FUDMA Journal of Sciences (FJS)
ISSN online: 2616-1370
ISSN print: 2645 - 2944
Vol. 7 No. 5, October, 2023, pp 173 - 175
DOI: https://doi.org/10.33003/fjs-2023-0705-2009

PRODUCTION OF BIOFERTILIZER USING GOAT DUNG, CHICKEN DUNG, PINEAPPLE PEELS AND CITRUS PEELS

***Muhammad, F. T., Musa, D. D., Buah, J. D.**

Department of Plant Science and Biotechnology, Faculty of Life Science, Federal University Dutsin-Ma, Katsina State, Nigeria

*Corresponding authors' email: fateematanko09@gmail.com

ABSTRACT

This study aimed at evaluating the efficacy of composed Biofertilizers from Pineapple and Orange (Citrus) Peels blended with Goat dung and Chicken dung.Organic wastes comprising goatdung, chiken dung, Pineapple waste and Citrus wastes were collected from the Dutsin-Ma vegetable Wednesday market, The agro waste was mixed and put into a digester to which 500 mL of water and 200 g of rumen content were also added. The digester was then tightly closed and a rubber pipe were put on top of the digester so as to allow the gas to escape. Sorghum seeds (10) were then planted using two polythene bags. The organic biofertilizer was applied to one polythene bag at 500 g and the other without treatment (control). The plant length and number of leaves were determined. Results obtained revealed that, the composed Biofertilizer significantly($p<0.05$) increased the growth parameters of the test plant considered. The production of organic biofertilizer is an excellent waste processing and recycling method which is cost effective, readily available and ecologically friendly.

Keywords: Biofertilizer, Cow dung, Pineapple peels, Citrus peels

INTRODUCTION

Agriculture as the main source of livelihood and food security in Nigeria, is facing a challenge of matching food, fodder, fuel, and fiber production with population growth. Nigeria is blessed with a lot of natural endowments which if properly harnessed will make it compete favorably with other industrialized nations. Although endowed with all these gifts, little or no efforts are being made to put them to optimum conversion for the enhancement of the living standards of the teeming population. It is imperative therefore that resource productivity be increased in order to bridge the gap between per capita food production and population growth. This calls for increased use of inputs such as clean irrigation water, organic manures fertilizers and crop protection techniques, which impact on the economics of agricultural production, environmental quality as well as soil fertility (Stentiford, 1996).

The fertility of soils is central to the sustainability of both natural and managed ecosystems (Havlin, 2005). This is because it is the medium from which terrestrial production emanates. Soil organic matter (SOM) plays an important role in maintaining soil texture, water holding capacity, the micro biomass and nutrient cycling among others (Abouelwafa *et al*, 2008). It also helps in improving the drainage and aeration properties of the root zone, and acts as a great source of nutrients to the growing plants (Cáceres, 2006).

Sawdust is mainly surface applied mulch used in ginger and garlic organic gardens. According to Olayinka *et al.* (1989), surface applied mulches serve to reduce soil water evaporation thus enhancing the potential for increased soil water conservation. This is highly important for improving crop production in tropical rain fed agriculture. The use of these inputs in agricultural production needs to be optimized in relation to economic and environmental quality considerations. This necessitates thorough understanding of the system response to applications of such inputs, which can only come from long-term experiments with the inputs in the farming system. One of the ways of getting rid of animal dung is to convert it to useful material that can be of help to the plant. Also, bio fertilizers improve the quality of soil for more productivity, because they contain natural components which improve plant growth and do not cause any damage to plants. In case of chemical fertilizers, the soil loses its natural balance and that in turn leaves a harmful effect on the environment. (Havlin, 2005).

Agricultural wastes are non-product outputs of production and processing of agricultural products that may contain material that can benefit man, but whose economic values are less than the cost of collection, transportation, and processing for beneficial use (). Estimates of agricultural waste arising are rare, but they are generally thought of as contributing a significant proportion of the total waste matter in the developed world. In recent years, the quantity of agricultural waste has been rising rapidly all over the world. As a result, the environmental problems and negative impacts of agricultural wastes are drawing more attention. Therefore, there is a need to adopt proper approaches to reducing and reusing agricultural wastes. The study aimed at production of organic biofertilizer from agro waste using agro waste and determine its effect on plant growth.

MATERIALS AND METHODS

Experimental site

The research was conducted at Biology Laboratory and the screen house of Biological Garden, Federal University Dutsin-Ma, Katsina State.

Sample Collection

The sample was collected from Dutsin-Ma Wednesday market Dutsin-Ma, Katsina State.

Sample Preparation

The fruit waste comprising of pineapple and citrus peels were used as an agro waste and it included waste from water melon, pineapple, banana and orange. Each of the fruit wastes were cut in to smaller pieces using knife and grinded with blender, and weighed using a weighing balance.

Quantities of each Agro Waste Used

i. Water melon measured 973g
ii. Banana measured 269g
iii. Pineapple 732g

iv. Orange 365g as used by Cáceres (2006).

Method of Application of Agro Waste

The agro waste was mixed and put into a digester to which 500 mL of water and 200 g of rumen content were also added. The digester was then tightly closed and a rubber pipe were put on top of the digester so as to allow the gas to escape.
Sorghum seeds (10) were then planted using two polythene bags. The organic biofertilizer was applied to one polythene bag at 500 g and the other without treatment (control). The plant length and number of leaves were determined.

Data Analysis

The data was subjected to analysis of variance (ANOVA) using Genstat software version 16.0, and the mean of each parameter were separated using Fisher's protected least significant difference test at 95% CI

RESULTS AND DISCUSSION

Table 1 showed that at 6DAS, there was statistical significant difference between the treatment (organic biofertilizer) and control (without treatment), but at 8DAS there was no statistical significant difference between the treatment (organic biofertilizer) and control (without treatment), but also at 10DAS still there was statistical significant difference between the treatment (organic biofertilizer) and control (without treatment), but at 12DAS and 14DAS was no statistically $p>0.05$. Significant difference between the treatment (organic biofertilizer) and control (without treatment).
Table (2); represent the comparison table showing the least significant difference between the treatment and control, using fisher's protected least significant difference test to determine the effect of organic biofertilizer on number of leaves of sorghum.

Table 1: Effect of organic Biofertilizer on Plant (Sorghum) height

Treatment	4DAG	6DAG	8DAG	10DAG
Organic bio fertilizer	1.97^a	3.42^a	3.71^a	4.40^a
Control	1.50^a	1.63^b	2.11^b	2.80^c
LSD	0.971	1.722	1.340	0.676

Means with same superscript are Not significantly different

Table 2: Effect of organic biofertilizer on the number of leaves of Sorghum Plant

Treatment	6DAS	8DAS	10DAS	12DAS	14DAS
Organic bio fertilizer	3.47^a	4.24^a	6.72^a	9.00^a	10.86^a
Control	2.14^b	3.33^a	5.80^b	7.74^a	8.1^a
LSD	1.242	2.461	3.931	4.462	3.738

From the table, it showed that at 4DAG, there was no statistical significant difference between the treatment (organic biofertilizer) and control (without treatment), but at 6DAG, 8DAG, 10DAG there was statistical significant difference between the treatment (organic biofertilizer) and control (without treatment). Earlier after germination, the length of the plant remains the same in both treated and untreated sorghum plant, but as soon as the plant grow, the length of the treated plant grow faster than the untreated plant (sorghum).
This is because organic biofertilizers have a plant growth regulating substances and also keep the soil environment rich in all kinds of micro- and macro-nutrients via nitrogen fixation, phosphate and potassium solubisation or mineralization, production of antibiotics and biodegradation of organic matter in the soil, as observed by Sinha *et al.* (2014).

Number of leaves

Table (2); represent the comparison table showing the least significant difference between the treatment and control, using fisher's protected least significant difference test to determine the effect of organic biofertilizer on number of leaves of sorghum.
From table (1), it showed that at 6DAS, there was statistical significant difference between the treatment (organic biofertilizer) and control (without treatment), but at 8DAS there was no statistical significant difference between the treatment (organic biofertilizer) and control (without treatment), but also at 10DAS still there was statistical significant difference between the treatment (organic biofertilizer) and control (without treatment), but at 12DAS and 14DAS was no statistical significant difference between the treatment (organic biofertilizer) and control (without treatment).
The differences in number of leaves in treated and untreated sorghum plant was observed toward the end of the research, and this can be because when organic biofertilizers are applied as seed or soil inoculants, they multiply and participate in nutrient cycling and benefit crop productivity as observed by Singh *et al.*, 2011.

CONCLUSION

The Biofertilizer produced significantly increased the number of leaves, leave area index, growth parameters considered
Therefore, the production of organic biofertilizer is an excellent waste recycling mehod and can be used as a Biofertilizer

ACKNOWLEDGEMENT

We want to extend our profound gratitude to the management of Federal University Dutsin-Ma, the Directorate of Research and Development of the University and the Tertiary Institutions Fund (TETFUND) for funding this research work.

REFERENCES

Abdel-Lateif, K, Bogusz, D, Hocher V. (2012). The role of flavonoids in the establishment of plant roots endosymbioses with arbuscular mycorrhiza fungi, rhizobia and Frankia bacteria. *Plant Signal Behav*, 7:636–641.

Adesemoye, A.O. &Kloepper J.W. (2009). Plant-microbes interactions in enhanced fertilizer-use efficiency. *Appl Microbiol Biotechnol* 2009, 85:1–12.

Ambrosini, A, Beneduzi, A., Stefanski T, Pinheiro F, Vargas L. & Passaglia L. (2012) Screening of plant growth promoting Rhizobacteria isolated from sunflower Helianthus annuus L. Plant & Soil, 356:245–264.

Araujo, A. S.F., Santos VB, Monteiro R.T.R. (2008) Responses of soil microbial biomass and activity for practices of organic and conventional farming systems in Piauistate, Brazil. *Eur J Soil Biol* 2008, 44:225–230.

Chaurasia, A.K. & Apte, S.K.(2011). Improved eco-friendly recombinant Anabaena sp.strain PCC7120 with enhanced nitrogen biofertilizer potential.*Appl Environ Microbiol* 77:395–399.

Dastager SG, Deepa CK, Pandey A: Isolation and characterization of novel plant growth promoting Micrococcus sp NII-0909 and its interaction with cowpea. *Plant Physiol Biochem* 2010, 48:987–992.

Megali, L, Glauser, G. & Rasmann, S.(2013) Fertilization with beneficial microorganisms decreases tomato defenses against insect pests. Agron Sustain Dev, doi:10.1007/s13593-013-0187-0.

Mohammadi, K, Yousef Sohrabi Y. (2012). Bacterial Biofertilizers for sustainablecrop production: A review. *J Agric Biol Sci* 2012, 7:307–316.

Sahoo, R.K, Ansari, M.W., Pradhan, M, Dangar, T.K., Mohanty, S. and Tuteja, N. (2014). Phenotypic and molecular characterization of efficient native *Azospirillum* strains from rice fields for crop improvement. *Protoplasma* 201-203.

Santos, V.B, Araujo, S.F, Leite L.F, Nunes, L.A, Melo, J.W. (2012). Soil microbial biomass and organic matter fractions during transition from conventional to organic farming systems. Geoderma 2012, 170:227–231.

Sinha, R. K., Valani, D, Chauhan, K. and Agarwal, S. (2014). Embarking on a second green revolution for sustainable agriculture by vermiculture biotechnology using earthworms: reviving the dreams of Sir Charles Darwin. *Int J Agric Health Saf* , 1:50–64.

Singh, J.S., Pandey, V.C., Singh, D.P. (2011). Efficient soil microorganisms: a new dimension for sustainable agriculture andenvironmental development. *Agric Ecosyst Environ*, 140:339–353

Pindi, P.K. and Satyanarayana, S.D.V. (2012). Liquid microbial consortium- a potential tool for sustainable soil health. J Biofertil Biopest 2012, 3:4.

Ogbo, F.C. (2010). Conversion of cassava wastes for biofertilizer production using phosphate solubilizing fungi. *Bioresour Technol*, 101:4120–4124.

Park, J., Bolan, N., Megharaj, M. and Naidu, R. (2010). Isolation of Phosphate-Solubilizing Bacteria and characterization of their Effects on Lead Immobilization. *Pedologist*, 53:67–75.

Lamabam, P.S., Gill, S.S. and Tuteja, N. (2011). Unraveling the role of fungal symbionts in plant abiotic stress tolerance. *Plant Signal Behav* 2011, 6:175–191.

Smith, S., Lakobsen, I., Gronlund, M. and Smith, F.A.(2011). Roles of arbuscular mycorrhizas in plant phosphorus nutrition: interactions between pathways of phosphorus uptake in arbuscular mycorrhizal roots have important implications for understanding and manipulating plant phosphorus acquisition. *Plant Physiol*, 156:1050–1057.

Roy, M., Srivastava, R.C.(2013). Assembling BNF system in rice plant: *frontier areasof research. Curr* Sci 2013, 104:3–10.

Venkataraman, G.S. & Neelakantan, S. (2016). Effect of cellular constituents of the nitrogen fixing blue-green algae. Cylindrospermum nusciola on the root growth of rice seedlings. *Journal of General Appl Microbiol*, 13:53–61.

Youssef, M.M.A, Eissa, M.F.M.(2014). Biofertilizers and their role in management of plant parasitic nematodes. A review. *E3 J Biotechnol. Pharm Res* 2014, 5:1–6.

Raja, N. (2013). Biopesticides and biofertilizers: ecofriendly sources for sustainable agriculture. *J. Biofertil Biopestici* 2013, 1000e112:1000e112.

Pandey, S, Shrivastava, A.K., Rai, R. and Rai, L.C. (2013). Molecular characterization ofAlr1105 a novel arsenate reductase of the diazotrophic cyanobacteriumAnabaena sp. PCC7120 and decoding its role in abiotic stressmanagement in *Escherichia coli. Plant Mol Biol*, 83:417–432.

Paul, D., Nair, S. (2008). Stress adaptations in a plant growth promoting Rhizobacterium (PGPR) with increasing salinity in the coastal agricultural soils. *J Basic Microbiol*, 48:1–7.

Yao, L., Wu, Z., Zheng, Y., Kaleem, I. and Li, C. (2010).Growth promotion and protection against salt stress by Pseudomonas putida Rs-198 on cotton. *European J Soil Biol*, 46:49–54.

Toussaint, J.P., Kraml, M., Nell, M., Smith, S.E. & Smith, F.A. (2008). Effect of Glomus mosseae on concentrations of rosmarinic and caffeic acids and essential oil compounds in basil inoculated with *Fusarium oxysporum*. *Plant Pathology journal*, 57:1109–1116.