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STUDY OF PHYSICO-CHEMICAL NATURE OF PRESS- MUD IN CONVERSION OF SUGARCANE PRESSMUD INTO BIO-ORGANIC MANURE

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ABSTRACT

Bio-composting of sugar-cane press-mud along with microbial inoculums acts as a no-toxic substance including the control over pathogens and for the sustainable agriculture enhancement. The study of waste micro biota and to identify some new active strains adapted to the waste industrial conditions, which metabolize organic compounds, similar to those which determine the pollution of waste such as starch, casein. Bio-Composting is the degradation of organic matter by various microbes in a moist, favourable environment. Composting takes place aerobically or an-aerobically in the environment. Microbial strains were identified for the rapid biodegradation of the organic compounds. The Bio-compost was prepared in farm by sugarcane wastes such as baggase and the dried sludge from Sugar Effluent Treatment Plant was mixed with it. Aerobic condition was maintained by regular tumbling of the trial bio-compost windrow and continuous monitoring of Temperature, pH and Electrical conductivity was done. Physico-chemical and microbiological results were performed once a week or as and when required. After proper degradation of the baggase the bio-compost was used in the cultivation of the plants in selected plot. The essential factors such as N: P: K was maintained by the selected strains of micro-organisms and it was also checked that no pathogenic activity by any microbes occurred while preparation of the bio-compost.

Keywords: *Bio-compost, Physico-chemical, Bagasse, Temperature, Pathogens, Sugar-cane, Press-mud.*

1. INTRODUCTION

Nowadays, farmers are growing diverse food crops and applying agro chemicals or fertilizers such as Urea and D.A.P. in imbalanced ratio as with the increasing population & consumption production capacity of the soil have reduced. Production of enough crops and it's by-products for consumption is a huge challenge in the field of agriculture. Hybridization or genetic development in crops has slowed down the ever growing demand of nutritious food. Waste and microbiology studies are becoming increasingly important for understanding the roles of micro-organisms that play in agricultural productivity. The C:N ratio of different treatment reflects

the organic waste mineralization and stabilization. The microbial population of soils is made up of five major groups including bacteria, actinomycetes, fungi, algae and protozoa, and among these groups, bacteria are the most abundant group and the most important microbe for degrading waste. Microbes present in the bio-compost undergo various mechanisms like proper fixation of Nitrogen, Potassium and Phosphorus and suppresses the growth of plant pathogens increasing the fertility of the soil and also minimizes the use of agrochemicals leading to pollutant free soil.

2. MATERIALS AND METHODS

2.1.1 Sample Collection:

In the present study, isolation of microorganisms were done from soil/root sample, pond water and ETP sludge namely, Cyanobacteria (blue-green Algae), Rhizobium sp. and Aspergillus sp. The leguminous roots were dipped in Ethanol for few minutes and then wiped with tissue paper to remove any foreign particles. Microbes were isolated in Buffered Peptone Water and BG11 broth. Serial dilution technique was performed from 10^{-1} – 10^{-8} dilution to isolate the micro-organisms. Pour plate Method was done in Differential Media namely Nutrient Agar for Cyanobacteria sp. and Aspergiluus sp. Sprinkle method and pour plate method was performed to isolate the Rhizobium sp. from roots and soil sample respectively. Pure culture was isolated in Soyabean Casein Digest Agar/ Nutrient Agar for Rhizobium sp., CyanoAgar for isolation of Cyanobacteria and Sabouraud Dextrose Agar for Aspergillus sp. Further microscopically observation was done for enumeration of morphology of the colonies. Isolated pure cultures were preserved on freshly prepared slant. Shredded sugarcane baggase was collected from sugar manufacturing industry for the preparation of Bio-compost. Plant seeds were collected from vendor.

2.2.2 Sample Preparation:

The isolated microorganisms preserved in slant were further processed for Microbial Consortium in double stranded Soyabean Casein Digest Medium. The baggase was laid on the plot scale trial in Windrows. The Microbial Consortium was diluted with sugarcane treated effluent water to check controlled growth of Microbes and to prevent the growth of any pathogenic micro-organisms such as Escherichia coli sp., Salmonella sp., Pseudomonas sp., and Staphylococcus sp. Windrow was sprayed by the diluted Microbial Consortium and tumbling was done by Aero tiller. The windrow was turned on a regular basis to improve the oxygen content, distribute heat to regulate temperature and to distribute moisture equally in the windrow.

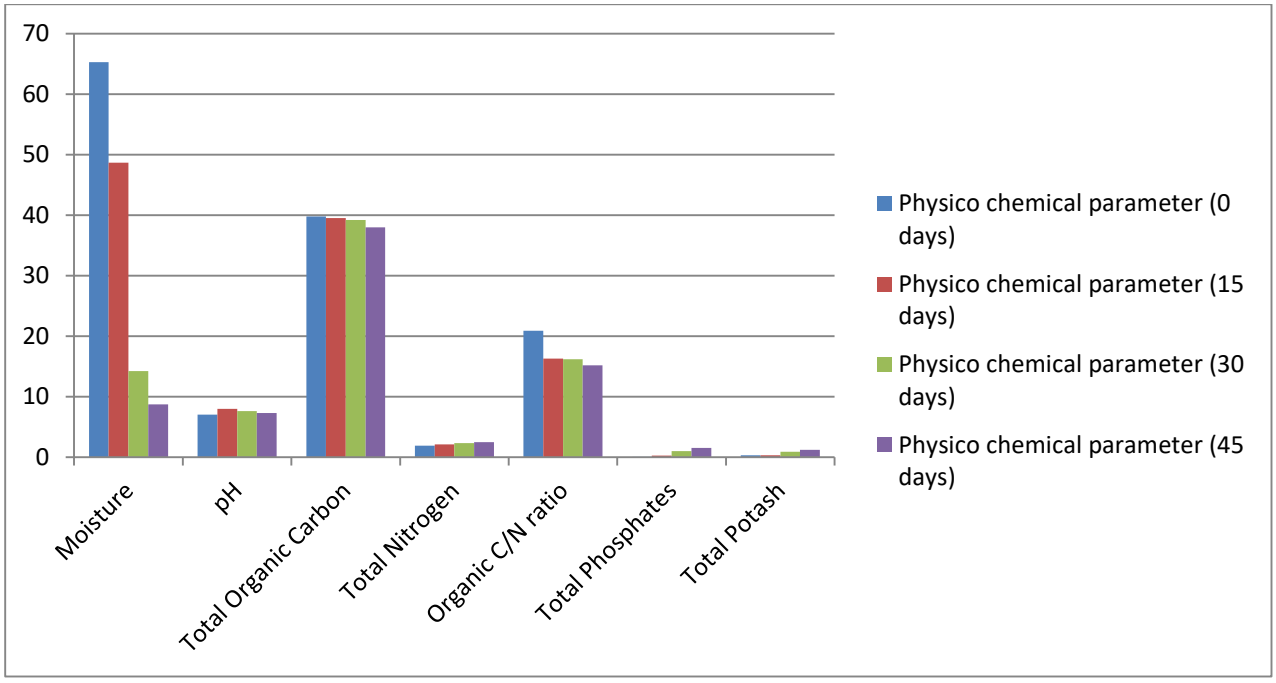
3. Results and Discussions:

The prepared bio-compost was analysed phsico-chemically to determine the physico-chemical properties were experimented to determine the chemical properties of the manure up-to 45 days at different time intervals i.e. 0, 15, 30 & 45 days finally. Temperature was monitored in regular intervals to understand the metabolic activity in the press-mud.

A. Physico-chemical analysis results of Sugarcane pressmud:-

S. No.	Physicochemical parameters	Obtained Values				Specified/ Desired Limits (As per FCO)	Comments
A	Physicochemical Analysis	"0" day	"15"day	"30" day	"45" day		
01	pH	7.0	8.0	7.6	7.3	6.5-7.5	Complies with specified values
02	Moisture, % by mass	65.3	48.7	14.2	8.7	25% Max	Complies with specified values
03	Total Organic Carbon, % by mass	39.8	39.5	39.2	38.0	14 % Min.	Complies with specified values
04	Total Nitrogen, % by mass	1.9	2.1	2.3	2.5	1.2 Min	Complies with specified values
05	Organic C/N ratio	20.9	16.3	16.2	15.2	<20	Complies with specified values
06	Total Phosphates as $P_2 0_5$, % by mass	0.014	0.231	1.01	1.5	1.2 Min	Complies with specified values
07	Total Potash as K_2O, % by mass	0.31	0.32	0.91	1.2	1.2 Min	Complies with specified values

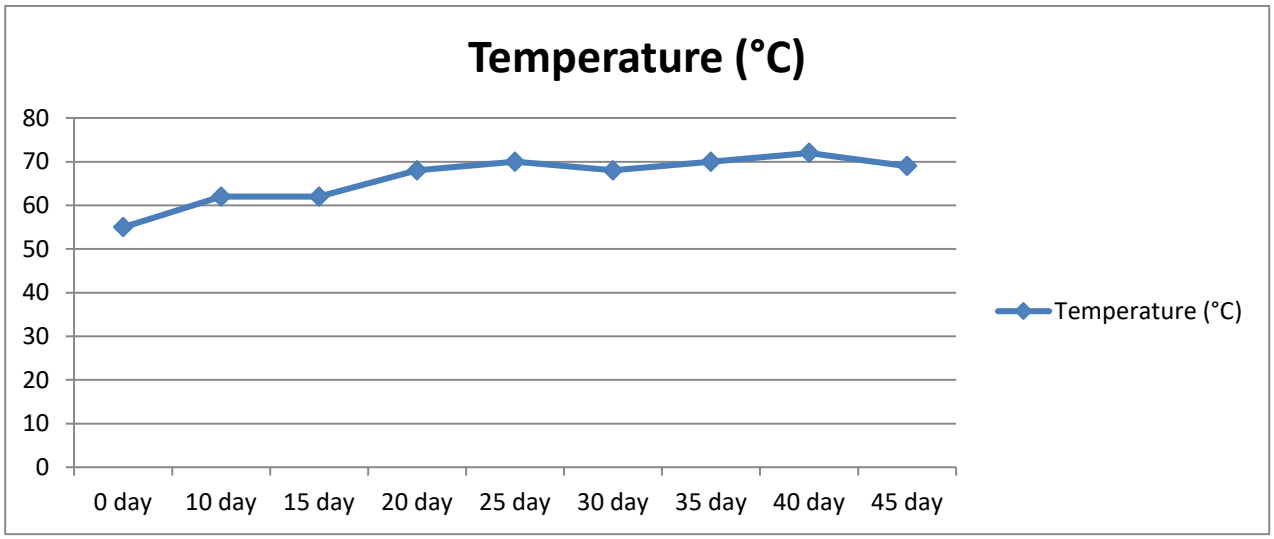
Bar Graph representing the Physico –chemical parameters



B. Monitoring of Temperature of Sugar-cane press-mud:-

S. No.	Press-mud Windrow	Obtained Values "0" day	"10" day	"15" day	"20" day	"30" day	"35" day	"40" day	"45" day
01	Temperature observed	55ºC	62ºC	68ºC	70ºC	68º C	70º C	72º C	69º C
02	Aero tilling	Performed by Aero tiller	-	Performed by Aero tiller	-	Performed by Aero tiller	-	Performed by Aero tiller	-

Line Graph representing the Temperature of press-mud



Conclusion:- After completion of 45 days, temperature was found in acceptable limits since initial "0" day temperature have risen as from mesophilic to thermophilic activity was undergone by micro-organisms which had ultimately risen the temperature of the press mud and gradually increasing the decomposition of press-mud at a faster rate.

Physico- chemical parameters were found within the specified/ desired range, as prescribed in Fertilizer Control Order for Organic Manure. The organic Carbon Nitrogen C/N ratio also reduced from 20.9 to 15.2 in completion of 45 days due to action of microbes inoculated in the form of Consortia.

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