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Impact of Decomposing Culture and Cow Dung on Different Nutrients of Poultry Waste

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Abstract: ***Poultry litter is used as a natural fertilizer. Because of its high nutrient value, poultry waste is used as a bio-fertilizer in agricultural crops. But poultry farmers after liquidation of the scheme, they dump waste at one place in the farm as land filling, which cause harmful effects on environment. It is important to understand nutrient content of poultry manure, which includes various macro and micro nutrients present in litter after recycling the manure .The poultry litter, provides a major source of nitrogen, phosphorous, potassium and other micro elements needs for crop production. In the present study, after decomposing the poultry waste for the duration of 45 days using cow dung resulted enrichment of macro and micro nutrients. This is the viable alternative for solid waste management of animal waste from rural or urban areas.***

Keywords: Poultry waste, Decomposing culture, Compost

1. Introduction

Poultry is one of the fastest growing industries from our country. India is considered as fifth largest egg producing country (www.fao.org). The majority states include Andhra Pradesh, Tamilnadu and Maharashtra producing 70% of total egg production of India. Following are some top poultry industries in India: Venkateshwara Group,Pune, Suguna Poultry Farm Ltd., Coimbatore, Godrege Agrovet Ltd. ,Mumbai, Poineer Poultry Group ,Coimbatore ,Sky Lark Group, North India (www.indiamirror.com/indian-industries/poultry.html). Solapur district in Maharashtra is not only famous for sugarcane yielding but also surrounded by various poultry farms which are involved in the production of eggs and meat in the large quantity. As a small scale industry the poultry farms are giving employment for laborers. One of the byproduct of poultry industry is the poultry litter which is deposited every day in the large quantity and its management is becoming major problem for poultry farmers.

The poultry farms producing huge quantity of waste mainly the excreta along with feather waste, broken egg shells etc. (John Cassius Moreki and Teto Keaikitse, 2013). Bolan *et al., (*2010) studied poultry litter management and its use. They have recommended that this litter is a good organic source for improving crops. It is important to understand the amount of essential components like nitrogen, phosphorous, potassium, calcium, magnesium, sodium, chloride, C: N ratio, pH, electricity conductivity and moisture from the animal waste. All these contents are essential for agricultural crops. Arbab Khan (2006) studied a detailed account on poultry litter nutrient composition. Andrew Sharpley *et al.,* (FSA9529) studied the nutrient analysis of poultry litter and analyzed moisture, pH, nitrogen, potassium, phosphorous, calcium and organic carbon. In the present investigation an attempt has been made to understand the nutrient content of poultry manure without decomposing and after decomposing with the help of commercial DC culture available in the market and natural decomposer in the form of cow dung.

2. Aim and Objective

The main aim of this study is to recycle the poultry waste by using scientific methods for proper management of waste.
The objectives are:

1) To convert the poultry litter into compost by using cow dung and commercial decomposing culture and
2) To study the physico–chemical parameters of compost.

3. Materials and Methods

Study Area

Nearby Solapur there are different poultry farms located in the vicinity of 30 kms. Reddy's poultry farm near Itkal village was selected for our study.

Collection of samples

Raw poultry litter was collected from Itkal poultry farm during June 2015. Initially it was wet and mixed with other poultry wastes like feathers of birds, food insects etc. About one ton of litter was collected for our study.

Preparation of Sample

Collected sample was sundried on open land for 3-4 months after that other wastes were removed. The cleaned raw litter was grinded in Monica fertilizer Mill, Itkal, Solapur district with the help of electronic grinder.

Experimental setup

The decomposition experiments were conducted by heap and pot method in agricultural farm. The earthen pots of 20kg capacity were used while heaps of sizes 2×1×0.5 m were made for experiment. Heaps were layered by pebbles, straws, soil, ORM (original raw material) etc. as per the standard methods. (Ankaram 2013).

Both pots and heaps were loaded with ORM and decomposing cultures in 5:1 ratio. Concurrent control was run simultaneously. All experiments were carried out in triplicates. The experimental groups were as follow:

- POT A - Original raw material (poultry litter) - control
- POT B - ORM +DC (decomposing culture) - pot method

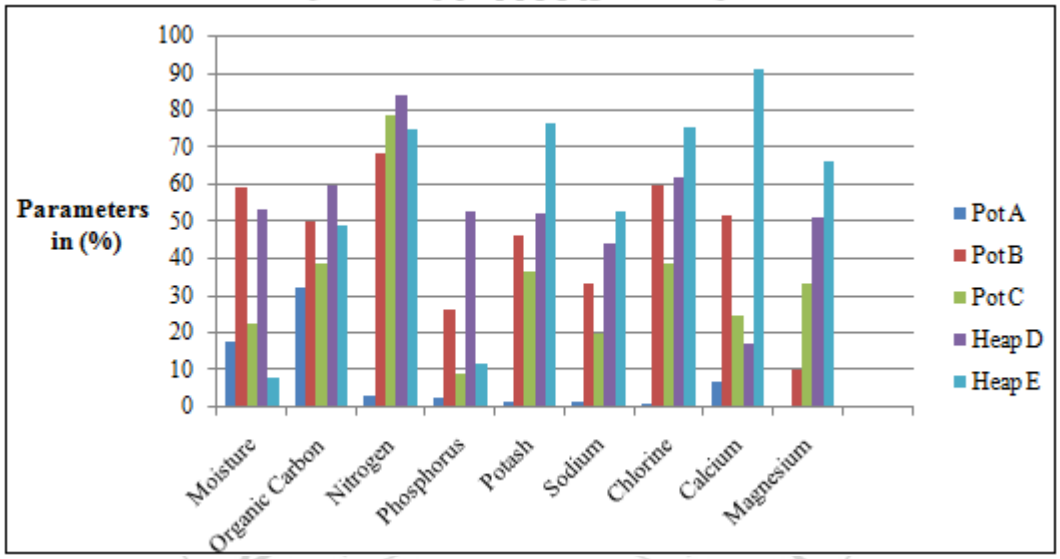
- POT C - ORM + CD (cow dung) - pot method
- HEAP D - ORM + DC (decomposing culture) - heap method
- HEAP E - ORM + CD (cow dung) - heap method

The mixtures were kept for decomposition by maintaining the moisture at 60%-70% for 45 days. After completion of decomposing period samples were collected and analyzed physico-chemical parameters. pH was recorded by using pH meter (CyberScan 300). After recording of pH the suspension was kept as it is for one hour and electrical conductivity was measured after settling of suspension at the bottom of flask (Elico, CM-183EC-TDS). For determination of moisture weighed sample was placed in oven at 105^0C for 24 hours and after heating it was weighed again. The difference between weight of sample before and after drying gave the percent moisture.

Total organic carbon was estimated by wet oxidation redox titration method (Jackson, 1962). Available nitrogen was determined by microkjeldhal method (Jackson, 1975). Percentage of Phosphorous was calculated by Olsen's method (Olsen et al., 1954) and read on blue filter by spectrophotometer. Potassium and sodium were estimated by flame photometric neutral ammonium acetate method(APHA,1998).Magnesium was determined by DTPA (Diethylene triamine penta acetic acid) extraction and estimation by AAS (Atomic absorption spectroscopy) (Shimadzu AA 7000). Chloride was estimated by Argentometric titration method. All the readings were taken in three recordings for confirmation and standardization of results. (Ankaram 2013).

4. Result

Our result on nutrient value of poultry manure is summarized in graph 1.



Graph 1: Overall nutrients analysis from different sets of experiment after duration of 45 days

Majority of components analyzed from five different sets of experiments carried out for 45 days. The moisture content from pot B, C, heap D increased when compared with original raw material. The organic carbon overall increased from pot B, C, heap D and heap E. The nitrogen content was substantially increased from all experimental groups; however ORM +DC in the heap harvesting showed maximum increase. Phosphorous showed increasing trends from all experimental groups. Heap D showed maximum increasing trends as was the case with nitrogen. Potash showed similar increasing pattern likewise sodium, chloride, calcium, magnesium also showed increasing trends when compared with original ORM from four experimental groups. Potassium, sodium, chloride, calcium and magnesium showed higher values in heap E. This indicates that cow dung has major role to play in the enhancement of nutrients while harvesting with the heap method.

5. Discussion

Plant nutrients includes the organic matter produced from various activities which enrich soil and useful for growth of various crops. Organic matter also benefits in overall production and yield of agricultural products .Proper management of animal waste is necessary which can be done by using decomposition material like animal cow dung or commercial decomposition culture. Organic matter act as depot of plant reserves mainly in the form of sodium, potassium, phosphorous and major micronutrients including magnesium, chloride, calcium, potash etc. all these components are essential for overall productivity of plants(Zamil *et al.,*2004).

In the present investigation after treating the raw poultry manure with DC culture and cow dung by using heap and pot methods, almost all the nutrients showed increasing trends in their contents. This clearly indicates that there is a significant positive relation between the microbial composition present in both the Cow dung and DC culture. There might be nutrient enhancing factors present in micro organisms which could enhance the macro nutrients especially NPK.As far as the methods are concerned heap along with the cow dung enhance the nutrient quantity more when compare with the pot experiments. This might be due to natural humidity and more moisture could have boosted

the multiplication of microbes in heaps. Because the availability of the space is more in heap experimentation rather than the pot, this enhancement was possible. Our method is an eco-friendly and a viable alternative of the poultry waste management and could be used for sustainable agricultural practice. The method is also cost effective and can be utilized in the agricultural farm itself which will avoid the transport cost. In the recent past, people preferring organic farming and the agricultural products from this organic farming gaining more popularity. Therefore, our investigations are environmental friendly and could be taken up by poultry farmers.

Unprocessed or untreated poultry waste is one of the causes for spreading diseases, pollution of soil and groundwater resources. Effective treatment of poultry waste can be converting into feed supplement, biodiesel and biodegradable plastic and organic fertilizer (Motcha Rakkini and Vincent 2016). Andrew Sharpley *et al.,* (FSA9529) while reviewing nutrient analysis of poultry litter summarized that 1.4 million tons of litter produced in Arkansas used for agronomic and environmental useful material and also suggested that if the routine fertilizer prices stand up high then poultry litter could be used as the alternative source for agricultural production .Choudhary *et .al.,* (2013) extensively studied the C: N ratio, nitrogen content, P and K from the poultry litter. They have suggested that least C: N ratio recorded in the pit and summarized that if the poultry litter is protected from plastic sheets it could conserve more nutrient strength in it. Prabhakaran and Manivannan (2014) studied the effect of fungus on nutrient changes during composting of poultry droppings amended with bagasse and they reported that when poultry waste is incorporated with fungus, it was taken less time to compost and this compost with desirable C: N ratio and high macro and micro nutritional value as compare to natural composting.

6. Conclusion

As population is tremendously increasing, demands of food, shelter also increasing. To achieve the target of food requirement, agricultural crops need to grow fast with all essential nutrients and vitamins. Decomposition of solid waste or recycling of waste due to natural decomposing cultures helps in providing the essential plant nutrients to soil. Native decomposition by the microbes present in environment requires more time to decompose the waste. Use of DC culture and cow dung in decomposing process, reduces decomposition time. Subsequently it leads into good yield of agricultural products by improving soil fertility. Poultry waste management overcomes not only pollution problems but also enhances soil fertility. It is an eco-friendly approach for sustainable development of nature.

7. Future Scope

There are certain areas to be explore to support solid waste management and sustainable development of environment

a) To study the useful microbial flora present in poultry litter for crops
b) To educate the poultry farmers for efficient management of poultry waste

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