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Production of Biofertilizer from Agro-Waste.

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ABSTRACT-

In today's word has dealing with two problems pollution and soil degradation and their solution is biofertilizers. Biofertilizers are containing beneficial microorganisms, offer a natural and cost-effective solution for enhancing soil fertility and improving crop productivity. The process involves collection and pre-treatment of agro waste, then due to Fermentation breakdown of organic matter it result in the release of essential nutrients. Maturation and stabilization processes ensure the viability and effectiveness of the microorganisms. Quality testing is performed to assess nutrient content, microbial population, pH, moisture, and absence of harmful substances. The biofertilizer, meeting the required standards, is then packaged and distributed for agricultural use. This research contributes to sustainable agriculture by utilizing agro waste as a valuable resource for biofertilizer production, promoting soil health, and reducing dependence on chemical fertilizers. The production of biofertilizer from agro waste offers a sustainable solution to nutrient management in agriculture while simultaneously addressing waste management challenges. By harnessing the potential of beneficial microorganisms, this approach contributes to sustainable agriculture, soil health improvement, and environmental conservation.

Introduction-

The increasing global demand for food production, coupled with the need for sustainable agricultural practices, has led to a growing interest in the production of biofertilizers from agro waste. Agro waste, which includes crop residues, animal manure, and organic byproducts, is abundant and often considered a waste material with potential environmental implications if not managed properly. However, harnessing the nutrient-rich content of agro waste through biofertilizer production offers a sustainable solution to enhance soil fertility, improve crop yields, and reduce reliance on chemical fertilizers.

Chemical fertilizers have long been the primary means of supplementing essential nutrients in agricultural systems. However, their overuse has resulted in environmental pollution, including water contamination and soil degradation. In contrast, biofertilizers offer a natural and eco-friendly alternative by utilizing beneficial microorganisms to enhance nutrient availability in the soil and support plant growth.

Biofertilizers are composed of microorganisms such as bacteria, fungi, and algae, which possess unique capabilities to fix atmospheric nitrogen, solubilize phosphorus, enhance nutrient uptake, and promote plant growth through various mechanisms. These microorganisms establish symbiotic or associative relationships with plants, facilitating the conversion of complex organic compounds present in agro waste into forms that are readily assimilated by plants.

The production of biofertilizers from agro waste involves a series of processes that encompass collection, pre-treatment, microorganism inoculation, fermentation, maturation, quality testing. These processes aim to optimize the nutrient content, microbial population, and overall quality of the biofertilizer, ensuring its efficacy and safety for agricultural use.

The utilization of agro waste for biofertilizer production not only addresses the issue of waste management but also offers potential economic benefits for farmers and promotes sustainable agriculture. By converting agro waste into a valuable resource, the production of biofertilizers reduces the environmental footprint associated with waste disposal, minimizes the need for chemical fertilizers, and improves soil health in the long term.

This can aims to provide an overview of the production of biofertilizers from agro waste, highlighting the significance of this approach in sustainable agriculture, soil fertility enhancement, and the promotion of environmentally friendly farming practices. By exploring the production process and its potential benefits, this study aims to contribute to the understanding and adoption of biofertilizers as an effective tool for agricultural sustainability and productivity.

Methodology-

1. Collection of Sample –

Various types of agro waste, such as crop residues (stalks, leaves, husks) and organic by products from agricultural activities, are collected from farms. The Agro waste was cut into small pices and smashed . They were used for solid state fermentation (SSF). The weight of organic waste is 1kg.

Fig. Organic Waste

Fig. Food Waste

2. Preparation for fermentation process

Two batch of fermentation process were carried out - BATCH – I

Materials Required

- Polyethene bottle
- Fruit wastes (rotten)
- Distilled water

Batch – I

1 kg of Agro- waste was placed in a polythene bottle which has capacity of 2.5 liter. 200ml of water add to it. The bottle was kept undisturbed for 30-40 day until the soluble product was formed . This soluble product was filtered with a fabricated filter . The fermented solution is the first batch of organic waste biofertilizer

Fig. Batch 1 (Fermentation Process)

3. Applicability of the biofertilizer in vegetable plantation

The biofertilizers were applied on the chili seed samples of 3 weeks of age in order to determine the effectiveness of the biofertilizer. Each batch of the biofertilizers were applied on 20 plant samples. At the same time, another 20 samples were planted in the absence of any fertilizer.

Fig. Vegetable plantation

4. Soil Fertility Analysis-

Soil Fertility Analysis was carried out by estimating the Soil pH, Electric Conductivity, Calcium, Magnesium, Sulphate, Chloride, Phosphorous, Total Organic Carbon, Nitrogen, Sodium, Potassium, Iron, Zinc, Manganese and Copper.

S.no	Parameters	Units	Soil-1	Soil –2	Normal Range
1	Density	gm/ml	1.10	1.01	0.8-1
2.	WHC	%	55	75	40-50
3	pH	-	8.32	7.1	6-8
4	P	Kg/ha	18	21	14-24
4	K	Kg/ha	291	403	250-450
5	C	%	0.76	0.99	0.4-1.0
6	Na	PPM	320	280	< 250
7	Ca	%	0.27	0.31	0.20-0.50
8	Mg	%	0.18	0.20	0.1- 0.20
9	Sulphur	PPM	25	26	10-50
11	N	Kg/ha	310	340	280-420
12	Fe	PPM	3.11	6.99	2.5-4.5
13	Cu	PPM	0.89	0.99	0.2-0.5
14	Mn	PPM	5.8	7.11	2.0-5.0
15	Zn	PPM	0.99	1.11	1.0-2.0

Table No-1 Soil Test Results

5. Experimental Design

Pot Culture 1000 g of soil was taken in empty box which has a capacity of 1500gm. 20 Chili seeds were taken. 5 ml of biofertilizer and 5 ml of water were mixed and applied to the soil. At regular intervals, the fertilizer was sprinkled on the soil.

6. Measurement of Plants

Observation of plant growth was noted in Soil sample and the measurement of plant height was taken at 3-week age of the plant. Root elongation, shoot length and number of leaves germinated shall be recorded. As a result, roots of the Biofertilizer filled plant having highest growth as compared to without using biofertilizer plants.

Fig- Plants Samples

Conclusion

The production of biofertilizer from agro waste holds significant potential as a sustainable and environmentally friendly solution for enhancing agricultural productivity. Biofertilizers are organic fertilizers derived from natural sources, such as agro waste, which contain beneficial microorganisms that help improve soil fertility and nutrient availability to plants.

There are several key advantages to producing biofertilizer from agro waste. Firstly, it helps in the proper disposal of agricultural waste, reducing the burden on landfills and minimizing environmental pollution. By utilizing agro waste as a raw material, we can turn a waste product into a valuable resource, thus contributing to a circular economy.

Secondly, biofertilizers provide a sustainable alternative to synthetic chemical fertilizers, which can have detrimental effects on soil health and water quality. Biofertilizers improve soil structure, enhance nutrient retention capacity, and promote beneficial microbial activity, leading to long-term soil fertility and reduced reliance on external inputs.

The process of producing biofertilizer from agro waste involves the decomposition and fermentation of organic materials, such as crop residues and agricultural by-products. The production of biofertilizer from agro waste offers a sustainable and eco-friendly approach to improving soil fertility, reducing waste, and enhancing agricultural productivity. By harnessing the power of beneficial microorganisms present in agro waste, we can create a closed-loop system that supports both agricultural needs and environmental conservation.

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