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Editorial Note

South Asian Journal of Management Research (SAJMR), is a scholarly journal that publishes scientific research on the theory and practice of management. All management, computer science, environmental science related issues relating to strategy, entrepreneurship, innovation, technology, and organizations are covered by the journal, along with all business-related functional areas like accounting, finance, information systems, marketing, and operations. The research presented in these articles contributes to our understanding of critical issues and offers valuable insights for policymakers, practitioners, and researchers. Authors are invited to publish novel, original, empirical, and high quality research work pertaining to the recent developments & practices in all areas and disciplined.

Cross-functional, multidisciplinary research that reflects the diversity of the management science professions is also encouraged, the articles are generally based on the core disciplines of computer science, economics, environmental science, mathematics, psychology, sociology, and statistics. The journal's focus includes managerial issues in a variety of organizational contexts, including for profit and nonprofit businesses, organizations from the public and private sectors, and formal and informal networks of people. Theoretical, experimental (in the field or the lab), and empirical contributions are all welcome.The journal will continue to disseminate knowledge and publish high-quality research so that we may all benefit from it.

Dr. Pooja M. Patil
Editor

South Asian Journal of Management Research
(SAJMR)

Volume 14, No. 2 **March, 2024**

C O N T E N T S

A Comparative Study of the Effect of Two Composted Organic Fertilizers of Water Hyacinth on the Growth of Chinese Mustard (Brassica juncea)

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Abstract

The objective of this work is to study the effect of water hyacinth compost with effective microorganisms (EM) and water hyacinth compost with water on the growth of Chinese mustard (Brassica juncea). In this work, two types of organic fertilizers were applied in cultivation. Composted organic fertilizer 1 (COF 1) contains water hyacinth and an effective microorganism solution, and composted organic fertilizer 2 (COF 2) contains water hyacinth and water. The physicochemical properties of composted organic fertilizers were qualitatively and quantitatively characterized by conventional methods and other modern techniques. The moisture content of COF 1 is lower than the moisture content of COF 2, and the pH value of COF 2 (7.96) is higher than the pH value of COF 1 (7.91). The content of C-H is high in both COF 1 and COF 2. The higher contents of potassium, phosphorus, and nitrogen were found in COF 1 than in COF 2. The content of sulfur and magnesium was higher in COF 2 than in COF 1. According to the data, the nutrients in COF 1 are greater than those in COF 2. After that, a field experiment was carried out to determine the effects of the composted organic fertilizers. In all treatments, these fertilizers were used at the same rate when cultivating Chinese mustard (Brassica juncea). Growth rates of plant height and leaf sizes of Chinese mustard were measured using two composted organic fertilizers. Field studies showed that the cultivar with COF 1 had a higher growth rate of Chinese mustard than the cultivar with COF 2. The results of this work indicated that composting using effective microorganisms (EM) is a safe and simple way of improving the effectiveness and output of a composting system.

Keywords: effective microorganisms (EM), composted organic fertilizers, NPK content, Chinese mustard

Introduction

There are two kinds of fertilizer: chemical and organic. Both restore the same vital nutrients to the soil, but in different ways. While organic fertilizer is made of naturally occurring organic materials, chemical fertilizer is manufactured, and its nutrients are synthesized in a factory. Although chemical fertilizers improve the growth of plants and increase the yields of fruits and vegetables in a relatively short period of time, there are certain disadvantages to using chemical fertilizers (Smithson and Griller, 2002). The overuse of chemical fertilizers can lead to soil acidification because of a decrease in organic matter in the soil. Nowadays, farmers in developed countries use organic fertilizers because they are renewable, biodegradable, sustainable, and environmentally friendly. Organic fertilizers are fertilizers derived from animal matter, animal excreta (manure), human excreta, and vegetable matter (e.g., compost and crop residues). The most common are plant-based organic fertilizers, animal-based organic fertilizers, and mineral-based organic fertilizers. Plant-based organic fertilizers break down quicker than other organic fertilizers. These materials help to add drainage and moisture retention to poor soils. Animal-based organic fertilizers, such as manure, bone meal, or blood meal, add lots of nitrogen to the soil. Mineral-based organic fertilizers can add nutrients to the soil as well as balance the pH level (Weltzein, 1989).

Composting

Composting is the biological decomposition of organic waste, such as food or plant material, by bacteria, fungi, worms, and other organisms. The result of composting is an accumulation of partially decayed organic matter called humus, known as compost, which is a good fertilizer for plants. At the simplest level, the process of composting requires making a heap of wet organic matter and waiting for the materials to break down into humus after a period of months. Composting is a naturally occurring process of decomposition found in nature. Composting with effective microorganisms (EM) has some advantages.

Effective Microorganisms (EM)

Effective microorganisms (EM) are mixed cultures of beneficial naturally occurring organisms that can be applied as inoculants to increase the microbial diversity of the soil ecosystem. Effective Microorganisms (EM) is a people-friendly and environmentally safe product of EMRO (EM Research Organization) that achieves synergistic effects by combining beneficial microorganisms that exist in nature, such as lactic acid bacteria, yeast, and phototrophic bacteria. There is evidence that effective microorganism (EM) inoculation of soil can improve the quality of soil, plant growth, and yield (Kengo and Hui-lian, 2000). Effective microorganism (EM) solution is used in agriculture in multiple ways. It is used in compost to increase soil fertility, and it serves pest and weed control. EM can be used in both aerobic and anaerobic composting systems and has many advantages over traditional composting. Effective microorganisms (EM) enhance the activities of beneficial indigenous microorganisms. Effective microorganisms (EM) also promote germination, growth, flowering, fruiting, and ripening in crop plants. Effective microorganisms (EM) enhance the photosynthetic capacity of plants. Effective microorganisms (EM) develop the internal immunity of plants, thus enhancing natural resistance.

The Purpose of this Study

The purpose of this paper is to study the effect of composted organic fertilizers prepared from plants (water hyacinth) on the growth of Chinese mustard. Two types of composted organic fertilizers are prepared from water hyacinth by using an effective microorganism (EM) solution and water.

Research Methodology

Sample Collection

Water hyacinth used in this work was collected from Yangon City Development Committee (YCDC) drainage system, South Okkalapa Township, Yangon Region, Myanmar. Effective microorganisms (EM) and molasses were collected from Myay Patethar Island, Yangon Region, Myanmar.

Sample Preparation and Analysis

First of all, collected water hyacinth plants were prepared to be put into two composting boxes. In one composting box, prepared water hyacinth and effective microorganisms (EM) solution were used, and in another box, prepared water hyacinth and water were used. After 60 days, the composts were ready to use and were kept in an airtight container. Raw material (water hyacinth) and two composted organic fertilizers were qualitatively and quantitatively characterized by conventional methods and other modern techniques. The field experiments were conducted at the field in Thuwanna football stadium compound, Thingangyun Township, Yangon Region, Myanmar. The growth rate of Chinese mustard were taken every 5 days after transplanting.

Results and Discussion

Some Physicochemical Properties of Raw Material (Water Hyacinth) and Composted Organic Fertilizers

The pH value and the moisture content of raw material (water hyacinth) and composted organic fertilizers are characterized by conventional methods. The pH value and the moisture content of the raw material are the highest. The pH value of COF 2 (7.96) is higher than the pH value of COF 1 (7.91). The moisture content of COF 1 is lower than the moisture content of COF 2.

Most finished compost generally has a pH between 6 and 8 (Montoya, et al., 2013). According to the data from Table 1, the pH values of two composted organic fertilizers are consistent with the pH value range of the most finished compost.

Table 1: Some Physicochemical Properties of Raw Material (Water Hyacinth) and Composted Organic Fertilizers

Parameters	Raw Material	COF 1	COF 2
Moisture (%)	9.90	76.19	87.89
pH	8.0	7.91	7.96

Macro- and Micronutrients of Raw Material (Water Hyacinth) and Composted Organic Fertilizers
Nutrients of raw material (water hyacinth) composted organic fertilizers are characterized by conventional methods and other modern techniques at the Department of Agriculture, Land Use Division, Myanmar. Raw material was found to contain nitrogen (3.810%), phosphorus (2.440%), potassium (4.380%), calcium (2.490%), and magnesium (1.240%).

A sufficient amount of macro- and micronutrients were present in both composted organic fertilizers. The total nitrogen content of COF 1 (1.085%) was higher than the total nitrogen content of COF 2 (0.525%). The total phosphorus content of COF 1 (2.900%) was higher than the total phosphorus content of COF 2 (2.700%). The total potassium content of COF 1 (7.200%) was higher than the total potassium content of COF 2 (5.640%). The macro- and micronutrient content of COF 1 is higher than that of COF 2. The macro- and micronutrient content of raw material and composted organic fertilizers are shown in Table 2 and Figure 1.

Table 2: Macro- and Micronutrients of Raw Material (Water Hyacinth) and Composted Organic Fertilizers

Macro- and Micronutrients	**Raw Material (%)**	**COF 1 (%)**	**COF 2 (%)**
Total Nitrogen (N)	3.810	1.085	0.525
Total Phosphorus (P_2O_5)	2.440	2.900	2.700
Total Potassium (K_2O)	4.380	7.200	5.640
Total Calcium (Ca)	2.490	3.046	2.405
Total Magnesium (Mg)	1.240	1.361	0.972

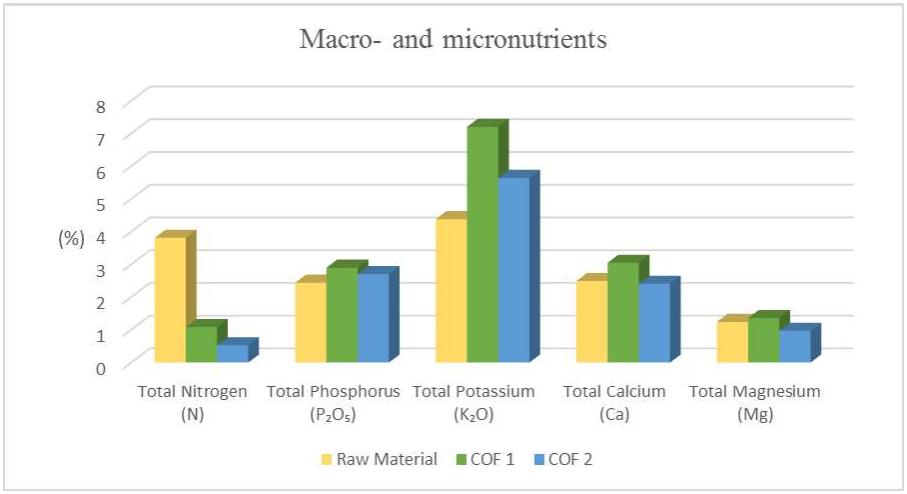


Figure 1: Histogram of macro- and micronutrients of composted organic fertilizers

Relative Abundance of Elements in Raw Material (Water Hyacinth) and Composted Organic Fertilizers
The content of potassium, calcium, phosphorus, sulphur, iron, zinc, manganese, and copper in raw material and composted organic fertilizers are shown by the EDXRF spectra represented in Table 3 and Figures 2, 3, and 4. The relative abundance of elements in raw material was found to be in the range of K > Cl > Ca > Si > P > S, etc.
The relative abundance of elements in two composted organic fertilizers were found to be in the range of K > Ca > S > P> Fe > Mn, etc. The content of C-H is high in both COF 1 and COF 2. Both two composted

organic fertilizers contain essential nutrients that are required by plants for growth, development, and reproduction.

Table 3: Relative Abundance of Elements in Raw Material (Water Hyacinth) and Composted Organic Fertilizers by EDXRF

Elements	Relative Abundance (%)		
	Raw Material	COF 1	COF 2
K	2.508	0.661	0.609
Cl	2.159	-	-
Ca	0.922	0.190	0.172
Si	0.576	-	-
P	0.418	0.089	0.083
S	0.301	0.064	0.116
Fe	0.061	0.021	0.025
Mn	0.021	0.005	0.005
Ba	0.017	-	-
Zn	0.002	0.001	0.001
Cu	0.002	0.002	0.001
Ti	-	0.002	0.002
Sr	0.001	0.001	0.001
Br	0.001	0.001	0.001
Cr	0.001	-	-
C H	93.009	98.961	98.984

Raw Material = water hyacinth
COF 1 = composted organic fertilizer 1 (water hyacinth + EM)
COF 2 = composted organic fertilizer 2 (water hyacinth + water)

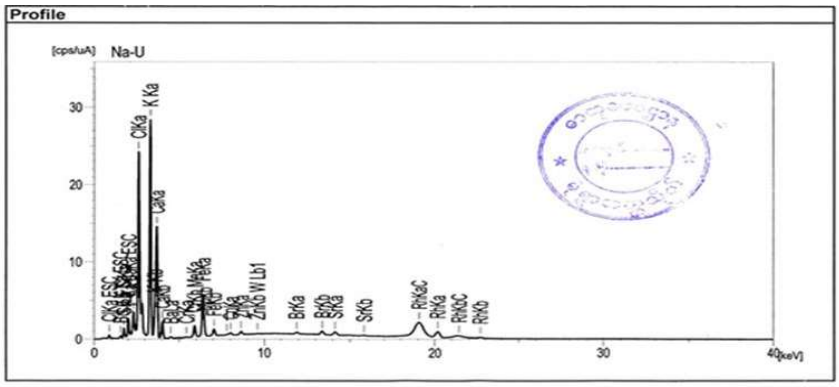


Figure 2: EDXRF spectrum of water hyacinth (Eichhornia crassipes)

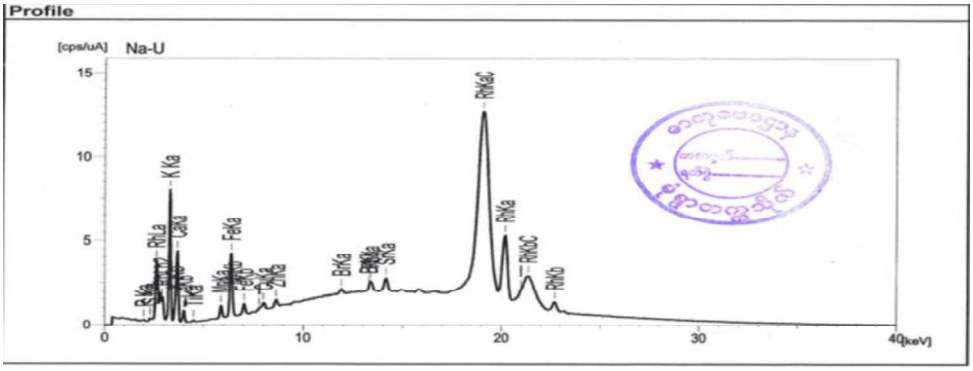


Figure 3: EDXRF spectrum of composted organic fertilizer with effective microorganisms (EM) solution

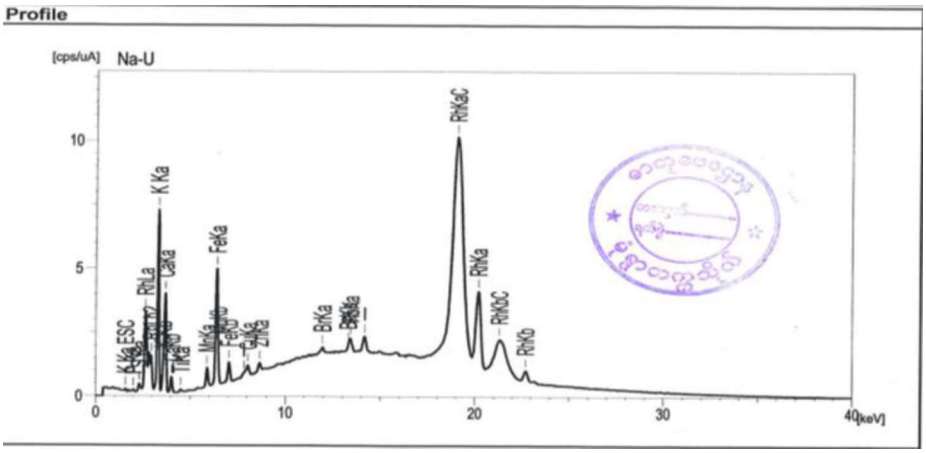


Figure 4: EDXRF spectrum of composted organic fertilizer with water

Effect of Composted Organic Fertilizers on the of Chinese Mustard (Brassica Juncea)

The field experiments on cultivating Chinese mustard with two composted organic fertilizers are shown in Figure 5. The effect of composted organic fertilizers on the growth of Chinese mustard (Brassica juncea) is shown in Table 4 and Figures 6, 7, and 8. From the time of transplanting to the harvested time, the time frame was 25 days. Plant growth increased along with the increasing age of the plant. The growth of plant heights and leaves sizes were measured at a five-day interval. Plant height, leaf length, and width in T 1 are greater than in T 2. The growth rate of T 1 was higher than that of T 2.

Both T 1 and T 2 can produce good growth rates in plants. But plants in T 1 are healthier than those in T 2. According to the data from field experiments, composting with effective microorganisms (EM) can get a better result than composting without effective microorganisms (EM). By adding effective microorganisms (EM) to composting, it can enhance nutrient uptake and add more nutrients to the soil and plants.

T 1 (5 days)

T 2 (5 days)

T 1 (10 days)

T 2 (10 days)

T 1 (15 days)

T 2 (15 days)

T 1 (20 days)

T 2 (20 days)

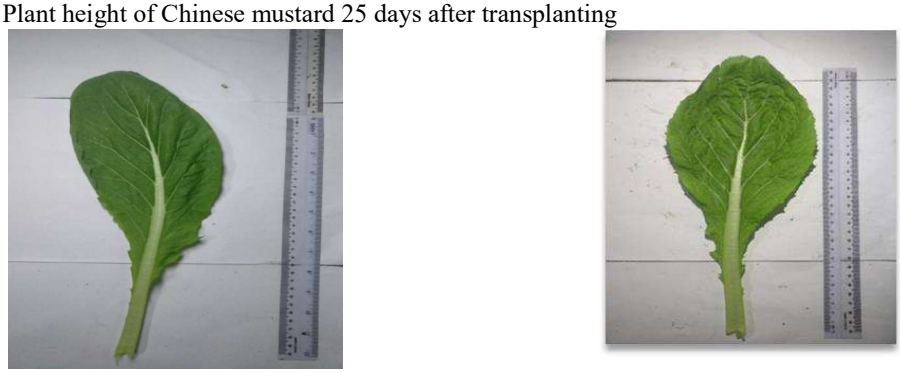
T 1 (25 days)

T 2 (25 days)

Figure 5: Cultivating Chinese Mustard with Two Composted Organic Fertilizers

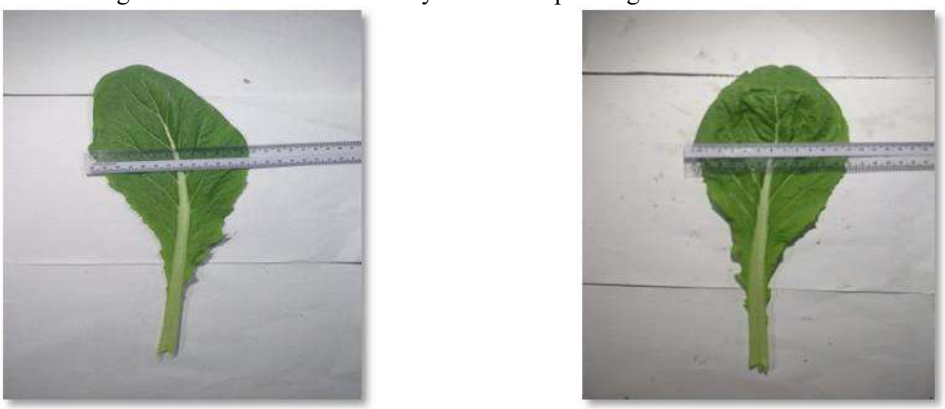
T 1 T 2

Figure 6: Plant height of Chinese mustard 25 days after transplanting



T 1 T 2

Figure 7: Leave length of Chinese mustard 25 days after transplanting



T 1 T 2

Figure 8: Leave width of Chinese mustard 25 days after transplanting

Table 4: Effect of Composted Organic Fertilizers on the Growth of Chinese Mustard (Brassica Juncea)

Time (days)	Plant Height (cm)		Leaf Length (cm)		Leaf Width (cm)	
	T 1	T 2	T 1	T 2	T 1	T 2
0	8.0	8.0	7.0	7.0	2.5	2.5
5	15.5	14.6	14.4	13.5	4.0	3.5
10	18.2	17.4	17.0	16.8	6.2	6.0
15	23.1	22.5	22.4	20.0	8.1	7.7
20	36.5	32.0	30.0	27.0	11.5	10.5
25	44.0	40.0	37.0	33.0	12.5	12.0

T 1 = Soil treated with COF 1, water hyacinth + EM

T 2 = Soil treated with COF 2, water hyacinth + water

Encouraging Local Farmers to Compost

Agriculture plays a vital role in all countries because of the increasing population. Therefore, the farmers need to use fertilizers to fulfill the food supply. Both chemical fertilizer and organic fertilizer restore the same vital nutrients to the soil, but in different ways. Chemical fertilizer can increase crop production in a short time; it costs less and is readily available in large quantities. Organic fertilizer improves the structure of the soil and increases its ability to hold water and nutrients. Organic fertilizer is the ultimate slow-release fertilizer, so it reduces nutrient loss. The weak point of organic fertilizer is that it is expensive to produce, and only available in small quantities. Farmers choose chemical fertilizers over organic fertilizers because of their cost and quick absorption. However, using chemical fertilizers can cause a lot of pollution in our environment.

In Myanmar, some farmers have also started to use organic fertilizers. On the other hand, most farmers in Myanmar cannot afford the cost of organic fertilizer. The easiest and least expensive way to make organic fertilizer is composting. However, composting is not very popular among farmers in Myanmar. The level of knowledge and attitude about composted organic fertilizers needs to improve among farmers. And also the practice of making and using composted organic fertilizers. Composting can be done with different kinds of plant parts, kitchen waste, and water. An effective microorganism (EM) solution should be used instead of water to make composted organic fertilizer more effective. Effective microorganism (EM) solutions accelerate the decomposition of organic waste and compost. So, the period of composting is shorter than that of normal composting. As a consequence, farmers can increase crop production by using organic fertilizer, preventing soil erosion, chemical leaching, and other pollution caused by chemical fertilizer, and reducing organic waste.

Conclusion

Organic compost fertilizers are rich in macro- and micronutrients that are essential for plants. When they are added to the soil, they release these nutrients slowly. So plants can get available nutrients whenever they need them. They can also improve the structure and texture of the soil and help balance the pH of the soil. In addition, composting with organic waste materials such as leaves, straw, kitchen waste, etc. can reduce waste. From experimental results, the physicochemical properties of composted organic fertilizers were found to be suitable for plant growth and soil fertility. Field studies showed that COF 1 was able to produce a higher growth rate of Chinese mustard than COF 2. From the results, it can be concluded that composting with effective microorganisms (EM) enhances the growth of Chinese mustard. Composting using effective microorganisms (EM) saves energy and the work force. It is easy to handle and available at a low cost. Summing up, effective microorganisms (EM) create the value of added compost. It will give a more complete breakdown of organic matter in compost and a higher quality. Moreover, it can accelerate the composting process and reduce odor during composting. This means composting with effective microorganisms (EM) can give plants a higher growth index and, therefore, a better growth rate. The aim of this research work is to raise the knowledge of local farmers about how to make composted organic fertilizer with organic waste that is easily obtained and their attitude toward using composted organic fertilizer in farming.

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