

Study the Effects of Vermicompost Prepared by Decoction Tea Powder on *Abelmoschus esculentus*

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ABSTRACT- The present study was carried on *Abelmoschus esculentus* (*A. esculentus*) by using the vermicompost. The decoction tea powder is wasted wet garbage and discarded on the dumping ground. It generally creates environmental pollution. This wet garbage can be used as a good source of nutrients to the vegetable crop plants. The research is carried out by preparing vermicompost using 75% decoction tea powder and 25% mixture of black soil, cow dung, leaf litter and little vermicompost. The compost prepared by using decoction tea powder has increased concentration of necessary nutrients such as pH, minerals, organic carbon (O.C.), total phosphorus, potassium, calcium, magnesium and sodium required for vegetable crop plants for its development. In present investigation by applying this compost, Electrical conductivity was decreased by 9.51%, O.C. 89.30%, total phosphorus 26.09%, potassium 1.0%, Mg and Na by 43.17% shows a significant increase in absorption. It is also observed that the germination period decreases whereas height of stem, leaf area, flowering and fruits were developed earlier than control soil.

Key-words- *A. esculentus*, Biological resistance, Decoction tea powder, Green revolution, Vermicompost

INTRODUCTION

The 'green revolution', in the 1960-70's came as a 'mixed blessing' for mankind. There found a dominant tendency to use chemical fertilizers for the better crop yield. Undoubtedly we got better results of it. It boosted food productivity, but it robs the fertility of farm land and created environmental problems. It dramatically increased the 'quantity' of the food produced but decreased its 'nutritional quality' and also the 'soil fertility' over the years. It killed the beneficial soil organisms which help in renewing natural fertility. It also impaired the power of 'biological resistance' in crops making them more susceptible to pests and diseases. As a result, the farm soil lost its physical, chemical and biological properties so much so that the farmers are complaining of the decrease in soil fertility and occurrence of multi-nutrient deficiency. The soil which was once well supplied with available nutrients, are now gradually becoming deficient ^[1]. Over the years it has worked like a 'slow poison' for the soil with a serious 'withdrawal symptoms'.

The excessive use of 'nitrogenous fertilizer' (urea) has also led to increasing in the level of 'inorganic nitrogen' content in groundwater (through leaching effects) and in the human food with grave consequences for the human health. Chemically grown foods have adversely affected human health. In order to enhance the soil fertility which is decreasing day by day, agricultural scientists are suggesting various means and ways like vermicompost, green manure, desi cow dung etc. The application of vermicompost is very much there in practice for a long time. Vermicompost is rich in NKP (nitrogen 2–3%, potassium 1.85-2.25% and phosphorus 1.55–2.25%), micronutrients and beneficial soil microbes. It also contains 'plant growth hormones & enzymes'. It is scientifically proving as 'miracle growth promoter & also plant protector' from pests and diseases. Vermicompost retains nutrients for long time than the conventional compost ^[2]. Vermicompost is a safe and non polluting conversion of organic wastage into organic manures which is cost effective and contains plant nutrients in available form ^[3].

In the present study, focus is laid down on the preparation of vermicompost by using decoction tea powder. Vermicompost, prepared with such method has a rich source of nutrients such as minerals, phosphorus, potassium, calcium, magnesium and sodium along with organic carbon. As a result, it increases the water holding capacity and also crop production. The basic purpose of

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this experiment was to evaluate the chemical properties of vermicompost prepared by using decoction tea powder and its effects on the growth of *A. esculentus*.

MATERIALS AND METHODS

The experiment was conducted during the rainy seasons (Kharif) of 2016 at a farmer field lies in Jamner- Tahsil of Jalgaon-District, (M.S.) India on 20°49' North latitude and 75°47' East longitude. The decoction tea used for experiment was collected from tea stalls of the town in wet form. Every day 30–40 Kg tea powder was dumped and partially decomposed. Vermicompost was prepared by using 75% decoction tea powder and 25% mixture of leaf litter, pieces of banana stem, black soil and cow dung as a food of earthworm (*Eisenia foetida*). The partially decomposed waste lay down in the vermicompost pit having a size of 15X15 feet. The pit was covered with gunny bags. Earthworms (*E. foetida*) having voracious capacity of feeding, were selected. Five kilograms earthworms were laid down on the partially decomposed material. The loose bed was maintained to enable easy movement of earthworms. The moisture content of the food sources was maintained 60–70% by sprinkling tap water regularly at room temperature but avoid the fog. The precautionary measures were taken to avoid the entry of natural enemies like ant, termites, frog, snake and rat by using nylon net. A small hole was made on the sides of the container for ventilation. After 7–8 weeks the compost was prepared. The compost and the control soil were analyzed, for its physico-chemical properties using the following analytical methods (Table 1) [4].

A. esculentus plants were grown in plots involving ten replications; net plot size was 6 X 4 meter. Following treatments were organized. Each plot is divided into two test plots. One section as control means no vermicompost (C) and experimental with 100 % vermicompost (E) with spacing 10 feet. The efficiency of the compost was checked by using physic-chemical methods of soil. Growth parameters such as seed germination, length of the stem, the width of leaves, flower bud initiation, flower formation and duration of time of fruit were studied.

Table 1: Methods of Physio-chemical of soil [4]

S. No	Parameters	Methods
1	pH	Digital pH meter
2	Minerals	Conductivity bridge
3	Organic Carbon	Walkley & Black method
4	Total Phosphorus	Olsen-P method
5	Potassium	Flame photometer (1954), Exchangeable method
6	Calcium	EDTA method
7	Magnesium	EDTA method
8	Sodium	Flame photometry

Statistical Analyses- The collected data were analyzed statistically with ANOVA one way difference test at 0.05 probability levels to find the significant difference in the parameters studied between soil samples.

RESULTS AND DISCUSSION

The effect of vermicompost on growth parameters of selected vegetable plant namely *A. esculentus* was studied. Physico-chemical nutrients properties of control soil and vermicompost were analyzed and presented in Table 3. Significant results were observed in EC, organic carbon, total Phosphorus, potassium, magnesium and sodium. Germination and growth pattern of *A. esculentus* plant was observed in control soil and in vermicompost from germination of seeds till the flowering and fruiting. It was recorded and presented in Table 4. Seed germination period, height of stem, width of leaves, flower and fruiting period were significantly observed in farm soil and vermicompost. The morphological features were observed 74 days till fruiting, recorded and presented in Table 4. In the present investigation, physico-chemical analysis of vermicompost, and control soil showed significant level. It is observed that the vermicompost had a neutral pH (7.3), EC 0.673 mmhos/cm, O.C 0.935%, total phosphorus 44.07 kg/ha, potassium 332.94, Mg 0.69% and Na 0.69%. These findings were agreed with recent reports [5]. It was demonstrated that during the vermicompost of some crop residue mixed with cattle dung resulted in an increase in total 'N' (91–144%), available 'P' (63–105%) and exchangeable 'K' (45–90%) content of it [6]. In the present study *A. esculentus* vegetable crop was selected to check the efficiency of vermicompost. Being a short duration crop its growth and yield were largely influenced by appropriate management practices. Researchers show that the cost invested in inorganic fertilizer can be reduced to a great extent by the application of plant nutrients through organic sources. This would increase nutrient use efficiency, soil fertility, besides enhancing crop production as well as quality. Therefore, the present trial was carried out to determine Physico-chemical status of vermicompost prepared by decoction tea powder for better yield and income of *A. esculentus*. The field soil and vermicompost made was analyzed for the following parameters.

Table 3 shows that the Physico-chemical analysis of Field soil and vermicompost and mean values of parameters. The experimental results revealed that the growth parameters were influenced positively by the application of vermicompost in *A. esculentus*. F statistical value is much greater than the F critical value; P is 0.05 for the parameters EC, O.C. total Phosphorus Potassium, Magnesium and Sodium. The results revealed that there was a significant difference between means at $P \leq 0.05$ (Table 2).

Table 2: Following F values are calculated for different parameters at P=0.05

Parameters	pH	E.C (mmhos/cm)	Organic Carbon %	Total Phosphorus (Kg/ha)	Potassium (Kg/ha)	Calcium %	Magnesium %	Sodium %
'F' Critical	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87
'F' Statistical	1.49	27.39	1936.77	77.86	153.70	0.0	336.36	268.62

Table 3: Physico-chemical analysis of Field soil and vermicompost

Sr.	Parameters	Farm Soil	Control	Vermi- compost	Exptal	Std. Dev	Std. Error
1	pH	7.3	7.1	7.3	7.1	0.302	±0.095
2	EC (mmhos/cm)	0.599	0.553	0.673	0.609	0.030	±0.096
3	Organic Carbon %	0.845	0.265	0.935	0.1	0.0302	±0.0095
4	Total Phosphorus Kg/ha	31.91	23.81	44.07	32.57	3.03	± 0.957
5	Potassium Kg/ha	311.96	310.36	332.94	329.6	3.028	± 0.957
6	Calcium %	0.039	0.039	0.039	0.039	0.003	±0.001
7	Magnesium %	0.039	0.029	0.069	0.039	0.003	±0.001
8	Sodium %	0.049	0.034	0.069	0.039	0.003	±0.001

Table 4: Morphological feature of the *Abelmoschus esculentus* plant

Date	Seed ger. in hrs		Length of steam (cm)		Width of leaf (cm)		Flowers and fruits	
	Control	Expt.	Control	Exp.	Control	Exp.	Control	Expt.
05-07-16	96	72	-	-	-	-	-	-
29-07-16	-	-	4	11	1.5	2.5	-	-
05-08-16	-	-	6	15	2.5	3.5	-	-
12-08-16	-	-	9	18	3.5	6	-	-
19-08-16	-	-	12	21	4.5	7.2	-	-
26-08-16	-	-	15	23	5.8	8	-	-
02-09-16	-	-	19	27	5.8	8	-	Flower buds
09-09-16	-	-	21	32	5.8	8	-	Flowers
16-09-16	-	-	24	38	5.8	8	Flowers	<i>A. esculentus</i>

pH- The level of pH was very similar in vermicompost as well as in control soils. It was neutral as 7.1 in both. The pH of both control soil and experimental soil decreased by 2.7% and shown insignificant change. *A. esculentus* performs best in well-drained, fertile soils in full sun. Avoid wet, poorly drained sites. Soil pH is generally not a problem as *A. esculentus* grows well in soils that are slightly acidic to slightly alkaline (pH 6.5 to 7.5).

Electrical Conductivity (EC)- Electrical conductivity measured in control soil 0.553 while in experimental soil was 0.609 mmhos/cm. Electrical Conductivity estimates the concentration of soluble salts in the soil. Very high Electrical conductivity indicated higher concentration of soluble salts in the soil and is undesirable for the growth of most plants.

Organic Carbon (O.C.)- Organic carbon in control soil was measured 0.265 % while in the experimental soil it was 0.1%. It means O.C. in control soil was absorbed 68.24 % while in experimental 89.30 % absorbed. The result showed that vermicompost helps in absorption of organic carbon into the plant.

Total Phosphorus- Total Phosphorus was observed 23.81 while in experimental soil 32.57 Kg/ha. It means total phosphorous in control soil was absorbed 25.38 % while in experimental, it was 26.09 %. The result indicates phosphorous enrichment in the soil due to vermicompost. Phosphorus can influence fruiting and fruit developments of crops and proves to be a key to life because it is directly involved in the most living process. Phosphorus is a key constituent of ATP, which transforms energy to the plant. Phosphorus is a constituent of protein, enzyme, and chlorophyll which might have been helpful in the development of better infrastructure of plants through increased branching and vegetative growth. Phosphorus takes part in various physiological processes and helps in nutrients uptake by promoting root growth and thereby ensuring a good pod yield.

Potassium- Potassium was observed 310.36 in control while in experimental soil 329.6 Kg/ha. It means potassium in control soil was absorbed 0.51 % while in experimental 1 % absorbed. Potassium is an activator of many enzymes such a DNA polymerase, starch polymerase. It maintains permeability and hydration. It also influences translocation chlorophyll formation.

Calcium- It wasn't absorbed in control and experimental soil. No change was observed.

Magnesium- In control soil, the magnesium was 0.029% while in experimental it was 0.003%. The percentage of absorption in control soil was observed to be 25.32 % while in experimental it was 43.17 %. It helps in chlorophyll synthesis, metabolism of phosphorus, enzyme of carbohydrate metabolism, nucleic acid synthesis, and ATP synthesis required Mg as an activator.

Sodium- In control, soil sodium was 0.034 % while in experimental it was 0.003 %. The percentage absorption in control soil was observed to be 30.3 % while in experimental it was 43.17 %. It played a role in the synthesis of a nucleoprotein by regulating the transport of amino acids to the nucleus. Sodium involves nitrate reductase activities and also maintains the water balance in the plant (Table 5).

Table 5: Percentage of absorption level in control soil and vermicompost

S. No	Parameters	Control Soil	Experimental
1	pH	2.7 % decrease	2.7 % decrease
2	E.C. (mmhos/cm)	.68 % decreased	9.51 % decreased
3	Organic Carbon %	68.64 % absorption	89.30 % absorption
4	Total Phosphorus (Kg/ha)	25.38 % absorption	26.09 absorption
5	Potassium (Kg/ha)	0.51 % absorption	1 % absorption
6	Calcium %	0.0 %	0.0 %
7	Magnesium %	25.32 % absorption	43.17 % absorption
8	Sodium %	30.3 % absorption	43.17 % absorption

Effect on seed germination- In control, the seeds germinated in 96 hours while in experimental in 72 hours. High temperature and/or high seed moisture contents were the two major factors that affect the seed germination. Increased percentage of seed germination together with shoot and root length were reported in chilli and tomato grown in vermicompost amended soil compared to those grown in control red soil^[7].

The morphological feature of the plant was also seen to have a significant increase in stem length and leaf width (Table 4).

Stem length- The present investigation showed an increase in stem length. It was found that vermicompost treated plant showed highly significant effects on stem length in Table 4. It may be due to higher amount of phosphorus having greater availability of salt like phosphate, and potash which significantly increase plant height. An observation regarding plant height was in close conformity with the finding^[8]. It was reported that the addition of vermicompost increased plant heights and yield of tomato (*Lycopersicum esculentum*) significantly which confirms the results of the present study^[9]. The above findings are in collaboration with the findings of the number of workers^[10-13].

Leaf area- Tremendous increased in the leaf area of *A. esculentus* grown in vermicompost amended soil was reported [14].

Flowering- In the present study, in control, the flowers buds are produced within 60 days, flowering in 65–67 days. In experimental (vermicompost) the flowers grew near about 10–14 days earlier than the control soil. Early flowering may be due to integration effect as vermicompost have soil microbes, nitrogen-fixing bacteria, phosphate solubilizing bacteria and growth hormones auxin, gibberellins, and cytokinins, which influences and enhance the efficiency of nitrogen greater than that of chemical fertilizer, which influence early flowering.

Early fruiting- In the present investigation, early fruiting might be due to the supplementation of micronutrients by nitrogen, phosphorus and potassium in inorganic besides the growth effect of vermicompost in *A. esculentus*. The increase in fresh pod weight of *A. esculentus* due to poultry manure and sowing date could be attributed to easy solubilization effect and sowing *A. esculentus* at the right time when moisture in the soil was adequate which enhanced the released of plant nutrients leading to improved nutrient status and water holding capacity of the soil. The results obtained were in agreement with the findings in which reported that higher yield response of crops due to organic manure application could be attributed to improved physical and biological properties of the soil resulting in better supply of nutrients to the plants [15-18].

The 'Green Revolution' in the 1960s and 70s ushered by the heavy use of agrochemicals, increased food production but also created several socio-economic and environmental problems like decreased nutritional quality of food produced, decreased soil fertility, higher demand for water for irrigation, soil and water pollution and pesticide poisonings [16,17]. It was also reported that indiscriminate use of chemical fertilizers in the wake of Green Revolution in Punjab has pushed the State to the brink of health hazards like 'blue baby syndrome' and cancer. To preserved global agro-ecosystems and protect human health from the harmful agrochemicals 'Ecological Agriculture and Organic Farming' has to be promoted [18]. Ecological agriculture is relatively more sustainable, and it could be an economically and environmentally viable alternative to the destructive chemical agriculture [19,20]. The use of chemical fertilizers for a long time has resulted in poor soil health; reduce production and enhance the disease and pest infestation [21]. The effective utilization of 'biological fertilizers' for vegetable crops will not only provide economic benefits to the farmers but also improve and maintain the soil fertility and sustainability in natural soil ecosystem [22]. Thus the rationale of the study is to establish a sustainable method of horticulture with the use of vermicompost replacing chemical fertilizers.

Vermicompost is a source of micro and macro nutrients and acts as a chelating agent. It could be suggested that

the better yield in all the plants tested may be due to the influence of the combined effect of various ingredients of vermicompost such as macro and micro nutrients and plant growth hormones [23]. Vermicompost contained most nutrients in plant available forms such as nitrates, phosphates, and exchangeable calcium and soluble potassium [24]. Vermicompost has been shown to have high levels of total and available nitrogen, phosphorous, potassium (NPK) and micro nutrients, microbial and enzyme activities and growth regulators and continuous and adequate use with proper management can increase soil organic carbon, soil water retention and transmission and improvement in other physical properties of soil like bulk density, penetration resistance and aggregation [25,26]. The vermicompost provides dual benefits by making good use of wet garbage thereby reducing the environmental pollution along with the provision of healthy organic vegetables. The increased in plant height of *A. esculentus* due to organic manure and sowing date could be due to the contribution made by manure to increased in fertility status of the soil and adequate moisture; as there was low moisture in it [15,27,28]. Manure when decomposed increases both macronutrients and micronutrients as well as enhances the physical and chemical properties of the soil [15]. This could have led to its high vegetative growth [15]. Application of organic manure and sowing date had a significant effect on plant height, number of leaves/plant, number of branches/plant, leaf area /plant, number of pods /plant and pod yield/ plot of *A. esculentus* [29]. The increase in plant height of *A. esculentus* due to organic manure and sowing date could be due to the contribution made by manure to increase fertility status of the soil and adequate moisture; as there was low moisture in it [15,27,28]. Manure when decomposed increases both macro and micro nutrients as well as enhances the physical and chemical properties of the soil [15]. This could have led to its high vegetative growth [15]. The increase in number of leaves per plant with organic fertilizer application and sowing date stressed its importance during the vegetative growth of plants [15,30].

CONCLUSIONS

Improvement of soil fertility was increased by using vermicompost made by decoction tea powder. It also observed that it enhanced the growth of stem, leaves, and flowers of *Abelmoschus esculentus*. In experimental plants, flowers and fruits grew faster and matured earlier than the control plant. Thus we can conclude that farmers can get better yields in lesser time which ultimately results in increase in profits. The preparation of vermicompost from decoction tea powder has profound implications in solid waste management. It eventually reduces environmental pollution. Due to vermicompost minerals, phosphorus, potassium and calcium elevated significantly which is helpful for the needy crop, thus no need of chemical fertilizers. It ultimately increases the fertility of the soil and reduces the cost of production. It has directly benefits to the farmers.

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REFERENCES

- [1] Zia MS, Nizami MI, Salim M. Problems of soil degradation in Pakistan. In the collection of land degradation data. Report of the expert consultation on the Asian network on problem soils. RAPA Publication: 1994/3. Regional office for Asia and the Pacific. Food and Agriculture Organization of the United Nations. Bangkok. Thailand, 1994; pp. 179-202.
- [2] Sinha RK. The wonders of earthworms & its vermicompost in farm production: Charles Darwin's 'friends of farmers', with potential to replace destructive chemical fertilizers from agriculture J. Agric. Sci., 2010; 1(2): 76-94.
- [3] Narkhede SD, Attarde SB, and Ingle ST. Study on effect of chemical fertilizer and vermicompost on growth of Chilli paper (*Capsicum annum*). J. Appl. Sci. Environ. Sanita., 2011; 6(30): 327-32.
- [4] Trivedi RK, Goel PK. Chemical and Biological methods for water pollution studies. Environmental Publications, 1986.
- [5] Manyuchi MM, Phiri A and Muredzi P. Effect of vermicompost, vermin wash and application time on soil micronutrients composition. Int. J. Eng. Adv. Technol., 2013; 2(5): 2249-58.
- [6] Suthar S, Singh P. Effect of vermicompost and composted farmyard manure on growth and yield of garlic (*Allium stivum* L.) field crop, 2008.
- [7] Sajani J. Effect of vermicompost on germinations and growth of tomato and chili. M. Phil. dissertation submitted to Bharathidasan University, Tiruchirapalli, Tamil Nadu, India, 2005.
- [8] Ansari AA, Sukhraj K. Effect of vermin wash and vermicompost on soil parameter and productivity of *A. esculentus* in Guyana. African J. Agric. Res., 2010; 5(4): 1994-98.
- [9] Gutierrez M, Federico A, Santiago-B, Jorge MM, Joaquin A, Carlos N, et al. Vermicompost as a soil supplement to improve growth, yield and fruit quality of tomato (*Lycopersicum esculentum*. Bioresource Technol., 2007; 98(15): 2781-86.
- [10] Sujatha K, Mahalakshmi A, Shenbagaratha R. Biotransformation of kitchen waste into compost by earthworm and microbes and its performance on the growth of tomato and chili. Nature Environ. Pollution Tech., 2003; 2(1): 53-56.
- [11] Thangavel P, Balagurunathan R, Divakaran J, and Prabhakaran J. Effect of vermiwash and vermicast extract on soil nutrient status, growth and yield of paddy. Adv. Plant Sci., 2003; 47(1): 50-53.
- [12] Shivasubramanian K, Ganesh KM. Influence on biological productivity of Madras Agrl. Jr., 2004; 91: 221-25.
- [13] Sajani J. Effect of vermicompost on germinations and growth of tomato and chili. M. Phil., dissertation submitted to Bharathidasan University, Tiruchirapalli, Tamil Nadu, India, 2005.
- [14] Sivapandian V, Sathish kumar N, Nithya S, Annapoorinai C, Premalatha Z, Jayaprakesh P, Ramaswamy M. Effect of vermicompost of leaf litter and paddy straw on some parameters of vegetative growth and fruiting in vegetable plant (*A. esculentus*), *Hibiscus esculentus* (L) (Var. TKM). In proceeding of National conference on Environmental science and Engineering in India, held at Bharathiar university, Tamil Nadu, India, 15th-17th 2005; pp. 67-68.
- [15] Tiamiyu RA, Ahmed HG, Muhammad AS. Effect of sources of organic manure on growth and yield of *A. esculentus* (*Abelmoschus esculentus* (L.) Moench) in Sokoto, Nigeria. Nigerian J. Basic Applied Sci., 2012; 20(3): 213-16.
- [16] Sinha RK. Embarking on the Second Green Revolution for Sustainable Agriculture in India: A Judicious Mix of Traditional Wisdom and Modern Knowledge in Ecological Farming. J. Agricultural Environmental Ethics, 1998; 10: 183-97.
- [17] Sinha RK, Herat S, Valani D, and Chauhan K. Vermiculture and Sustainable Agriculture. American-Eurasian J. Agricultural aEnvironmental Sci., 2009; 5(S): 1-55.
- [18] Gomiero T, Paoletti MG, Pimentel, D. Energy and Environmental Issues in Organic and Conventional Agriculture. Critical Rev. Plant Sci., 2008; 27(4):239-254.
- [19] Rasul G, Thapa GB. Sustainability Analysis of Ecological and Conventional Agricultural Systems in Bangladesh. World Development, 2003; 31(10): 1721-41.
- [20] Sinha RK. Vermiculture for Sustainable Agriculture. Sustainable Agriculture, 2004; pp. 370.
- [21] Ansari AA, Ismail SA. A case study of organic farming in Uttar Pradesh. J. Soil Bio. Ecol, 2001; 27: 25-27.
- [22] Kannaiyan P. Role of Biological Fertilizers, Biopesticides, and There Quality Control in vegetable Production', Proceedings of International conference on vegetables. November 11-14, Bangalore, India, 2002; pp. 461-89.
- [23] Dhanalakshmi V, Remia KM, Shanmugapriyan R, Shanthi K. Impact of addition of Vermicompost on Vegetable Plant Growth, Int. Res. J. Biological. Sci., 2014; 3(12): 56-61.
- [24] Orozco FH, Cegarra J, Trvjillo LM and Roig A. Vermicomposting of coffee pulp using the earthworm *Eisenia foetida*: effects on C and N contents and the availability of nutrients. Biology and Fertility of Soil, 1996; 22: 162-16.
- [25] Parthasarathi K, Ranganathan LS. Longevity of microbial and enzyme activities and their influence on NPK content in pressmud vermicasts. Europ. J. Soil Biol, 1999; 35(3): 107-13.
- [26] Chaoui I, Zibiliske M, Ohno T. Effects of earthworm casts and compost on soil microbial activity and plant nutrient availability. Soil Biology and Biochemistry, 2003; 35: 295-302.
- [27] Dilruba S, Mizra H, Karim R, Kamrun N. Yield response of okra to different sowing time an application of growth hormones. Ornamental. Journal of Horticultural Science & Ornamental Plants, 2009; 1(1): 10-14.
- [28] Ijoyah MO. Productivity of *A. esculentus* to varying sowing date in Makurdi, Nigeria. Journal of Applied Biosciences, 2010(32): 2015-19.
- [29] Mahmoud BA, Hamma IL, Saidu MS, Hayatudden MA. Effect of organic manure and sowing date on the growth and yield of *A. esculentus* (*Abelmoschus esculentus* Moench). International Journal of Agronomy and Agricultural Research, 2014; 5(5): 111-17.

- [30] Kolo E, Takim FO, Fadayomi O. Influence of planting date and weed management practice on weed emergence, growth and yield of maize in southern guinea savanna of Nigeria. *J. Agriculture Biodiversity Res.*, 2012; 1(3): 33-42.

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