

The effect of Organic Manure and its Combination on the Growth Performance and Yield of *Solanum lycopersicum*.

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Abstract- Field experiments to investigate the effect of different sources of organic manure and its combination on the growth performance and yield of *Solanum lycopersicum* was conducted on the research plot of Peace House Agricultural Training Institute during the 2025 cropping season. The experiment comprises of Eight [8] treatments such as Treatment group A was for Control [No manure was applied], Treatment group B [Poultry manure: PM] and Treatment group C [Cattle manure: CM], Treatment group D [Swine Manure: SM], Treatment group E [Poultry manure + Cattle manure: PM+CM], Treatment group F [Poultry manure + Swine manure: PM+SM], Treatment group G [Cattle manure + Swine manure: CM+SM] and Treatment group H [Poultry manure + Cattle manure + Swine Manure: PM+CM+SM]. The experimental plot was brushed, cleared, harrowed and manually ridged with hand hoes. Treatments were laid out before planting of seed and trans-planting at once, there was no re-application of treatment. Data were collected on growth and yield parameters (Plant height, Leaf number, Leaf area, Stem diameter, Number of fruits and Fruit weight at harvest). Organic manures exerted significant effects on the growth and yield components of tomatoes. The higher yield of tomato was obtained from the CM+SM and PM+CM treatments at the 9th week of harvesting. The highest number of leaves, leaf area, stem diameter, number and weight of tomato fruits (1st – 7th week) were obtained from the PM+CM treatment combination. From this study, the high potassium content in the CM+SM combination makes it suitable for tomato production. Hence, it is therefore recommended that tomatoes farmers should incorporate the use of CM+SM combination to a profitable tomato production.

Keywords- Cattle manure: Poultry manure: Swine manure: Tomato.

I. INTRODUCTION

Tomato [*Solanum lycopersicum* L.] is one of the world's most primary vegetable. Tomatoes are a popular and widely cultivated vegetable crop essential for human consumption due to their high nutritional value [Farid et al., 2023]. It is particularly important in tropical and subtropical regions, including Nigeria, where it serves as a staple food and a source of income for many farmers.

Tomato fruits are eaten raw or cooked and other dishes like as soups, juice, jam, jelly, ketchup, pickles, sauces, conserves, puree, paste, powder, and other products (Parvin et al., 2018). The fruits of tomatoes are enriched with [2.5-4.5%] of sugar, [10.6-1.2%] starch and contains minerals like potassium, calcium, sodium, magnesium, phosphorus, boron, manganese, zinc, copper, iron etc. In addition to these, the fruit includes citric acid, malic acid, acetic acid, and ascorbic acid [vitamin

C], all of which are organic acids that are really good for our health. and skin [Mishra et al., 2021]

Tropical soils are inadequate in soil nutrients. Low soil quality could be attributed to erosion, fixation and leaching amongst others [Omololu et al., 2024]. Most Nigeria soils range from low to medium in productivity but with appropriate management, soil can be further improved [Musa et al., 2020].

The adoption of organic farming has been encouraged in previous years to maintain and increase the long-term fertility of soils, enhance biological cycles within the farming system, involving micro-organisms, soil flora and fauna, plants and animals [FAO2005]. Organic farming is an agricultural practice that emphasizes the use of natural methods and materials to cultivate crops and raise livestock. It entails refraining from using antibiotics in livestock, synthetic fertilizers, pesticides, and genetically modified organisms [GMOs]. Instead, organic farmers rely on organic fertilizers, crop rotation, biological pest control, and other sustainable practices to maintain soil health, conserve biodiversity, and promote ecological balance. (Hui et al., 2023).

The increasing demand for tomatoes in the markets, the rising costs of inorganic fertilizer, and its adverse environmental impacts has prompted farmers to seek alternative methods to enhance production. Hence, this study was carried out to investigate the organic manure and the combination of different organic manure that will improve and enhance the growth performance and yield of tomatoes.

II. MATERIALS AND METHODS

A. Experimental Site

The experiments were conducted at the Research Plot of the Peace House Agricultural Training Institute, Isarun, Ondo State, South-Western part of Nigeria. The trials were carried out during June-September cropping season of 2025.

B. Materials

The tomato seeds were bought from First Let farms, Akure, Nigeria. The seeds were nursed four weeks before transplanting into treatment plots and hand weeding was done in the third and eighth week after planting. Organic manure was sourced from Peace House Agricultural Training Institute livestock farms and prepared for application. Three levels of organic fertilizers [Poultry, Cattle and Pig manure] were used in this research.

Other normal routine field management practices such as weeding, staking, pest and disease control were carried out as recommended.

C. Experimental Design

The experimental plot was brushed, cleared, harrowed and manually ridged with hand hoes. The area was lined, pegged, and seed beds created. The experimental plot was divided into Eight [8] different treatments. The experiment was placed out in a random complete block design [RCBD].

Treatment group A was for Control [No manure was applied], Treatment group B [Poultry manure: PM] and Treatment group C [Cattle manure: CM], Treatment group D [Swine Manure: SM], Treatment group E [Poultry manure + Cattle manure: PM+CM], Treatment group F [Poultry manure + Swine manure: PM+SM], Treatment group G [Cattle manure + Swine manure: CM+SM] and Treatment group H [Poultry manure + Cattle manure + Swine Manure: PM+CM+SM].

For each treatment group, 1kg of each organic manure was mixed with 3kg of the soil for the nursery plot. Each type of manure was applied at a rate of 1:3, mixed thoroughly into the soil at a designated planting spot before planting of tomato seedlings.

TABLE 1. NPK Values of Animal manure

Nutrient	Poultry Manure [PM]	Cattle Manure [CM]	Swine Manure [SM]
N [%]	1.1	0.6	0.8
P [%]	0.8	0.4	0.7
K [%]	0.5	0.5	0.5

<https://www.allotment-garden.org/composts-fertilizers/npk-nutritional-values-animal-manures-compost/>

D. Agronomic Practice

The tomatoes seeds were nursed for 15days in the nursery and the seedlings were transplanted on the 16th day. The weeding was done manually, first weeding was carried at week 3 while the second weeding was done at week 8 after the planting of tomato seedlings. The staking of the tomato plants began 3weeks after planting.

E. Data Collection

All data collection began from the first week after transplanting. Data were collected from 40 randomly selected plant stands in each treatment group. Data collected includes: Number of leaves [foliage] per plant per treatment group: this was done on the 40 plant stands by counting the number of leaves on each of them from week 1 to week 12. Plants height per treatment group: the height of the plants was taken from week 1 to week 12 for each treatment. Leaf area index of plants per treatment group was taken from week 1 to week 10. Stem diameter per treatment group: the stem diameter of the plants was taken from week 1 to week 12 for each treatment. Number and weight of tomato fruit at harvest per treatment: this was done by counting and weighing the tomato fruit per treatment group.

F. Data Analysis

The means and standard deviation [SD] of the data were calculated. The results were analysed by two-way analysis of

variance [ANOVA] with Tukey’s multiple comparisons test using GraphPad prism 10.0 to determine significant differences between means and where applicable, least significant difference [LSD] was used to determine significant results. The differences between groups were considered significant at P < 0.05.

III. RESULTS

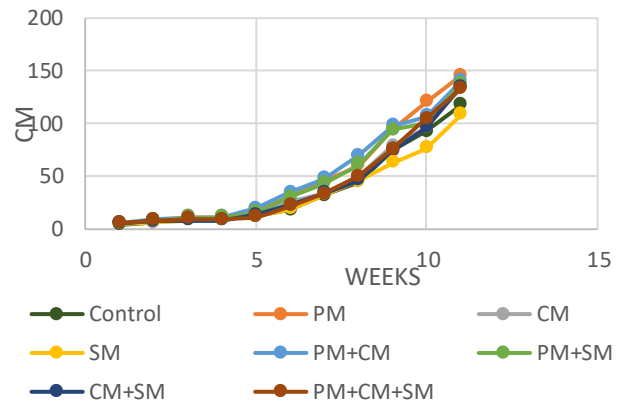


Fig. 1 Height of Tomato plant

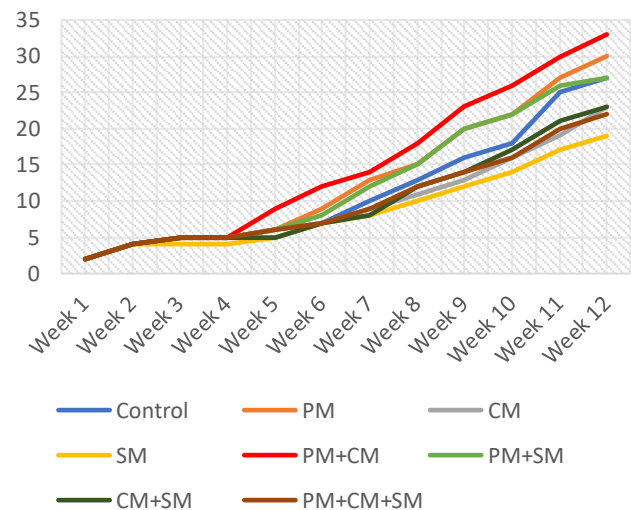


Fig. 2. Foliage of Tomato plant

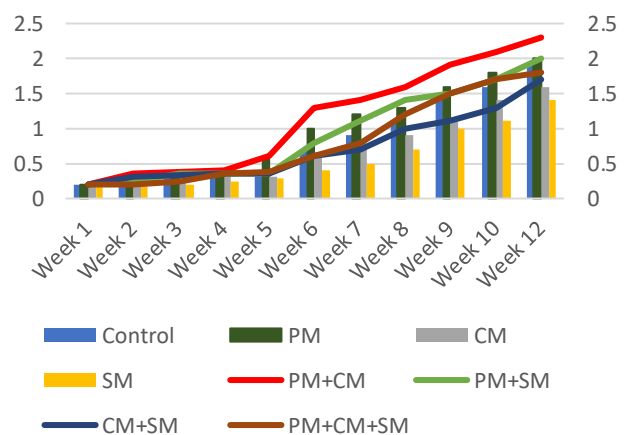


Fig. 3. Stem diameter of Tomato plant

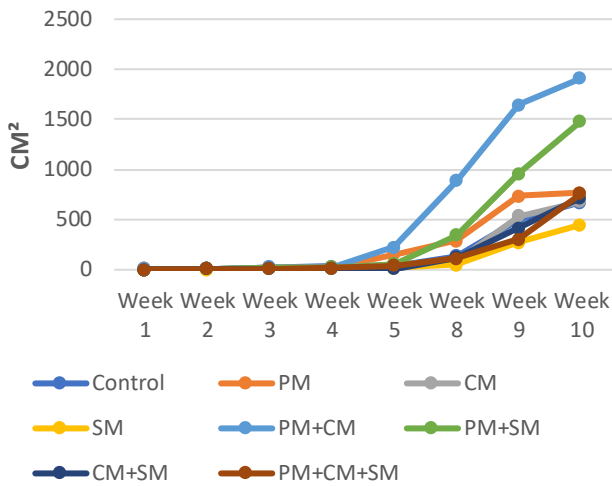


Fig. 4. Leaf area of Tomato plant

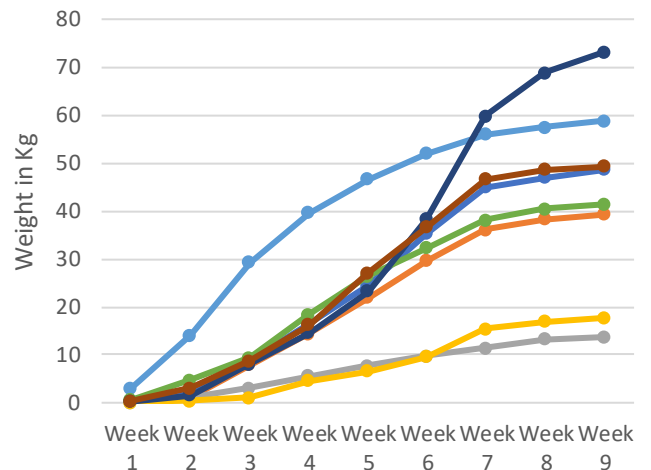


Fig. 7. Cumulative Weight of Fruit at harvest [Kg]

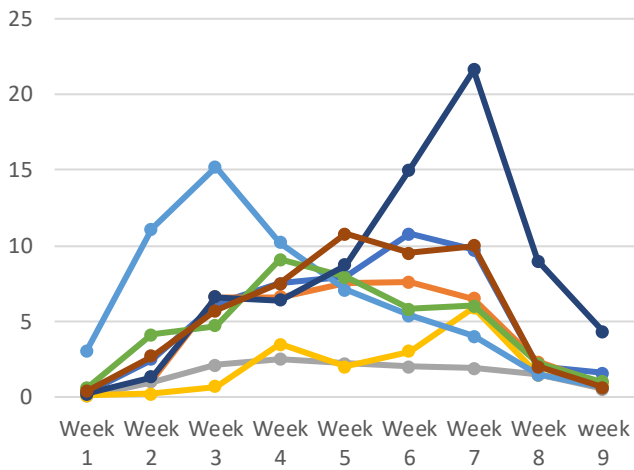


Fig. 5. Weekly Fruit weight at harvest [kg]

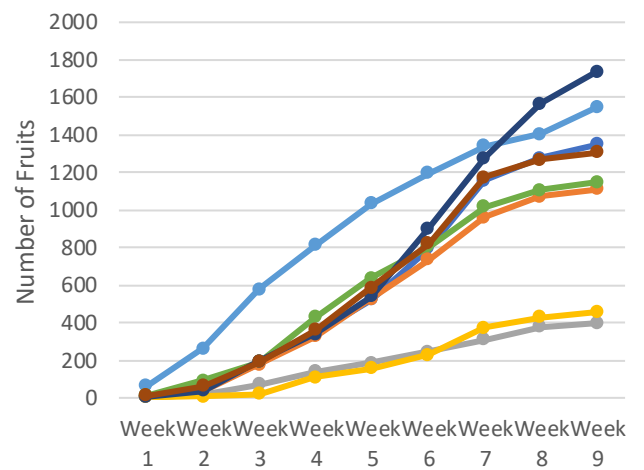


Fig. 8. Cumulative Fruit harvest [Numerically]

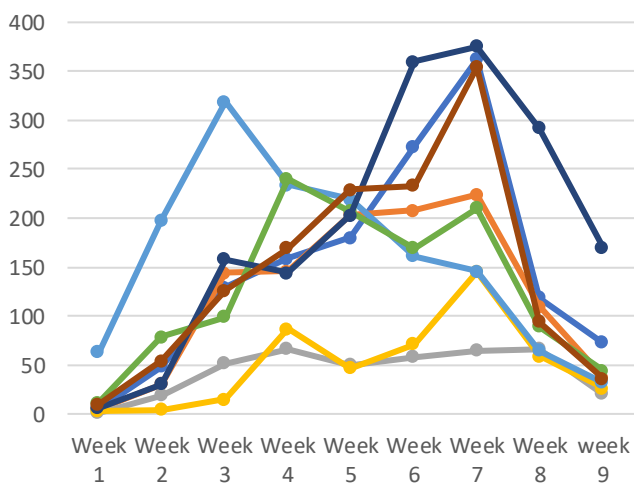


Fig. 6. Weekly Fruit harvest [Numerically]

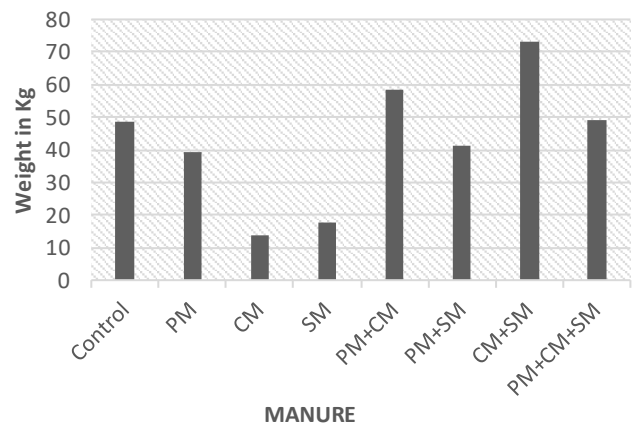


Fig. 9. Overall Weight of Tomato fruit per treatment [kg]

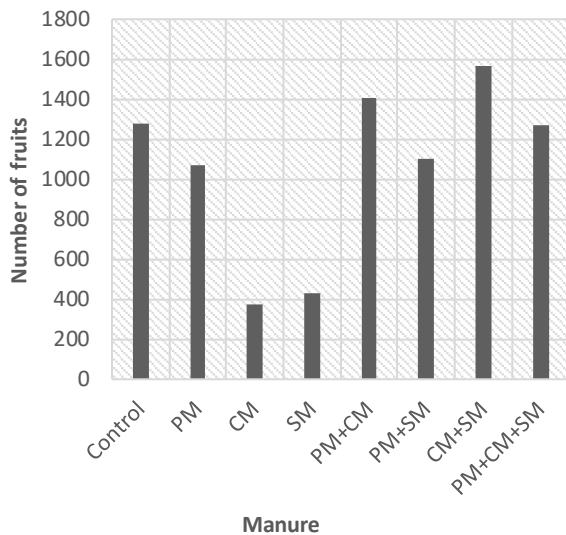


Fig. 10. Total number of tomato fruit per treatment.

IV. DISCUSSION

The results presented in Fig. 1-4 demonstrate the significant effects of different organic manure sources and its combination on the morphological parameters of tomato plants [*Solanum lycopersicum* L.]. The treatments included Control [No manure was applied], PM, CM, SM, PM+CM, PM+SM, CM+SM and PM+CM+SM each showing distinct impacts on plant height, leaf number, stem diameter and leaf area.

The tallest plants were observed in plants treated with PM [145.6±9.65cm], the height of tomato plant was significantly higher than the control [117.5±9.06 cm] in all the plants treated with both single and combination of organic manures except those treated with SM [108.2±6.91cm]. This finding aligns with previous studies that indicate organic manure, particularly poultry manure, enhance plant growth due to its rich nitrogen content and other nutrient which help improve soil structure and microbial activity. This favourable condition creates better nutrient absorption and favours for vegetative growth. The finding in this study is consistent with findings by Osman et al. [2024] and According to Olatunji et al. [2021], tomato plants grew considerably taller in poultry manure than in other fertilizer kinds. It is in agreement with the findings of Farid et al. [2023] who reported that combining of poultry manure with cattle manure increase the height of tomato plant which demonstrates optimal vegetative development.

The number of leaves per plant was higher in the plants treated with PM+CM [33 leaves] and PM [30 leaves], compared to lower counts in SM [19 leaves] and Control [27 leaves]. Increase in the number of leaf count is of great value as it correlates with greater photosynthetic capacity, which leads to improved growth and yield potential. The increase of foliage observed in plants treated with the combination of manure especially PM+CM may be attributed to the increase in the release of essential phyto hormones that enhances the formation of a greater number of shoot apex and leaves. This finding was supported by Farid et al. [2023] and also in agreement with Omololu et al. [2023 and 2024] who reported that poultry

manure treatment significantly increase the number of leaves in jute and okra. A similar result was found in the findings of Singh et.al. [2020], who found that the application of PM led to an increase in the number of tomato leaves.

Stem diameter was highest in plants treated with PM+CM [2.3 cm], while SM [1.4 cm] resulted in thinner stem. Thicker stems are indicative of stronger plants capable of supporting more extensive foliage and fruit, which is critical for overall yield. This increase in the stem diameter associated with the combination of organic manures can be attributed to improved nutrient uptake and soil health. This finding was supported by Jalloh et al [2024] who reported that the stem girth was thinner in plants treated with pig dungs.

The largest leaf area was observed in plants treated with PM+CM [1911cm²], the leaf area of tomato plant was significantly higher than the control [675cm²] in all the plants treated with both single and combination of organic manures except those treated with SM [450 cm²]. The findings reveals that organic amendments greatly enhance photosynthetic capacity through larger leaf areas. A larger leaf area improves the plant's capacity to capture sunlight for photosynthesis, which is crucial for growth and fruit development. Osman et al. [2024] and Adebayo et al. [2023] found that organic fertilizers improve overall plant vigour and productivity which is also in alignment with our findings in this study.

The results presented in Fig. 5-10 demonstrate the significant effects of different organic manure sources and its combination on the fruit number and the weight of tomato plants [*Solanum lycopersicum* L.].

The number of fruits was significantly higher in plants treated with CM+SM [1568 fruits] and PM+CM [1405 fruits] than other treatments and the control [1275 fruits]. This finding reveals that applying a different combination of organic manures helps create a good soil environment and facilitates proper plant growth. The findings of Akanbi et al. [2005] support this recent finding. It is also similar to that of Farid et al. [2023] who recorded a significant increase in the number of tomato fruit with the combination of different organic manure [Cow dung + Compost + Poultry Manure + Mustard Oil Cake].

CM+SM [73.18kg] and PM+CM [58.85kg] also resulted in the highest fruit weight significantly higher than all other treatments especially SM [16.91kg]. This happened due to the combined application of organic manures. Farid et al. [2023] conducted a study where they found the maximum weight of individual tomato fruit [113.33g] with the application of Cow dung + Compost + Poultry Manure + Mustard Oil Cake. This finding corroborates research by Osman et al. [2024] and Chukwuma et al. [2022], which indicated that organic fertilizers enhance fruit weight due to improved nutrient availability and soil structure.

At 3rd week of harvest, the cumulative production of PM+CM was 580 fruits and fruit weight of 29.34kg while CM+SM treated plants produced 194 fruits with 8.13kg. The weekly production of fruits of plant treated with PM+CM began to decline at the 7th week of harvest, but began to increased in the tomato plant treated with CM+SM. This finding reveals that tomato plants treated with PM+CM experienced early maturing compared with control, other single and combined organic

manure. This could be due to an increase in the mineralization of PM and the return of adequate quantities of macro and micro-nutrients than other sources which helps to enhance plant growth and increase flower number. Farid et al. [2023] also supports the findings in this study. It also reveals that tomato plant treated with CM+SM matured slowly but had the highest overall yield and this may be due to the gradual release of the constituent of the manure into the soil.

Potassium is responsible for the improvement of flowering and fruiting performance of the plants and nitrogen is used for maintaining the green colouring pigment of the plants, and widened the leaf size, thereby improving the photosynthetic efficiencies (Badr et al., 2016 and Gonzaga et al., 2020). It could be ascertained that CM+SM had released sufficient potassium to the soil and this would have caused an increase in the yield of tomato fruits when compared with PM+CM. Also, PM+CM has a higher nitrogen content when compared to CM+SM which could have resulted in the increase in growth performance parameters of tomato plant experienced in this study.

V. CONCLUSION

This present study underscores that the combination of different organic manures can significantly impact productivity, with better combinations [CM+SM] and [PM+CM] leading to higher yields. It will be apt to recommend the manure combination of CM+SM because of its impact on the overall yield of tomato plant.

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Disclosure of Conflict of Interest

The authors declare no conflict of interest.

REFERENCES

- [1]. Hui N., Rameshwar D. S. and Maisnam G. (2023) Impact of Different Organic Manures on Growth & Yield of Tomato (*Solanum lycopersicum* L.) International Journal for Research in Applied Science & Engineering Technology. 2:545-554
- [2]. Farid, M. N., Kobir, M. S., Obaidullah, A. J. M., Haque, M. E., Islam, M. R. and Mondal, M. F. (2023). Effects of different manures and fertilizers on growth and yield of tomato. Asian Journal of Crop, Soil Science and Plant Nutrition, 08(01), 299-307.
- [3]. Parvin S., Sani N.H., Modak S., Shahriar S.A and Uddain J. (2018) Efficacy of Different Organic Manures on Growth and Yield Performance of Organically Grown Tomato. Asian Journal of Advances in Agricultural Research 8(4): 1-10.
- [4]. Omololu P.A., Omololu V.O., Ogunrinde A.T. and Olanrewaju A. (2024) The effect of organic manure on the production of jute (*Corchorus olitorius*). International Journal of Science and Research Archive, 13(01), 2684–2689.
- [5]. FAO. (2005) The importance of soil organic matter. Key to drought resistant soil and sustained food production. FAO soils Bulletin 80. Food and Agricultural Organization of the United Nations, Rome, Italy. 78.
- [6]. Musa F.B, Oyetunji O.F, Oyewumi R.V, Adenuga D.A, Ihediuche C.I and Adelusi F.T (2020) Response of Jute Mallow (*Corchorus olitorius* L.) Grown in an Alfisol and Inceptisol to Different Organic Fertilizers and Mycorrhizal Inoculation in Nigeria. International Journal of Plant & Soil Science. 32(5): 83-93
- [7]. Mishra B., Dhall M., Barman S. and Baddana P. (2021) Role of organic nutrients on growth and yield of tomato: A review. International Journal of Botany Studies 6(6): 414-417
- [8]. Osman B.S.J., Jusu M.L., Philip M.P.M. and Peter D.M. (2024) Impact of Different Sources of Organic Fertilizer on Growth and Yield Parameters of Tomato (*Solanum lycopersicum* L.). *Global Research Journal of Social Sciences and Management*. 2(2): 89-96
- [9]. Singh, P., Singh, D., Singh, A. K., Singh, B., and Singh, T. (2020). Growth and yield of tomato grown under organic and inorganic nutrient management. *Int. J. Curr. Microbiol. App. Sci.* 9(3), 365-375.
- [10]. Omololu P.A., Omololu V.O., Ogunrinde B.A., Ogunrinde A.T. and Onah J.I (2023) The effect of organic manure on growth and yield of okra (*Abelmoschus esculentus* L.). International Journal of Science and Research Archive, 2023, 10(01), 605–610.
- [11]. Adebayo, A. H., Olatunji, A. A., and Akinola, A. A. (2022). Organic fertilizers and their impact on tomato production in Nigeria. *Nigerian Journal of Horticultural Science*, 10(1), 15-25.
- [12]. Adebayo, A. H., Olatunji, A. A., and Akinola, A. A. (2023). Comparative analysis of organic and inorganic fertilizers on tomato yield and quality. *Journal of Agricultural Research*, 14(2), 89-97.
- [13]. Olatunji, A. A., Akinola, A. A., and Adebayo, A. H. (2021). The effects of organic and inorganic fertilizers on the growth and yield of tomato. *Journal of Plant Nutrition*, 44(5), 789-800.
- [14]. Akanbi, W. B., Akande, M. O. and Adediran, J. A. (2005). Suitability of composted maize straw and mineral fertilizer for https://doi.org/10.1300/J484v11n01_06 [3]. tomato production, 11(1), 57-65.
- [15]. Gonzaga, N. R., Gonzaga, A. B., Pepito, S. L. A., Octavio, R. I. and Harper, S. M. (2020, December). Growth, yield and postharvest quality of tomato (*Solanum lycopersicum* Mill.) as influenced by different rates of nitrogen fertilizer. In III Asian Horticultural Congress-AHC2020, 1312:329-336.
- [16]. Badr, M. A., Abou-Hussein, S. D. and El-Tohamy, W. A. (2016). Tomato yield, nitrogen uptake and water use efficiency as affected by planting geometry and level of nitrogen in an arid region. *Agricultural Water Management*, 169:90-97.