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Fermentation Technology Is Utilized To Generate Efficient Organic Fertilizers, Specifically Bokashi

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ABSTRACT

The aim is to provide farmers with training and skills to efficiently utilize natural environmental resources, with particular emphasis on the optimal use of domestic vegetable and fruit waste. This will entail utilizing fermentation technology, which is predominantly unfamiliar yet desired by the community, to convert trash into more advantageous and environmentally friendly goods through the use of effective native microbes. Presently, folks exhibit less interest in investigating alternative approaches for the utilization of waste, especially home organic refuse. Bokashi fertilizer is an organic fertilizer created via the fermentation of organic waste, including manure and compost, employing decomposing microorganisms such as fermentative fungi or bacteria. The outcome is a granular, solid fertilizer enriched with a diverse array of nutrients, both macronutrients and micronutrients, readily absorbed by plant roots. The aim of this bokashi fertilizer course is to instruct and empower the community in the processing of organic materials sourced from household waste. The course intends to propagate fermentation technology for the management of organic waste in the community. This course seeks to enable farmers, vital societal contributors, to adopt innovative solutions for addressing environmental challenges. The methodology involves training participants, facilitating participant-led practice and mentoring, and evaluating the entire activity. This link augments the agricultural community's expertise and proficiency in employing domestic organic waste. The analysis of the questionnaire data indicated that all participants acknowledged the benefits of this training exercise. They have enhanced their interest and gained more profound information, and they are ready to apply it in their daily life.

Keywords: Effective Microorganisms; Bokashi Fertilizers; Fermentative Technology

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INTRODUCTION

Given the proven effectiveness of chemical fertilizers in boosting plant growth, their widespread adoption by farmers is understandable and remains a common practice. However, the sustained and excessive application of these synthetic inputs has revealed significant drawbacks. Over time, the soil structure deteriorates, becoming increasingly compacted and less suitable for cultivation. This degradation of soil health poses a long-term threat to agricultural productivity and ecosystem stability.

In contrast to the environmental challenges associated with chemical fertilizers, organic waste presents an opportunity for beneficial utilization. Organic waste is a natural byproduct of both ecological processes and human activities, and its generation inevitably increases with population growth. Effectively managing this growing volume of waste is crucial for environmental sustainability.

Fortunately, a multitude of strategies exist to address the issue of organic waste. At the household level, the 3R principle – reduce, reuse, and recycle – offers a fundamental framework for minimizing waste generation and maximizing resource utilization. This approach not only lessens the burden on landfills but also encourages a more circular and sustainable consumption pattern (Boechat et al., 2013).

Furthermore, diverse methods are available for transforming domestic waste into valuable resources. Composting, for instance, converts organic materials into nutrient-rich soil amendments, offering a natural alternative to chemical fertilizers. Anaerobic digestion can break down organic waste to produce biogas, a renewable energy source, and nutrient-rich digestate that can be used as fertilizer (Abo-Sido et al., 2021). Exploring and implementing these various waste utilization techniques can contribute significantly to a more sustainable and environmentally sound future.

RESEARCH ELABORATIONS

A method to convert trash into economic value is the production of liquid and solid fertilizers. The predominant trash originates from households, including food remnants, vegetables, and fruits; these categories are classified as organic waste due to their recyclability (Olle, 2021). The production of bokashi fertilizer, which employs microbes for processing, is an effective method for utilizing and managing organic waste. Bokashi fertilizer is an organic fertilizer produced through the fermentation of organic waste, including manure and compost, utilizing decomposing microorganisms such as fermented fungus or microbes. The outcome is a concentrated, decomposed bokashi fertilizer rich in macro- and micronutrients readily available for absorption by plant roots.

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The content generally comprises macronutrients such as nitrogen, phosphorus, potassium, magnesium, sulfur, and calcium, as well as micronutrients such as zinc, boron, iron, copper, manganese, molybdenum, and chlorine. The benefit of organic bokashi fertilizer lies in its elevated nutritional content and its pre-decomposed state. Moreover, solid bokashi fertilizer includes beneficial bacteria that inhibit the proliferation of diseases in the soil (Mohd Basri et al., 2021). The initial stage involves preparing the bacteria for the bokashi fertilizer decomposer. Effective Microorganisms 4 (EM4) is a prevalent bokashi decomposer. The EM4 solution comprises microorganisms specifically separated to rapidly digest organic waste. The microorganisms comprise photosynthetic bacteria, lactic acid bacteria (Lactobacillus sp.), Actinomycetes, and yeast. EM4 is available in the market as a viscous liquid, packed in many sizes. To create a bokashi decomposer, one must simply dilute the liquid and combine it with the raw material bokashi.

If acquiring EM 4 proves challenging, the liquid of effective microorganisms (EM) can alternatively be produced independently. In summary, you have to pulverize 500 grams of papaya peel, 500 grams of banana, 500 grams of pineapple, 500 grams of fresh long beans, and 500 grams of green vegetables, such as spinach or kale, utilizing a blender or similar apparatus. Place the pulverized components into the lidded bucket. Add 1 liter of water, 1 kilogram of sugar, and 5 grains of yeast tape. Gently stir until all components are amalgamated. Subsequently, secure the bucket firmly and allow it to remain undisturbed for seven days. Upon the completion of seven days, the liquid will exhibit a dark brown hue. The effective microorganism (EM) solution derived from the filtered liquid serves as a bokashi fertilizer decomposer. Store liquids in bottles or receptacles. The pulp is suitable for composting, and the EM solution remains effective for a duration of up to six months.

It is essential for the community to acquire the skills to convert home organic waste into innovative and beneficial goods that promote sustainability and environmental stewardship. Community training initiatives for the production of bokashi fertilizer from domestic organic waste remain infrequent and can be regarded as novel (Pascoalino et al., 2021). This activity is crucial for the community, particularly for farmers, as it will enable them to comprehend and implement fermentation technology to diminish their reliance on environmentally harmful chemical fertilizers and enhance agricultural production. DEVICE The community service approach involves training in Fermentation Technology-Based Organic Fertilizer Production (Bokashi) utilizing Effective Microorganisms among agricultural communities in villages. 1) The training participants consist of farmers or the general populace; 2) The training was conducted utilizing a lecture and demonstration model on the conversion of household organic waste into bokashi fertilizer products over a duration of at least one week.

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RESULTS AND DISCUSSIONS

The core objective of this initiative was the dissemination of art, science, and technology to a wider societal audience, with a specific focus on addressing the needs of the agricultural community. Recognizing the prevalent challenges of limited expertise in organic waste management and basic technological application, coupled with the latent potential of farmer groups in bokashi fertilizer production and the community's expressed interest in such projects, the initiative implemented targeted interventions. These actions were designed to catalyze both immediate and long-term transformations at the individual, community, and institutional levels.

A significant outcome of the program was the demonstrable acquisition of new knowledge and practical skills within the agricultural community. Participants actively engaged in training focused on the handling of organic waste through fermentation technology, utilizing efficient microorganisms (EM4) to produce bokashi fertilizer. The training methodology, combining informative lectures with practical demonstrations of converting household organic waste into this valuable soil amendment, proved highly effective. The substantial volume of inquiries and positive responses from the participants during these sessions clearly indicated a strong level of interest and engagement with the presented material.

The practical application of the newly acquired knowledge was equally noteworthy. Participants exhibited considerable enthusiasm and proficiency in the actual production of bokashi fertilizer from their own household organic waste, diligently following the guidelines provided by the instructors (Patel et al., 2021). This hands-on experience not only solidified their understanding of the process but also empowered them to adopt sustainable agricultural practices within their own contexts. The successful translation of theoretical knowledge into practical skill represents a crucial step towards fostering self-reliance and environmental responsibility within the community.

Beyond the direct impact on individual participants, the initiative yielded positive outcomes for the partnering village and the initiating organization. The village, as a collaborative partner, stood to gain from the potential for enhanced agricultural productivity and soil health through the adoption of bokashi fertilizer. Similarly, the initiating organization successfully fulfilled its objective of delivering valuable technological knowledge to the community. The seamless execution of the program, evidenced by the absence of reported issues during planning, implementation, and evaluation, further underscores the effectiveness and meticulous management of the initiative. The consistent feedback from participants, highlighting their appreciation for the new knowledge and experiences gained, reinforces the program's success in meeting its intended goals.

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In conclusion, this initiative effectively delivered scientific and technological knowledge to the agricultural community, addressing key challenges and fostering the adoption of sustainable practices. The enthusiastic engagement and demonstrable skill acquisition of the participants, coupled with the positive outcomes for the partnering village and the initiating organization, highlight the program's success in bridging the gap between knowledge and practical application. The seamless execution and positive feedback underscore the value of such initiatives in empowering communities with the tools and knowledge necessary for positive change and contributing to the broader societal goal of accessible art, science, and technology.

CONCLUSIONS

In summary, this initiative successfully addressed the identified needs within the agricultural community by effectively disseminating scientific and technological knowledge related to organic waste management and bokashi fertilizer production. The enthusiastic participation and demonstrable skill acquisition of the farmers, facilitated by a well-structured and engaging training program, underscore the initiative's success in bridging the gap between theoretical knowledge and practical application. This empowerment not only benefits the individual participants through enhanced skills and potential for improved agricultural practices but also contributes to the broader community by fostering self-reliance and environmental responsibility.

Furthermore, the positive outcomes extended to the partnering village, which stands to gain from improved soil health and agricultural productivity, and the initiating organization, which successfully fulfilled its objective of community outreach and knowledge transfer. The seamless execution of the program, as evidenced by the lack of reported issues and the positive feedback from participants, highlights the effectiveness of the planning and implementation strategies. Ultimately, this initiative serves as a valuable model for delivering scientific and technological knowledge to specific communities, fostering tangible skills, and contributing to the overarching goal of making such resources more accessible across society.

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