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"Production and Utilization strategies of Organic Fertilizer for Organic Farming: An eco-friendly approach"

Nimisha N.Joshi.
(P.G.T.D of Microbiology, Sant Gadge Baba Amravati University, Amravati.(M.S.) India)

Abstract: *Slaughter/polutry meat industry is growing tremendously. Presently broiler animal (which includes buffalo/ goat ..etc.) are slaughtered by small and medium sized retailers and the waste like intestinal material, skin, undigested feed materials generated from the slaughter is a problem for the operators and handling and disposing. Normally such waste unutilized and thrown out along with municipal waste, which attracts flies and insects, and produce unpleasant or off smell, thus creates bio-security problems. Further, during dump process, such waste creates more heat and odors problem also. Composting is a natural process by which the beneficial microorganisms decompose the organic waste quickly and generate heat which helps to eliminate pathogens. Compost is produced through the activity of aerobic micro-organisms. These microbes require oxygen, moisture, and food in order to grow and multiply. When these factors are maintained at optimal levels, the natural decomposition process is greatly accelerated. Natural decomposting process is very slow and it can takes more time. By using biocontrol agent and different fungi cultures which includes Aspergillus niger ,Aspergillus awamori,Penicillium chrysogenum. Trichoderma viride using this composting process time will increases.*

Keywards: *Aspergillus niger, A.awamori, P.chrysogenum and T.viride, compost, Slaughter house waste material.*

I. Introduction

Composting is a natural process by which the beneficial microorganisms decompose the organic waste quickly and generate heat which helps to eliminate pathogens. Compost is produced through the activity of aerobic micro-organisms. These microbes require oxygen, moisture, and food in order to grow and multiply. When these factors are maintained at optimal levels, the natural decomposition process is greatly accelerated Slaughter meat industry is growing tremendously. Presently broiler animal (which includes buffalo/ goat ..etc.) are slaughtered by small and medium sized retailers and the waste like intestinal material, skin, undigested feed materials generated from the slaughter is a problem for the operators and handling and disposing. Normally such waste unutilized and thrown out along with municipal waste, which attracts flies and insects, and produce unpleasant or off smell, thus creates bio-security problems. Further, during dump process, such waste creates more heat and odors problem also. Composting is a natural process by which the beneficial microorganisms decompose the organic waste quickly and generate heat which helps to eliminate pathogens. Compost is produced through the activity of aerobic micro-organisms. These microbes require oxygen, moisture, and food in order to grow and multiply. When these factors are maintained at optimal levels, the natural decomposition process is greatly accelerated. Natural decomposting process is very slow and it can takes more time.(N Bharathy et al 2012)

Microbes are especially important components of biodiversity. Particularly fungi and bacteria are crucial, as they change and release many nutrients playing important roles in nutrient cycling and sustain vegetation. The efficiency of fungi in decomposition and their potentially depend upon their abundance and composition. Aspergillus and Penicillium are economically, ecologically, and medically important and large genera. They are important in view of health hazards. In addition , they are used in industrial and food fermentation processes , they exists commonly in different types of soils , indoor and outdoor air , food and water. Aspergillus and Penicillium are ubiquitous fungi. This species of Aspergillus and Penicillium are among the most abundant and widely distributed microfungi in nature. The decomposition process carried out by these moulds is important in driving natural cycling of chemical elements, particularly in the carbon cycle where they contribute to replacement of supply of carbon dioxide and other inorganic compounds. The present work was designed to study the role of fungi as a decomposing agents for agriculture fields. The periodicity of occurrence of Aspergillus and Penicillium species in agricultural soils or organic materials which include slaughtered animal waste (skin, blood, intestinal flora and material). Fungi are the major decomposers of soil eco system. Biological control is a promising tool to maintain current level of agricultural production while reducing the release of polluting chemical pesticides to the environment. Trichoderma is filamentous fungi the species of which were previously considered to be culture contaminants. Trichoderma is a very versatile mold: a nuisance for people , a useful fungus for agriculture industry and biocontrol and a bane to other fungi.

Trichoderma spp. Is present in nearly all soils and other diverse habitats. In soil, they frequently are the most prevalent culturable fungi and now should be added to the growing list of emerging filamentous fungal pathogens. In recent years , considerable success has been achieved by the use of fungal bioagent and economically viable for improving the disease control potential of T.viride and are common inhabitant of rhizosphere and contribute to control of many soil born plant diseases cause by fungi. Apart from biological control, in many cases increased plant growth response was also noted after application of Trichoderma spp. Culture in organic waste material.(B.K.Mishra et.al 2011).

1.1 Advantages of organic fertilizer:

- Organic fertilizer provides all the nutrients that are required by plants but in limited quantities.
- It helps in maintaining C:N ratio in the soil and also increases the fertility and productivity of the soil.
- It improves the physical, chemical and biological properties of the soil / farm.
- It increases the water holding capacity of the soil.
- Due to increases the biological activity, the nutrients that are in the lower depths are made available to the plants.
- It act as much, thereby minimizing the evaporation losses of moisture from the soil.
- Improves and stabilizes soil pH
- Organic fertilizer richer in phosphate solublizing bacteria, nitrogen fixing bacteria and also in micronutrients with balance amount of trace elements.
- May control or suppress certain soil borne plant or crop pathogens.
- Increases infiltration and permeability of heavy soils, thus reducing erosion and runoffs.

1.2 Aims and Objectives:

- Comparative microbial study of raw material and mature material or composted material.
- Control of many soil born plant diseases cause by fungi and bacteria.
- To develop suitable inoculum as consortium of fungi for composting organic waste materials.
- To demonstrate an increase in crop yield attributed too the addition of compost.
- Isolation, Identification and characterization of phosphate solublizing bacterial spp., nitrogen fixing bacterial spp.
- To study an effective compost technology or method by using aerobic / windrows method.

1.3 Scope and limitations:

- Lower Risk Of Pollution and Nuisance Complaints.
- Pathogen Destruction .
- Slaughter house waste material will be collected from Allana company, Aurangabad and fungus culture / strain collected from NCIM, Pune. Culture will be used for decomposition process of animal waste material.
- Animal broiler waste material of Allana company will under for 2 seasons of the year.

II. Review of Literature

Composting is a thermogenic, solid state fermentation process, carried out by a succession of microbial populations beginning with mesophilic bacteria, actinomycetes and fungi followed by thermopiles and ending again with mesophiles (Johri et al.,1999). Composting process creates stable, soil-enriching humus and concentrates the

Nitrogen (N), Phosphorous (P), Potassium (K), Calcium (Ca) and Magnesium (Mg) contents (Eneji et al., 2001). Aerobic composting involves a process of biological decomposition and stabilization of organic substrates under conditions that allow multiplication and activity of thermophilic microorganisms as a result of biologically

produced heat, to produce a final product that is stable, free of pathogens, pests and plant seeds, useful in agriculture and forestry as manure (Balasundaran et al., 1999; Saravanan et al., 2003). High temperature within waste heap undergoing composting has been considered as consequence of microbial activity, whereby heat is liberated through respiration of microbes and built up within the pile (Tiquia and Tam, 2000).

At the initial stage, the easily degradable organic matters like carbohydrates, fats, proteins get degraded by the action of mesophilic fungi. Due to its action, some amount of heat energy is formed hence, the temperature of

the composting substrates is 40^0C or less, mesophilic fungi and acid producing bacteria appear. The proportion of the three groups of organisms- bacteria, fungi and actinomycetes is related to dominance of organic constituents., Water soluble simple sugars encourage rapid bacterial proliferation while starch benefits the actinomycetes in particular substrates rich in proteins or amino acids stimulate the spore forming bacilli.

Details of microbial genera capable of utilizing cellulose, hemicelluloses, starch, lignin etc. may be seen in Table-5. At the end of mesophilic action, the thermophilic fungi/bacteria will start its action and degrade some part of organic matters. Hence the temperature of 650 C to 700C attained during aerobic decomposition in compost pit leads to the destruction of

most of the pathogens, parasites and weed seeds present in the original material. In addition to the effect of higher temperature, some pathogens and parasites are also killed due to their failure to withstand the competition with

other microorganisms. The Actinomycetes and spore forming bacteria start its action to decompose cellulose and Hemicelluloses present in the waste. During anaerobic decomposition as prevailed in biogas plant and Bangalore method of composting, temperature does not rise to the extent lethal to parasites in a relatively short time. When sewage sludge or night soil is composted, anaerobic decomposition should be proceeded by aerobic composting at least for a week. The natural death of pathogens and parasites occurs under anaerobic environment and the microbial antagonism eventually eliminates them in relatively longer period of six months. After decomposition of maximum amount of organic matters, the temperature of the medium will slowly decreases. During the temperature from 600c to 400c again, the thermophilic fungi start to decompose remaining part of organic matter. After this, the temperature again decreases further. The white colour fungi commonly appears on the waste that shows presence of mesophilic fungi.

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III. Material And Methods

A composting cycle takes 45 days to complete and involves the following activities:

- Platform preparation / pit.
- Collection of waste material.
- Grinding of collected raw / waste material.
- Formation of windrows.
- Aero tilling / aeration – for uniform mixing of raw material to bring down the moisture at optimum level.
- Inloculation – inloculation of micro-organisms / bio-control agents in windrows only high remperature tolerate fungus / bacterial culture to be used.
- One layer content 5 MT raw material.
- Decomposing culture: Trichoderma viridae., Aspregillus niger., Asperguillus awamori, Penicillium chrysogenum.
- Enrichment of compost include:
- Phosphate solublizing bacteria like :Bacillus spp: B.megaterium and B.polymyxa.
- Bio-control agents like some fungal spp. Which include: Trichoderma viride

1st and 2nd: (14 days)

Application of T.viride fungal culture 80 lit- for 1st layer of raw material and water spray Optimum aeration to be maintained. Monitoring moidture content andTemperature of windrow (by thermometer)

3rd : (7days)

Application of aspergillus spp. Culture which include two spp. 1)A.niger and A.awamori 160 lit (80 lit each) for next two layer of raw material,Aeration and water spray. Monitoring moisture and temperature.

6th : (7 days)

Aeration,Application or spray of water for moisture.Temperature monitoring.Collection of sample: (last 3 days)

After 6th week, sample drawn from different site of platform / pit for microscopy/ Microbiological studies and Micronutrient testing. After passing all microbiological conditions, the ready organic or manure is enriched with Bio-agents, Bio-fertilizer (phosphate rich).

IV. Results And Discussion

Table No. 1.1 Microbiological and Micronutrient test results

S.N.	Parameters	Results	Methods
1	Total Bacterial Count	37×10^{10} CFU/g	IS 5402
2	Azatobacter	11×10^{4} CFU/g	F.C.O.Sch.III Part D
3	Azosprillium	$29x10^{2}$CFU/g	
4	Phosphate Solublising Bacteria	$21x10^{3}$	
5	Trichoderma viride	$7x10^{5}$	
6	E.coli	Absent/25g	IS 5887 Part I
7	Salmonella	Absent/25g	IS 5887 Part II
8	Total Nitrogen as N	0.86 %	F.C.O.Sch.II Part B
9	Total Phosphate as P_2O_5	0.52 %	Titrimetric method
10	Potassium as K	0.19 %	
11	Iron as Fe	1.61 %	
12	Manganese as Mn	0.10 %	

13	Zinc as Z	0.010%	By AAS
14	Copper as Cu	0.0054%	
15	Molybdenum as Mo	< 0.01	
16	Magnesium as Mg	0.82%	
17	Boron as B	< 0.01	F.C.O.Sch.II Part B
18	Moisture	15%	Karl fisher method
19	C:N ratio	17.13	
20	pH	7.10	pH meter

Results on dry basis:

Table No.1.2 Heavy metal results on dry basis:

S.N.	Parameters	Results on dry basis	Methods
1	Organic carbon	14.74%	F.C.O.Sch.IV Part D
2	Cadmium as Cd	<.01 mg/kg	By AAS
3	Chromium as Cr	19.65 mg/kg	
4	Nickel as Ni	23.85 mg/kg	
5	Lead as Pb	7.71 mg/kg	
6	Arsenic as AS	0.20 mg/kg	AAS-VGA
7	Mercury s Hg	<0.1 mg/kg	

Composting process was done in different stages in less timing. Slaughter house waste took 45 days to fininshing the composting process which are comparable with the criteria/result of F.C.O 1985. At the end of composting, moisture content,weight,of compost reduces significantly. pH, Total organic carbon and nitrogen content were also significantly reduced at the finishing composting. Cadmium, mercury is less than 0.1 mg/kg., chromium,lead,arsenic less than 50.0,100.0,10.0,50.0,mg/kg Compost enriched with phosphorus and absence of pathogens. This reduction was mainly due to increasing temperature and aeratations

.All crops like sugarcane, Ginger, Onion, Cotton and all vegetables seeds shows good germination percentages increased by the use of finished compost in the farm/fields. Ti indicated that all the finished compost were free from toxic substances. The results indicates that , composting of slaughter waste combined with fungal inoculum will be a hygienic and environmentally safe method of disposal of broiler slaughter house waste.

V. Conclusion

It is concluded above result indicated that, aerobic method of composting of slaughter house waste treated with fungal inoculum with open/pit method may be a hygienic and environmentally safe method of disposal of broiler slaughter house waste.

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References

[1]. Bharathy N, Sakthivadivu R, Sivakumar K, Ramesh Saravanakumar V (2012): "Disposal and Utilization of Broiler Slaughter waste by Composting," Vet World 5(6):359-361, doi:10.5455/vetworld.2012.359-361.

[2]. Balsundaran,M Haseena, A. (2008): "Development of microbial inoculants for aerobic composting" KFRI 390/03, ISSN 0970-8103.

[3]. Eneji, A. E., Yamamoto, S., Honna, T and Ishiguro, A. 2001. Physicochemical changes in livestock feces during composting. Common Soil Sci. Plant Anal. **32**: 477-489.

[4]. Balasundaran, M .(1999):" Chemistry and Process of Composting". In: M. Balasundaran,

[5]. J.K. Sharma, and K.C. Chacko (eds.), Compost for Container Seedling Production in Forest Nurseries. Kerala Forest Research Institute, Peechi, Thrissur. pp 31-36.

[6]. Dr.Krishan Chandra (2005):"Production and Quality control of organic inputs."

[7]. Dewa Ngurah Suprapta (2012) : " Potential of microbial antagonists as biocontrol agents against plant fungal pathogens." J. ISSAAS Vol. 18, No. 2:1-8.

[8]. E. Salminen , J. Rintala (2002) :" Anaerobic digestion of organic solid poultry slaughterhouse waste" 13-26.

[9]. Helena Górecka, Henryk Górecki, Katarzyna Chojnacka, Marzanna Baransk Izabela Michalak and Agnieszka Zielinska (2007): "New Role of Sulfuric Acid In Production of Multi component Fertilizers From Renewable Sources" American Journal of Agricultural and Biological Sciences 2(4): 241-247, ISSN 1557-4989.

[10]. Jean-paul schwitzguebel, Bernard Dubois, Yves Membrez, Dominique Descloux, Arthur Wellinger, Catherine Soma and Jesan-Jacques Disetti, (1999) : " Anaerobic treatment of effluents from slaughterhouse and catering wastes." 99.