of the plant at 30, 60 and 90 days after planting as influenced by the application of organic fertilizers is presented in Table 3. The height of the plants in the different treatments at 30 days after planting obtained insignificant result with mean values ranging from 33.16 to 45.06 centimeters.

Significant result was observed on the height of the plants at 60 days after planting. Result showed that the application of 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_3$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_2$) and 10–40–0kg NPK ha$^{-1}$ (RR based on soil analysis) ($T_1$) obtained the tallest plants with mean values of 71.56, 71.26 and 71.09 centimeters. It was followed by the application of 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_7$), 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_6$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_8$) and 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ ($T_5$) and 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_4$) with mean values of 65.98, 65.42, 65.08, 65.04 and 62.56 centimeters, respectively. However, it showed that the application of 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_4$) produced comparable heights to the plants applied with 2300kg Mudpress ha$^{-1}$ ($T_9$) and 650kg Vermicast ha$^{-1}$ ($T_{10}$) with mean values of 60.72 and 60.58 centimeters.

The height of plants at 90 days after planting obtained significant result. The height of plants significantly increased from the application of 10–40–0kg NPK ha$^{-1}$ (RR based on soil analysis) ($T_1$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_2$) and 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_3$) with mean values of 85.63, 85.60 and 85.59 centimeters. It was followed by the application of 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_7$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_8$), 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_6$), 5–20 –0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ ($T_5$), and 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_4$) with mean values of 78.54, 78.47, 78.27, 78.21 and 76.92 centimeters, respectively. However, the latter obtained comparable heights from the plants applied with 650kg Vermicast ha$^{-1}$ ($T_{10}$) and 2300kg Mudpress ha$^{-1}$ ($T_9$) with mean values of 73.40 and 73.33 centimeters. The significant result was attributed to the application of fertilizer that adsorption of adequate amounts of nitrogen which is the main element in the chlorophyll synthesis and its fixation could lead to vigorous growth as cited by Davoodi (2007). This is further corroborated by Awadalla and Abbas (2017) in their research fertilizer adequate supply of nitrogen fertilizer is essential for growth and yield of plants.

*Number of Root Nodules*

The number of root nodules of NSIC Pn 09 as influenced by the application of organic fertilizers is presented in Table 4. Significant result was obtained on the number of root nodules.

The application of 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_3$), 10–40–0kg NPK ha$^{-1}$ (RR based on soil analysis) ($T_1$), and 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_2$) recorded the most number of root nodules with mean values of 61.60, 61.57 and 61.46, respectively. It was followed by -20-0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_8$), 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_6$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ ($T_5$), and 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_7$) with mean values of 56.16, 56.15, 56.14, and 56.04 respectively. The least was obtained in the application of 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_4$) 2300kg Mudpress ha$^{-1}$ ($T_9$) and 650kg Vermicast ha$^{-1}$ ($T_{10}$). With mean values of 51.11, 50.87 and 50.84. The significant result on the number of root nodules coincided with the findings of Mathivanan *et al.* (2012) that more number of root nodules in the combination of inorganic and organic fertilizers fix most of the nitrogen requirements of the plant.

**Table 3.** Plant Height (cm) of NSIC Pn 09 as Influenced by Organic Fertilizer.

| Treatment | Plant Height | | |
|---|---|---|---|
| | 30 DAP | 60 DAP | 90 DAP |
| $T_1$ – 10–40–0kg NPK ha$^{-1}$ ( RR based on soil analysis) | 44.53 | 71.09a | 85.63a |
| $T_2$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 44.24 | 71.26a | 85.60a |
| $T_3$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 45.06 | 71.56a | 85.59a |
| $T_4$ – 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 38.16 | 62.56bc | 76.92bc |
| $T_5$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ | 39.05 | 65.04b | 78.21b |
| $T_6$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ | 38.52 | 65.42b | 78.27b |
| $T_7$ – 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ | 38.20 | 65.98b | 78.54b |
| $T_8$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ | 38.25 | 65.08b | 78.47b |
| $T_9$ – 2300kg Mudpress ha$^{-1}$ | 33.44 | 60.58c | 73.33c |
| $T_{10}$ – 650kg Vermicast ha$^{-1}$ | 33.16 | 60.72c | 73.40c |
| ANOVA RESULT | Ns | ** | ** |
| C.V. (%) | 14.51 | 1.94 | 1.68 |
| HSD | – | 3.74 | 3.90 |

Note: Means with common letter/s are not significantly different with each other using Tukey's Honest Significant Difference (HSD) Test.

ns – not significant

** – significant at 1% level

**Table 4.** Number of Root Nodules of NSIC Pn 09 as Influenced by Organic Fertilizer.

| Treatment | Number of Root Nodules |
|---|---|
| $T_1$ – 10–40–0kg NPK ha$^{-1}$ ( RR based on soil analysis) | 61.57a |
| $T_2$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 61.46a |
| $T_3$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 61.60a |
| $T_4$ – 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 51.11c |
| $T_5$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ | 56.14b |
| $T_6$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ | 56.15b |
| $T_7$ – 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ | 56.04b |
| $T_8$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ | 56.16b |
| $T_9$ – 2300kg Mudpress ha$^{-1}$ | 50.87c |
| $T_{10}$ – 650kg Vermicast ha$^{-1}$ | 50.84c |
| ANOVA RESULT | ** |
| C.V. (%) | 2.52 |
| HSD | 4.15 |

Note: Means with common letter/s are not significantly different with each other using Tukey's Honest Significant Difference (HSD) Test.

** – significant at 1% level

*Total Number of Leaves*

The total number of leaves of NSIC Pn 09 as infleunced by the application of organic fertilizer is presented in Table 5. Significant differences among treatment means were observed on the total number of leaves wherein the application of 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_3$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_2$) and 10–40–0kg NPK ha$^{-1}$ (RR based on soil analysis)

($T_1$) obtained the most number of leaves with mean values of 189.50, 188.92 and 188.71, respectively. It was followed by the application of 7.5–30–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ ($T_7$), 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ ($T_6$), 5–20–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ ($T_8$), 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ ($T_5$), and 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_4$) with mean values of 175.94, 175.73, 175.69, 175.17 and 165.95, respectively. Moreover, the application of 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_4$) produced comparable number of leaves from the application of 650kg Vermicast $ha^{-1}$ ($T_{10}$) and 2300kg Mudpress $ha^{-1}$ ($T_9$) with mean values of 160.87 and 160.21, respectively. The number of leaves was significantly influenced due to nutrients. The emergence of more leaves in plants was observed when plant nutrition was properly managed as cited by Davoodi (2007) and Kandil *et al.* (2007).

**Table 5.** Total Number of Leaves of NSIC Pn 09 as Influenced by Organic Fertilizer.

| Treatment | Number of Leaves |
|---|---|
| $T_1$ – 10–40–0kg NPK $ha^{-1}$ ( RR based on soil analysis) | 188.71a |
| $T_2$ – 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ | 188.92a |
| $T_3$ – 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ | 189.50a |
| $T_4$ – 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ | 165.95bc |
| $T_5$ – 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ | 175.17b |
| $T_6$ – 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ | 175.73b |
| $T_7$ – 7.5–30–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ | 175.94b |
| $T_8$ – 5–20–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ | 175.69b |
| $T_9$ – 2300kg Mudpress $ha^{-1}$ | 160.21c |
| $T_{10}$ – 650kg Vermicast $ha^{-1}$ | 160.87c |
| ANOVA RESULT | ** |
| C.V. (%) | 2.38 |
| HSD | 12.24 |

Note: Means with common letter/s are not significantly different with each other using Tukey's Honest Significant Difference (HSD) Test.

** – significant at 1% level

*Leaf Area ($cm^2$) at 30, 40, 60 and 90 Days after Planting*

The leaf area of NSIC Pn 09 at 30, 40, 60 and 90 days after planting as influenced by the application of organic fertilizer is presented in Table 6. Insignificant result was observed on the leaf area at 30 days after planting with mean values of ranging from 17.23 to 31.03 square centimeters ($cm^2$).

The leaf area at 40 days after planting was significantly affected by the application of fertilizer. The application of 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_3$), 10–40–0kg NPK $ha^{-1}$ (RR based on soil analysis) ($T_1$) and 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_2$) obtained the biggest leaf area with mean values of 35.82, 35.78 and 35.70$cm^2$, respectively. It was followed by the application of 5–20–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ ($T_8$), 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ ($T_5$), 7.5–30–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ ($T_7$), 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ ($T_6$) and 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_4$) with mean values of 30.82, 30.62, 30.30, 30.24 and 26.64$cm^2$, respectively. However, the latter was comparable to the application of 2300kg Mudpress $ha^{-1}$ ($T_9$) and 650kg Vermicast $ha^{-1}$ ($T_{10}$) with mean values of 24.94 and 24.71$cm^2$.

The leaf area at 60 days after planting was significantly influenced by the application of fertilizer. The application of 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_3$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_2$) and 10–40–0kg NPK ha$^{-1}$ (RR based on soil analysis) ($T_1$) obtained the largest leaves with mean values of 40.83, 40.23 and 40.15cm$^2$, respectively. It was followed by the plants that received 5-20-0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_8$), 7.5-30-0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_7$), 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_6$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ ($T_5$) and 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_4$) with mean values of 35.96, 35.92, 35.83, 35.53 and 33.57cm$^2$, respectively. The least leaf area were obtained from the application of 2300kg Mudpress ha$^{-1}$ ($T_9$) and 650kg Vermicast ha$^{-1}$ ($T_{10}$) with mean values of 29.93 and 29.92cm$^2$. Leaf area increased rapidly up to 60 days from planting where the production of fully expanded leaf on the main axis of each plant at the second nodal position below the apex Nigam *et al.* (2001). The significant leaf area per plant was enhanced which might be due to involvement of micronutrients in the organic fertilizer. Adequate supply of micronutrients might have promoted cell division and enlargement, which ultimately resulted in higher leaf area as cited by Baraker *et al.* (2017). On the other hand, the different treatments had comparable leaf area at 90 days after planting with mean values ranging from 11.81 to 18.87cm$^2$.

**Table 6.** Leaf Area (cm$^2$) of NSIC Pn 09 at 30, 40, 60 and 90 Days after Planting as Influenced by Organic Fertilizer.

| Treatment | Leaf Area (cm$^2$) | | | |
|---|---|---|---|---|
| | 30 DAP | 40 DAP | 60 DAP | 90 DAP |
| $T_1$ – 10–40–0kg NPK ha$^{-1}$ ( RR based on soil analysis) | 28.18 | 35.78a | 40.15a | 18.87 |
| $T_2$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 28.20 | 35.70a | 40.23a | 17.48 |
| $T_3$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 31.03 | 35.82a | 40.83a | 18.87 |
| $T_4$ – 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 22.13 | 26.64bc | 33.57b | 14.68 |
| $T_5$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ | 23.24 | 30.62b | 35.53b | 16.52 |
| $T_6$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ | 23.36 | 30.24b | 35.83b | 16.53 |
| $T_7$ – 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ | 23.85 | 30.30b | 35.92b | 16.02 |
| $T_8$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ | 24.81 | 30.82b | 35.96b | 16.88 |
| $T_9$ – 2300kg Mudpress ha$^{-1}$ | 18.57 | 24.71c | 29.93c | 12.39 |
| $T_{10}$ – 650kg Vermicast ha$^{-1}$ | 17.23 | 24.94c | 29.92c | 11.81 |
| ANOVA RESULT | Ns | ** | ** | ns |
| C.V. (%) | 21.95 | 4.81 | 5.28 | 16.65 |
| HSD | - | 4.30 | 5.53 | - |

Note: Means with common letter/s are not significantly different with each other using Tukey's Honest Significant Difference (HSD) Test.

ns – not significant

** – significant at 1% level

*Leaf Area Index at 30, 40, 60 and 90 Days after Planting and Total Leaf Area Index*

The leaf area index at 30, 40, 60 and 90 days after planting and total leaf area index as influenced by the application of organic fertilizers is presented in Table. Insignificant result was obtained on the leaf area index at 30 days after planting with mean values ranging from 1.38 to 2.48. The leaf area index at 40 days after planting showed a significant result in the application of organic fertilizers.

The application of 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_3$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_2$) and 10–40–0kg NPK ha$^{-1}$ ( RR based on soil analysis) ($T_1$) obtained the LAI mean values of 2.95, 2.88 and 2.81, respectively. It was followed by 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ ($T_5$), 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_6$), 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_7$) and

5–20–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ ($T_8$) with mean values of 2.50, 2.46 and 2.37. Next in rank was observed on the plants applied with 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_4$) with 2.19 which did not also differ in the application of 650kg Vermicast $ha^{-1}$ ($T_{10}$) with 2.04 and yet insignificant to application of 2300kg Mudpress $ha^{-1}$ ($T_9$) 1.93.

There was a significant effect of fertilizer on the leaf area index at 60 days after planting that the plants applied with 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_2$) with 3.22, 10–40-0kg NPK $ha^{-1}$ (RR based on soil analysis) ($T_1$) and 7.5-30-0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_3$) , 5–20–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ ($T_8$), 7.5–30–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ ($T_7$), 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ ($T_6$) and 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ ($T_5$) had comparable LAI with mean values ranging from 2.88 to 3.21. While $T_1$, $T_2$, $T_3$ $T_5$, $T_6$, $T_7$ and $T_8$ did not differ in terms of LAI and yet did not differ to the plants that received 2300kg Mudpress $ha^{-1}$ ($T_9$) and 650kg Vermicast $ha^{-1}$ ($T_{10}$) with means of 2.40 and 2.39, respectively.

Insignificant result was observed on the leaf area index at 90 days after planting with mean values ranging from 0.94 to 1.51.

The total leaf area index of peanut was significantly influenced by the application of organic fertilizers. The highest LAI was obtained in all the treatments $T_1$, $T_2$, $T_3$, $T_4$, $T_5$ $T_6$, $T_7$, and $T_8$, and yet $T_4$, $T_5$ $T_6$, $T_7$, and $T_8$ did not also differ in the application of 2300kg Mudpress $ha^{-1}$ ($T_9$) and 650kg Vermicast $ha^{-1}$ ($T_{10}$) with mean values of 2.09 and 2.18. The highest LAI was obtained in the application of inorganic and organic fertilizers that might be due to the presence of micronutrients in the application of organic fertilizers and various enzymes as cited Baraker *et al.* (2017).

**Table 7.** Leaf Area Index of Peanut as Influenced by Organic Fertilizers.

| Treatment | Leaf Area Index | | | | Total |
|---|---|---|---|---|---|
| | 30 DAP | 40 DAP | 60 DAP | 90 DAP | LAI |
| $T_1$ – 10–40–0kg NPK $ha^{-1}$ ( RR based on soil analysis) | 2.25 | 2.81a | 3.21ab | 1.51 | 2.51ab |
| $T_2$ – 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ | 2.26 | 2.88a | 3.22a | 1.40 | 2.79a |
| $T_3$ – 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ | 2.48 | 2.95a | 2.93ab | 1.51 | 2.79a |
| $T_4$ – 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ | 1.77 | 2.19cd | 2.69bc | 1.18 | 2.39ab |
| $T_5$ – 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ | 1.86 | 2.50b | 2.84abc | 1.32 | 2.63ab |
| $T_6$ – 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ | 1.87 | 2.46b | 2.87abc | 1.32 | 2.58ab |
| $T_7$ – 7.5–30–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ | 1.91 | 2.46b | 2.87abc | 1.28 | 2.59ab |
| $T_8$ – 5–20–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ | 1.98 | 2.37b | 2.88abc | 1.35 | 2.53ab |
| $T_9$ – 2300kg Mudpress $ha^{-1}$ | 1.49 | 1.93e | 2.40c | 0.99 | 2.09b |
| $T_{10}$ – 650kg Vermicast $ha^{-1}$ | 1.38 | 2.04de | 2.39c | 0.94 | 2.18b |
| ANOVA RESULT | Ns | ** | ** | Ns | ** |
| C.V. (%) | 21.93 | 3.20 | 6.41 | 16.67 | 7.36 |
| HSD | | 0.23 | 0.53 | | 0.54 |

Note: Means with common letter/s are not significantly different with each other using Tukey's Honest Significant Difference (HSD) Test.

ns – not significant

** – significant at 1% level

*Number of Developed and Undeveloped Pods*

The number of developed and developed pods as influenced by the application of organic fertilizers is presented in Table 8. Significant result was obtained on the number of developed pods whereby the application of 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_2$), 10–40–0kg NPK $ha^{-1}$ (RR based on soil analysis) ($T_1$) , and 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_3$), produced the most number of developed pods with mean values of 76.95, 76.92 and 76.57, respectively. It was followed by the application of 5-20-0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ ($T_8$), 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_6$), 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_7$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ ($T_5$), and 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_4$) with mean values of 73.97, 73.69, 73.66, 73.65 and 69.66, respectively. While the application of 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_4$) produced comparable number of developed pods from the application of 2300kg Mudpress ha$^{-1}$ ($T_9$) and 650kg Vermicast ha$^{-1}$ ($T_{10}$) with mean values of 65.93 and 65.86. Insignificant result was observed on the number of undeveloped pods with mean values ranging from 17.03 to 24.90.

**Table 8.** Number of Developed and Undeveloped Pods of NSIC Pn 09 as Influenced by Organic Fertilizer.

| Treatment | Number of Pods | |
|---|---|---|
| | Developed | Undeveloped |
| $T_1$ – 10–40–0kg NPK ha$^{-1}$ ( RR based on soil analysis) | 76.92a | 17.11 |
| $T_2$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 76.95a | 17.03 |
| $T_3$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 76.57a | 17.54 |
| $T_4$ – 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 69.66bc | 23.54 |
| $T_5$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ | 73.65b | 24.35 |
| $T_6$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ | 73.69b | 24.56 |
| $T_7$ – 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ | 73.66b | 24.12 |
| $T_8$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ | 73.97b | 24.05 |
| $T_9$ – 2300kg Mudpress ha$^{-1}$ | 65.93c | 24.33 |
| $T_{10}$ – 650kg Vermicast ha$^{-1}$ | 65.86c | 24.90 |
| ANOVA RESULT | ** | ns |
| C.V. (%) | 2.65 | 18.66 |
| HSD | 5.63 | - |

*Dry Matter Weight at 20, 40, 60 and 90 Days after Planting and Total Dry Matter Weight*

The dry matter of NSIC Pn 09 at 30, 40, 60 and 90 days after planting and total dry matter as influenced by the application of organic fertilizers is presented in Table 9. Insignificant result was obtained on the dry matter at 20 days after planting. It means that regardless of the different treatments made it showed no differences among treatments with means ranging from 1.56 to 6.92 grams.

The dry matter at 40 days after planting was significantly influenced by the application of fertilizers. The application of 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_3$), 10–40–0kg NPK ha$^{-1}$ (RR based on soil analysis) ($T_1$), and 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_2$) obtained the highest dry matter with mean values of 28.44, 28.37 and 28.29 grams, respectively. It was followed by the application of 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_6$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ ($T_5$), 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_7$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_8$) and 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_4$) with means values of 23.44, 23.35, 23.32, 23.31 and 21.11 grams. While the latter treatment ($T_4$) was comparable to the application of 650kg Vermicast ha$^{-1}$ ($T_{10}$) and 2300kg Mudpress ha$^{-1}$ ($T_9$) with mean values ranging from 18.47 and 18.20 grams.

Significant result on the dry matter at 60 days after planting that the plants applied with 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_3$), 10–40–0kg NPK ha$^{-1}$ (RR based on soil analysis) ($T_1$) and 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_2$) a had the heaviest dry matter with mean values of 48.61, 48.45 and 48.32 grams, respectively. It was followed by the application of 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ ($T_5$), 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_6$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_8$), 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_7$), and 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_4$) with mean values of 43.53, 43.44, 43.40, 43.20 and 41.01 grams, respectively while $T_4$

was comparable by the application of 2300kg Mudpress ha-1 ($T_9$) and 650kg Vermicast ha-1 ($T_{10}$) with mean values of 38.16 and 38.14 grams.

Significant dry matter weight at 90 days after planting was consistently obtained by the application of 5–20–0kg NPK ha-1 (50% RR) + 2300kg Mudpress ha-1 + 650kg Vermicast ha-1 ($T_2$), 7.5–30–0kg NPK ha-1 (75% RR) + 2300kg Mudpress ha-1 ($T_3$), and 10–40–0kg NPK ha-1 (RR based on soil analysis) ($T_1$) obtained the heaviest dry matter with mean values of 58.71, 58.62 and 58.48 grams, respectively. Next in rank was obtained by the application of 7.5–30–0kg NPK ha-1 (75% RR) + 2300kg Mudpress ha-1 ($T_6$), 7.5–30–0kg NPK ha-1 (50% RR) + 650kg Vermicast ha-1 ($T_7$), 5–20–0kg NPK ha-1 (50% RR) + 650kg Vermicast ha-1 ($T_8$), 5–20–0kg NPK ha-1 (50% RR) + 2300kg Mudpress ha-1 ($T_5$) and 2300kg Mudpress ha-1 + 650kg Vermicast ha-1 ($T_4$) with mean values of 53.58, 53.49, 53.42, 53.36 and 51.25 grams, respectively. While and 2300kg Mudpress ha-1 + 650kg Vermicast ha-1 ($T_4$) had comparable dry matter weight with the application of 2300kg Mudpress ha-1 ($T_9$) and 650kg Vermicast ha-1 ($T_{10}$) which had the least dry matter weight with mean values of 48.57 and 48.54 grams. Significant result was obtained on the total dry matter weight with the same trend of result. The application of 7.5–30–0kg NPK ha-1 (75% RR) + 2300kg Mudpress ha-1 ($T_3$), 5–20–0kg NPK ha-1 (50% RR) + 2300kg Mudpress ha-1 + 650kg Vermicast ha-1 ($T_2$), 10–40–0kg NPK ha-1 ( RR based on soil analysis) ($T_1$) obtained the heaviest dry matter with mean values of 135.67, 135.31, and 135.30 grams, respectively. The application of 7.5–30–0kg NPK ha-1 (75% RR) + 2300kg Mudpress ha-1 ($T_6$), 5–20–0kg NPK ha-1 (50% RR) + 2300kg Mudpress ha-1 ($T_5$) 5–20–0kg NPK ha-1 (50% RR) + 650kg Vermicast ha-1 ($T_8$), 7.5–30–0kg NPK ha-1 (50% RR) + 650kg Vermicast ha-1 ($T_7$) and 2300kg Mudpress ha-1 + 650kg Vermicast ha-1 ($T_4$) with mean values of 120.46, 120.24, 120.145, 120.02 and 113.37 grams, respectively. Treatment 4 had also statistically the same total dry matter weight in the application of 650kg Vermicast ha-1 ($T_{10}$) and 2300kg Mudpress ha-1 ($T_9$) with mean values of 105.16 and 104.93 grams. The increased in dry matter weight maybe attributed to the application of fertilizer. Anil Kumar Das *et al.* (2008) stated that among the essential plant nutrients for seed production, helping to form a healthy and sound root system which is essential for nutrient uptake.

The fertilizer plays a role in cell division, root development, photosynthesis, nitrogen fixation and other vital physiological processes that enhanced dry matter weight of the plants. Increasing in the photosynthetic activity, dry matter accumulation and NPK uptake as stated by El-Desuki *et al.* (2000); Ahmed *et al.* (2007); Ferrante *et al.* (2008); Ng'etich *et al.* (2013); Oloyede and Adebayo (2013) and Adebayo *et al.* (2014).

**Table 9.** Dry Matter Weight (g) at 20, 40, 60 and 90 Days after Planting and Total Dry Matter of NSIC Pn 09 as Influenced by Organic Fertilizers.

| Treatment | Dry Matter Weight (g) | | | | |
|---|---|---|---|---|---|
| | 20 DAP | 40 DAP | 60 DAP | 90 DAP | Total Dry Matter (g) |
| $T_1$ – 10–40–0kg NPK ha-1 ( RR based on soil analysis) | 6.45 | 28.37a | 48.45a | 58.48a | 135.30a |
| $T_2$ – 5–20–0kg NPK ha-1 (50% RR) + 2300kg Mudpress ha-1 + 650kg Vermicast ha-1 | 6.29 | 28.29a | 48.32a | 58.71a | 135.31a |
| $T_3$ – 7.5–30–0kg NPK ha-1 (75% RR) + 2300kg Mudpress ha-1 + 650kg Vermicast ha-1 | 6.92 | 28.44a | 48.61a | 58.62a | 135.67a |
| $T_4$ – 2300kg Mudpress ha-1 + 650kg Vermicast ha-1 | 3.11 | 21.11bc | 41.01bc | 51.25bc | 113.37bc |
| $T_5$ – 5–20–0kg NPK ha-1 (50% RR) + 2300kg Mudpress ha-1 | 4.20 | 23.35b | 43.53b | 53.36b | 120.24b |
| $T_6$ – 7.5–30–0kg NPK ha-1 (75% RR) + 2300kg Mudpress ha-1 | 4.15 | 23.44b | 43.44b | 53.58b | 120.46b |
| $T_7$ – 7.5–30–0kg NPK ha-1 (50% RR) + 650kg Vermicast ha-1 | 4.18 | 23.32b | 43.20b | 53.49b | 120.02b |
| $T_8$ – 5–20–0kg NPK ha-1 (50% RR) + 650kg Vermicast ha-1 | 3.44 | 23.31b | 43.40b | 53.42b | 120.14b |
| $T_9$ – 2300kg Mudpress ha-1 | 1.56 | 18.20c | 38.16c | 48.57c | 104.93c |
| $T_{10}$ – 650kg Vermicast ha-1 | 1.72 | 18.47c | 38.14c | 48.54c | 105.16c |
| ANOVA RESULT | ns | ** | ** | ** | ** |
| C.V. (%) | 5.95 | 4.46 | 2.32 | 1.78 | 2.48 |
| HSD | | 3.08 | 2.97 | 2.80 | 8.78 |

Note: Means with common letter/s are not significantly different with each other using Tukey's Honest Significant Difference (HSD) Test.

*Weight of Pods per Plant, Pod Weight per 6 m² Sampling Area, and Weight of 100 Seeds per Treatment*

Table 10, showed the weight of pods per plant, weight per sampling area and weight of 100 seeds. Significant differences among treatment means were observed on the weight of pods per plant wherein the application of 10–40–0kg NPK $ha^{-1}$ (RR based on soil analysis) ($T_1$), 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_2$) and 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ ($T_3$), obtained the heaviest pods with mean values of 33.65, 33.60 and 33.52 grams, respectively. It was followed by 7.5–30–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ ($T_7$), 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ ($T_5$), 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_4$), 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ ($T_6$), and 5–20–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ ($T_8$) with mean values of 24.66, 24.24, 24.07 and 24.03 grams, respectively. The lightest was obtained by 2300kg Mudpress $ha^{-1}$ ($T_9$) and 650kg Vermicast $ha^{-1}$ ($T_{10}$) with mean values of 16.21 and 16.09 grams. The significant result of the study conformed to the findings of Singh and Chaudhari (2015; Singh and Joshi (2013) that balanced fertilization on peanut where macro and microlements area increasing pod development. High yields of groundnut can be obtained with better fertility management practices especially with organic farming practices (Nagaraj *et al.* (2001).

Likewise, same result was observed on the weight of pods per sampling area wherein the plants applied with 10–40–0kg NPK $ha^{-1}$ (RR based on soil analysis) ($T_1$), 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_2$) and 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ ($T_3$) obtained the heaviest pods with mean values of 1.62 and 1.61 kilograms, respectively. It was followed by 7.5–30–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ ($T_7$), 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ ($T_5$), 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_4$), 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ ($T_6$), and 5–20–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ ($T_8$) with mean values of 1.18, 1.16 and 1.15 kilograms, respectively. The lightest was obtained by 2300kg Mudpress $ha^{-1}$ ($T_9$) and 650kg Vermicast $ha^{-1}$ ($T_{10}$) with mean values of 0.78 and 0.77 kilograms.

**Table 10.** Weight of Pods per Plant (g), Weight per Sampling Area )kg), and Weight of 100 (g) Seeds per Treatment of NSIC Pn 09 as Influenced by Organic Fertilizer.

| Treatments | Weight of Pods per Plant (g) | Weight per Sampling Area (kg) | Weight of 100 Seeds (g) |
|---|---|---|---|
| $T_1$ – 10–40–0kg NPK $ha^{-1}$ ( RR based on soil analysis) | 33.65a | 1.62a | 69.13a |
| $T_2$ – 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ | 33.60a | 1.61a | 69.37a |
| $T_3$ – 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ | 33.52a | 1.61a | 69.41a |
| $T_4$ – 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ | 24.07b | 1.16b | 62.28b |
| $T_5$ – 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ | 24.24b | 1.16b | 66.78ab |
| $T_6$ – 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ | 24.03b | 1.15b | 66.36ab |
| $T_7$ – 7.5–30–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ | 24.66b | 1.18b | 66.72ab |
| $T_8$ – 5–20–0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ | 24.03b | 1.15b | 66.74ab |
| $T_9$ – 2300kg Mudpress $ha^{-1}$ | 16.21c | 0.78c | 62.73b |
| $T_{10}$ – 650kg Vermicast $ha^{-1}$ | 16.09c | 0.77c | 62.03b |
| ANOVA RESULT | ** | ** | ** |
| C.V. (%) | 8.81 | 8.95 | 3.03 |
| HSD | 6.55 | 0.32 | 5.87 |

Note: Means with common letter/s are not significantly different with each other using Tukey's Honest Significant Difference (HSD) Test.

Same trend, was observed on the weight of 100 seeds wherein the plants applied with 7.5–30–0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ ($T_3$), 5–20–0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ ($T_2$) and 10–40–0kg NPK $ha^{-1}$ (RR based on soil analysis) ($T_1$) obtained the heaviest pods with mean values of 69.41, 69.37 and 69.13 grams, respectively. It was followed by 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ ($T_5$), 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_8$), 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ ($T_7$), 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ ($T_6$), and 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ ($T_4$) with mean values of 66.78, 66.74, 66.72, 66.36 and 66.28 grams, respectively. The lightest was obtained by 2300kg Mudpress ha$^{-1}$ ($T_9$) and 650kg Vermicast ha$^{-1}$ ($T_{10}$) with mean values of 62.73 and 62.03 grams.

*Computed Yield per Hectare*

The computed pod yield of a NSIC Pn 09 production as affected by the application of organic fertilizers is presented in Table 11. The yield of NSIC Pn 09 in every treatment is organized in a descending order: Treatment 1 with 2692.27 kilograms (2.69 tons), Treatment 2 with 2688.00 kilograms (2.69 tons), Treatment 3 with 2681.60 kilograms (2.68 tons), Treatment 7 with 1972.53 kilograms (1.97 tons), Treatment 5 with 1938.93 kilograms (1.94 tons), Treatment 4 with 1925.33 kilograms (1.93 tons), Treatment 6 with 1922.67 kilograms (1.92 tons), Treatment 8 with 1922.13 kilograms (1.92 tons), Treatment 9 with 1297.07 kilograms (1.30 tons) and Treatment 10 with 1287.47 kilograms (1.29 tons). The yield of peanut in the study is higher than the yield in Cagayan Valley. The higher yield obtained in the study may be attributed to the application of fertilizer.

**Table 11.** Computed Yield per Hectare of NSIC Pn 09 as Influenced by Organic Fertilizer.

| Treatment | Yield per Hectare | |
|---|---|---|
| | Kilograms | Tons |
| $T_1$ – 10–40–0kg NPK ha$^{-1}$ ( RR based on soil analysis) | 2692.27 | 2.69 |
| $T_2$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 2688.00 | 2.69 |
| $T_3$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 2681.60 | 2.68 |
| $T_4$ – 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ | 1925.33 | 1.93 |
| $T_5$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ | 1938.93 | 1.94 |
| $T_6$ – 7.5–30–0kg NPK ha$^{-1}$ (75% RR) + 2300kg Mudpress ha$^{-1}$ | 1922.67 | 1.92 |
| $T_7$ – 7.5–30–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ | 1972.53 | 1.97 |
| $T_8$ – 5–20–0kg NPK ha$^{-1}$ (50% RR) + 650kg Vermicast ha$^{-1}$ | 1922.13 | 1.92 |
| $T_9$ – 2300kg Mudpress ha$^{-1}$ | 1297.07 | 1.30 |
| $T_{10}$ – 650kg Vermicast ha$^{-1}$ | 1287.47 | 1.29 |

*Cost and Return Analysis*

The cost and return analysis of one hectare peanut production as applied with organic fertilizers is shown in Table 12. The return of investment obtained in the different treatments is arranged in descending order: $T_1$ had 628.64 percent, $T_2$ had 569.30 percent, $T_3$ had 561.65 percent, $T_5$ had 528.39 percent, $T_6$ had 517.20 percent, $T_4$ had 466.24 percent, $T_7$ had 454.66 percent, $T_8$ had 452.33 percent, $T_9$ had 407.82 percent and $T_{10}$ had 396.86 percent. The application of sole inorganic fertilizer had the highest return because of the immediate effect of the inorganic fertilizer while the plots. But among the plots applied with organic and inorganic fertilizer at the rate of 5–20–0kg NPK ha$^{-1}$ (50% RR) + 2300kg Mudpress ha$^{-1}$ + 650kg Vermicast ha$^{-1}$ yielded the highest return on investment.

*Protein and Fat Analysis*

The protein and fat analysis of NSIC Pn 09 as influenced by the application of organic fertilizers is presented in Table 13. The different treatments gave protein contents ranging from 28.93 to 34.19 percent while the fat contents range from 23.98 to 28.25 percent. Fertility status of the soil, moisture availability and sunshine period particularly from flowering to maturity are the major determinants of oil and fatty acid accumulation in peanut seed oil and the oil content as cited by Hassan *et al.* (2005).

**Table 12.** Cost and Return Analysis of One Hectare Peanut Production as Influenced by Organic Fertilizers.

| Treatments | Total Cost of Production | Gross Income | Net Income | Roi (%) |
|---|---|---|---|---|
| $T_1$ | 29559.212 | 215381.60 | 185822.39 | 628.64 |
| $T_2$ | 32129.05 | 215040.00 | 182910.95 | 569.30 |
| $T_3$ | 32421.33 | 214528.00 | 182106.67 | 561.69 |
| $T_4$ | 27201.85 | 154026.40 | 126824.55 | 466.24 |
| $T_5$ | 24684.26 | 155114.40 | 130430.14 | 528.39 |
| $T_6$ | 24921.32 | 153813.60 | 128892.28 | 517.20 |
| $T_7$ | 28450.54 | 157802.40 | 129351.86 | 454.66 |
| $T_8$ | 27840.18 | 157802.40 | 125930.22 | 452.33 |
| $T_9$ | 20433.59 | 103765.60 | 83332.01 | 407.82 |
| $T_{10}$ | 20729.83 | 102997.60 | 82267.77 | 396.86 |

**Table 13.** Protein and Fat Content of NSIC Pn 09 as Affected by Organic Fertilizer.

| Treatment | Protein Content (%) | Fat Content (%) |
|---|---|---|
| $T_1$ – 10-40-0kg NPK $ha^{-1}$ ( RR based on soil analysis) | 32.97 | 27.30 |
| $T_2$ – 5-20-0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ | 33.11 | 25.74 |
| $T_3$ – 7.5-30-0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ | 32.42 | 26.66 |
| $T_4$ – 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ | 31.84 | 28.15 |
| $T_5$ – 5-20-0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ | 31.69 | 25.47 |
| $T_6$ – 7.5-30-0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ | 28.93 | 27.50 |
| $T_7$ – 7.5-30-0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ | 33.23 | 28.25 |
| $T_8$ – 5-20-0kg NPK $ha^{-1}$ (50% RR) + 650kg Vermicast $ha^{-1}$ | 30.77 | 25.74 |
| $T_9$ – 2300kg Mudpress $ha^{-1}$ | 30.68 | 23.98 |
| $T_{10}$ – 650kg Vermicast $ha^{-1}$ | 34.19 | 27.20 |

Source: Isabela State University Feed Mill Laboratory, Echague, Isabela.

## Conclusion

Based on the results of the study, it is concluded that the application of 10-40-0 (Recommended Rate of the Soil Analysis), 7.5-30-0kg NPK $ha^{-1}$ (75% RR) + 2300kg Mudpress $ha^{-1}$ and 5-20-0kg NPK $ha^{-1}$ (50% RR) + 2300kg Mudpress $ha^{-1}$ + 650kg Vermicast $ha^{-1}$ produced the highest pod yield. The protein content of the peanut seeds ranged from 28.93 to 34.19 percent while the fat contents ranged from 23.98 to 28.25 percent. The application of the 100% recommended rate of the soil analysis and 50% recommended rate of inorganic fertilizer combined with mudpress and vermicast had the highest return on investment with 628.64 and 569.30 percent, respectively.

## Recommendations

Based on the result of the study, the following statements are recommended: 1.) The application of the 100% of recommended rate of the soil analysis,50% recommended rate of inorganic fertilizer combined with recommended rate mudpress and vermicast is recommended because it obtained the highest pod yield and return on investment. 2.). Application of vermicast and mudpress is encouraged to be done in the area ahead of time for at least one month before planting to obtain more conclusive results on the efficacy of organic fertilizer. 3.) Further study is recommended to be conducted in line with the effect of mudpress and vermicast application on the protein and fat content of the peanut seeds.

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