

"PHYSICOCHEMICAL ANALYSIS OF PRE-COMPOSTED BAGASSE, PRESS MUD, AND CHARACTERS OF SUPPLEMENTARY FEED MATERIAL"

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Abstract:

Vermicompost is a highly nutritive organic fertilizer that helps to increase crop production. It is produced by plants and animals. Vermicompost is the product of the decomposition of organic wastes by earthworms. It is the process of making compost. Organic waste includes municipal solid waste, industrial waste, food waste, agriculture waste, etc. The bagasse, press mud, cow dung, urine, and earthworm were collected. Mass production of earthworms was done in the vermicompost unit. Physiochemical analysis of raw material (bagasse and press mud) and cow dung was done. In this paper, we observed that analyzed bagasse and press mud, and cow dung are nutrient-rich and can be used for vermicompost. Production of vermicompost can be increased by using these as raw materials.

Keywords: Vermicompost, organic waste, earthworms, organic fertilizer.

Introduction:

Organic fertilizers are derived from plants and animals and are composed of organic materials. Vermicomposting is used to convert organic matter such as animal waste, municipal waste, agriculture waste, industrial waste, sewage sludge, human feces, and anaerobic digestate into high-nutrient fertilizers by using earthworms (3,4).

Organic fertilizers are used for the improvement of the physical, chemical, and biological characteristics of the soil. Organic waste is broken down by earthworms and other microorganisms known as vermicomposting (1).

Vermicompost is nutrient-rich. Earthworms indirectly stimulate the growth of microorganisms and play an important role in vermicomposting. It helps with growth stimulation, seed germination, flowering, and the production of fruit. Plant biomass can be converted into high-quality organic fertilizer by the process of vermicomposting (1).

Vermicompost is used as a humus biofertilizer, soil fertility booster, and soil conditioner. It contains vitamins, enzymes, growth regulators, and beneficial microorganisms (2).

Vermicompost is rich in nitrogen, phosphorus, and potassium. It contains micronutrients and beneficial soil microbes such as nitrogen-fixing bacteria, phosphate-solubilizing bacteria, and actinomycetes. Vermicompost is rich in macro and micronutrients, vitamins, growth hormones, enzymes such as proteases, amylases, lipase, cellulase, chitinase, and immobilized microflora (3,5). Vermicomposting of rice straw, dry grass clippings, and cow manure by using *Eisenia foetida* (3).

Chemical fertilizers are used in high quantities which is responsible for changes in soil quality and soil productivity. It is found that vermicomposting gives positive changes in soil quality and soil productivity, it also helps to increase crop production (4).

Vermicompost helps to soil stability, pH, density, water holding capacity of the soil, soil aggregation, and reduced soil erosion (4).

In this paper, we analyzed the physicochemical characteristics of pre-composted bagasse, mud, and cow dung.

Material and Methods:

Collection of raw materials: The bagasse and press mud were collected from Kisan Veer Sahakari Sugar Factory Ltd. Bhuinj, which is situated in Satara district (Maharashtra, India). The sample was placed in sterile plastic bags. The sample were chopped into small pieces and kept in shade for 15 days.

Collection and cow dung and urine: Cow dung and urine were obtained from cow shade, Godoli, Satara, Maharashtra, India.

Pre-composting of sample: Dried sample from the shade was blended and mixed with urine and cow dung to increase C: N ratio. Moisture content (80%) was maintained by using sprinkling water. The sample was kept for pre-composting for up to three weeks.

Collection and Mass culture production of earthworms: *Eudrilus euginae* was collected from the vermicomposting unit, Ajinkya Krushi Seva, Padali, Satara (Maharashtra, India). Earthworm culture was brought to the laboratory and produced mass quantity in a culture pot containing cow dung as a growth medium at the vermicomposting unit, Y.C. Institute of Science, Satara, Maharashtra, India.

Physicochemical analysis of pre-composted bagasse, mud, and cow dung: For physicochemical analysis of pre-composted bagasse, mud, and cow dung, all samples were sent to the Nikhil Analytical and Research Pvt. Ltd., Sahyadrinagar, Sangli, Maharashtra, India.

Results and Discussion:

Physicochemical analysis of raw material:

The bagasse and press mud were used as the main feeding material for earthworms in the present investigation. Physicochemical characteristics of partially decomposed bagasse, and press mud residues are presented in [Table No.1 and Table No.2]

Table No.1: Physicochemical characteristics of pre-composted bagasse

Sr. No.	Parameter	Unit	Value
1	Moisture	%	6.43
2	Ash	%	4.87
3	Total solids	%	93.27
4	Organic carbon	%	0.4

5	Organic matter	%	1.03
6	Fiber	%	38.12
7	Carbon / Nitrogen		100
8	Water soluble substance	%	12.26
9	Bulk density	Kg /mq	60.0
	Macronutrients		
1	Nitrogen	%	0.4
2	Phosphorous (as P ₂ O ₅)	%	0.13
3	Potassium (as K ₂ O)	%	0.024
4	Calcium	%	0.541
5	Magnesium	%	0.824
	Micro- Nutrients		
1	Iron	Ppm	197
2	Manganese	Ppm	1.1
3	Zinc	Ppm	6.8
4	Copper	Ppm	0.1
5	Cellulose	%	34
6	Hemi Cellulose	%	27
7	Lignin	%	20.02

Table No.2: Physicochemical characteristics Pre-composted Press mud

Sr. No.	Parameter	Unit	Pre-composted Press mud
1	Moisture	%	14.24
2	Total ash	%	67.44
3	Organic carbon	%	24.3
4	Silicon	%	20.40
5	Nitrogen	%	1.46
6	Phosphorous (as P ₂ O ₅)	%	1.25
7	Potassium (as K ₂ O)	%	0.26
8	Calcium	%	3.30
10	Protein	%	9.12
11	Fiber	%	1.44
12	Wax	%	0.11
13	Sugar	%	0.89
14	Iron	ppm.	12450
15	Manganese	Ppm	29.9

Characters of supplementary feed material

The supplementary feed material rich in different nutrients were tried as an additive to the main feed material. Cow dung was tried as supplementary feed for vermicomposting of bagasse and press mud. It was selected as a supplementary feed because it is easily available and rich in nutritional elements and microflora. The physicochemical characteristics of this sample feed material are presented in [Table No. 3].

Cow dung the urine-free cow dung was collected and sundried in form of cakes and powdered to get particle size of about less than 1 mm diameter. The physicochemical characteristics of cow dung showed that it is rich in N, P, K, and other elements essential for the growth of the earthworm [Table No. 3]. The 7.3 pH and high C/N ratio [31:19] were suitable for the growth of both earthworms and microorganisms

Table No.3: Physicochemical characteristics of Cow dung

Sr. No.	Parameter	Unit	Value
1	Moisture	%	69.94
2	Organic carbon (on a dry basis)	%	49.29
3	C/ N	--	09.49
4	Nitrogen	%	01.58
5	Phosphorous (as P ₂ O ₅)	%	00.68
6	Potassium as K ₂ O	%	00.92
7	Calcium		02.18
8	Magnesium	%	01.09
9	Iron	Ppm	852.47
10	Manganese	Ppm	20.09
11	Zinc	Ppm	09.77
12	Copper	Ppm	04.18
13	Chromium	Ppm	Less than one

It is clear from the observations C/N ratio of bagasse was [1]and press mud [16:64] was very low, so it is not suitable for feeding by earthworms. Moreover, the material was found to contain less quantity of N, P, K, Ca, and Mg. The press mud contains an appreciable quantity of C, and N but less in P, K, and Mg quantity.

Conclusion:

In the present study, we analyzed the physiochemical characteristics of pre-composted bagasse, mud, and cow dung. We used them as raw materials for vermicomposting. Vermicompost is a

highly nutritive organic fertilizer and an excellent growth promoter. We suggested that the pre-composted bagasse, mud, and cow dung can be used for better results of vermicompost.

Acknowledgment: We would like to acknowledge and give special thanks to Nikhil Analytical and Research Pvt. Ltd., Sahyadrinagar, Sangali, Maharashtra, India for providing support to carry out this work

Conflict of interest: Authors declare no conflict of interest.

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