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Article

Evaluation of the Effectiveness of Maggot Compost and Chicken Manure Fertilizer on Sunflowers in Sandy Land

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ABSTRACT

Sunflowers have excellent prospects for future development in Indonesia. This commodity offers a variety of uses, from food and medicine to industrial use and even as a beauty product. Currently, development is focused on marginal land, particularly sandy soil. However, such land is known to have various limitations, necessitating innovations to enable its use as cultivation. One such approach is the application of fertilization technology using maggot compost and chicken manure. The purpose of this study was to evaluate the effectiveness of maggot compost and chicken manure on sunflowers in sandy soil. This study was conducted in Pasir Putih, Padang City, from June to September 2025. The design used in this study was a randomized block design with two factors and three replications. The first factor was the dose of maggot compost and the second was the dose of chicken manure. The results showed that the application of chicken manure and maggot compost at various doses resulted in increased growth and yield of sunflowers in sandy soil with each dose increase. Maggot compost at a dose of 20 g/plant and chicken manure at a dose of 30 g/plant had an interaction on plant height. Meanwhile, at a dose of 20 g/plant of chicken manure fertilizer and 15 g/plant of maggot compost, there was an interaction on the number of sunflower seeds.

INTRODUCTION

Sunflowers are one type of agricultural commodity that needs to be considered for further development. This is based on the many benefits we can obtain not only as a food ingredient but also as a raw material for various industries, medicines and even suspected to have great potential for beauty products. In addition, all components of the plant can also be used such as the roots, stems, leaves and seeds. According to [1] in everyday life, sunflower seeds are usually used as snacks, then the seed coat is used as animal feed, the stems are used as paper making materials and the leaves as a substitute for tobacco. Sunflower seeds are known to have good nutritional content of vegetable oil compared to other vegetable oils. According to [2] in sunflower seeds there are vegetable oils ranging from 23-45%. Sunflower seed oil contains 44-72% linoleic acid and 11.7% oleic acid and has a good vitamin E content for the body [3]. In addition, it was also reported that sunflower stems contain 31.5% to 48% cellulose and 2.5% to 14% lignin [4] and sunflower cultivation can also produce a lot of honey, thus providing opportunities for people to cultivate honey bees [5]

Considering this potential, it is appropriate to develop sunflowers in various remote areas of Indonesia. This development is certainly limited by various fertile land, so it is shifted to the use of marginal land such as sandy land in coastal areas. Research [6] revealed that sunflowers have the potential

to be developed on idle land in coastal areas, but the results are not optimal. As we know, coastal land is one of the areas that has many problems such as high salinity levels and a lack of sufficient nutrient availability for cultivated plants.

The availability of extensive land in coastal areas that has not been optimally utilized should be the right choice to support the development of sunflowers. However, many problems have been found, of course, there is a need for an innovative design that can be applied to support sunflower cultivation in sandy coastal areas. One of them is the application of maggot compost and chicken manure. As we know, maggot compost is the result of the decomposition of maggots or larvae of the Black Soldier Fly (BSF) [7]. These BSF fly larvae can decompose organic waste that often becomes human waste such as rice, vegetables, fruit, and meat so that its use is quite beneficial to reduce environmental pollution. According to [8], maggots can eat almost all types of organic waste because of their wide range of tolerance to food pH. The application of maggot compost to long bean plants provides better long bean growth results when compared to growth without compost [9].

In addition, another effort that can be made to add organic matter to the soil to maintain soil fertility and ensure sufficient micro and macro nutrients for plants is by utilizing chicken manure. Sutedjo [10] stated that chicken manure contains three times more nitrogen (N) than other manures and a fairly high phosphorus (P) content, namely 2.6% (N), 2.9% (P), and 3.4% (K) with a C/N ratio of 8.3. In addition, based on research results [11], the use of organic matter, especially chicken manure, can improve soil quality so that corn production increases and is no different from the use of 100% inorganic fertilizer. However, the use of maggot compost and chicken manure is still limited, especially on sandy land, so an evaluation of its effectiveness is needed. The purpose of this study was to determine the effectiveness of maggot compost and chicken manure on sunflowers on sandy land.

METHODS

Time and Place of Research

The research was conducted at Pasir Putih Beach, Bungo Pasang, Padang City, West Sumatra Province from June to September 2025.

Tools and materials

The tools used were hoes, machetes, watering cans, scissors, rulers, digital scales, cameras, and stationery. The materials used were local jumbo sunflower seeds, maggot compost, chicken manure, Mutiara NPK fertilizer, and chemical pesticides.

Research design

The study used a factorial randomized block design. Factor I was the maggot compost dosage, namely 0g/plant (M1), 10g/plant (M2), 15g/plant (M3), and 20g/plant (M4). While factor II was the chicken manure fertilizer dosage consisting of 0g/plant (P1), 10g/plant (P2), 20g/plant (P3), and 30g/plant (P4), each of which was repeated three times, resulting in 48 experimental units. Data analysis used was ANOVA with F test at 5% level and

Research Implementation

The research was conducted by first preparing the land. The land was hoed and raised beds were created. Manure compost and chicken manure were then applied according to the treatment, and the land was incubated for a week. Afterward, sunflower seeds were planted by inserting one seed into the planting hole. Maintenance included watering, weeding, follow-up fertilization, and pest and disease control.

Observation Parameters

The parameters observed were the percentage of plant growth, plant height, number of leaves, stem diameter, number of seeds per plant and weight of 100 seeds.

RESULTS AND DISCUSSION

Seedling Growth Percentage (%)

Sunflower seeds planted in sandy soil had a high germination rate, ranging from 86.67% to 100%. Statistical tests showed that the treatments had no significant effect on seedling germination. Observational data can be seen in Table 1.

Table 1. Percentage of sunflower seedling growth at 2 weeks after planting (WAP)

Chicken Manure Dosage (g/plant)	Maggot Compost Dosage (g/plant)				Average
	0	10	15	20	
0	90.00	90.00	90.00	93.33	90.83
10	86.67	90.00	93.33	96.67	91.11
20	90.00	90.00	96.67	100.00	94.17
30	93.33	96.67	100.00	96.67	96.67
Average	90.00	91.67	95.56	96.67	

The data in Table 1 illustrates that the higher the dose of chicken manure and maggot compost applied, the higher the average percentage of sunflower seedling growth in sandy soil. This is thought to be because the addition of chicken manure and maggot compost to sandy soil can add several nutrients and improve the physical condition of the soil so that the soil can become an optimum growing place for sunflower seedlings. Muhsanati et al [12] reported that the application of chicken manure combined with mycorrhiza can maintain soil conditions in coastal areas so that they remain in accordance with the needs of plants to grow well. In addition, [13] stated that the application of maggot compost can add nutrients to the soil which helps seedlings to grow well. This is in line with [14] that the application of compost has the ability to improve the physical properties of the soil and provide nutrients that will be needed by plants.

Plant Height (cm)

The application of chicken manure and maggot compost in several doses can increase the growth of sunflower plants on sandy soil. The higher the dose, the higher the sunflower plant height. Based on statistical tests, the treatments significantly affected sunflower plant height on sandy soil. Observational data can be seen in Table 2.

Table 2. Height of sunflower plants in sandy land at 7 MST

Chicken Manure Dosage (g/plant)	Maggot Compost Dosage (g/plant)				Average
	0	10	15	20	
0	171.34	170.65	171.53	172.31	171.46 c
10	172.88	172.89	174.37	174.53	173.67 b
20	174.54	174.76	177.56	179.78	176.66 ab
30	174.69	175.63	178.80	180.12	177.31 a
Average	173.36 c	173.48 c	175.57 b	176.69 a	

Description: Numbers followed by the same lowercase letters according to columns and rows are not significantly different according to the DNMRT follow-up test at the 5% level.

The application of chicken manure and maggot compost can increase the availability of nutrients in sandy soil. As is known, sandy land is marginal land that is poor in nutrients so it is rarely used for cultivation. The addition of these two fertilizers can meet the needs of plants in carrying out their growth process. Obel et al [13] stated that maggot compost can improve the condition of sandy soil for the better, such as more available water content and better soil structure. In line with that, based on the results of

research [15], the elements in maggot compost are more complex in supporting plant growth, such as N content of 3.276%, P of 3.387%, K of 9.74%, C-organic of 40.95%, C/N ratio of 12.50%, and water content of 11.04%.

Plant height increased along with the increase in the dose given. This is thought to be due to the high nutrient content for each treatment. According to [10], chicken manure contains quite high levels of N and P nutrients compared to other manures with a percentage of N 2.6%, P 2.9%, and K 3.4% with a C/N ratio of 8.3. In addition, [16] added, the higher the dose of chicken manure given, the better the vegetative growth of corn plants, because the content of N, P, and K nutrients is quite high.

Number of Leaves (Sheets)

Based on statistical tests, the application of chicken manure and maggot compost had no significant effect on the number of sunflower leaves in sandy soil. The number of sunflower leaves ranged from 22.45 to 29.14. The data can be seen in Table 3.

Table 3. Number of sunflower leaves on sandy land at 7 MST

Chicken Manure Dosage (g/plant)	Maggot Compost Dosage (g/plant)				Average
	0	10	15	20	
0	22.67	23.77	24.62	25.88	24.24
10	22.45	24.31	25.13	26.77	24.67
20	26.12	28.43	29.14	28.98	28.17
30	24.63	27.66	28.73	28.87	27.47
Average	23.97	26.04	26.91	27.63	

In Table 3 we can see that the number of sunflower leaves increases with the addition of the maggot compost dose. In contrast to the addition of chicken manure fertilizer which has the highest number of leaves at a dose of 20g/plant. This is thought to be due to the complex nutrient content contained in the chicken manure fertilizer so that it increases the number of sunflower leaves more quickly. According to [17], chicken manure fertilizer contains complete nutrients, both macro and micro, which play a role in renewing soil conditions. Purboningtyas et al [18] stated that the addition of nutrients in the soil and the ability of plant roots to absorb them will affect the growth of a plant's height, the number of leaves, and the diameter of the plant stem. In addition, maggot compost has a fairly high N content of 3.276% so it plays a role in stimulating vegetative growth in plants, especially during the formation of leaf blades, which of course also affects the process of photosynthesis. According to [19], the N element has an influence on leaf growth and development.

Bar Diameter (mm)

Sunflowers planted in sandy soil had stem diameters ranging from 20.14 mm to 23.78 mm after applying several doses of chicken manure and maggot compost. Statistical analysis showed that the doses of chicken manure and maggot compost had no significant effect on sunflower diameter. The data can be seen in Table 4.

Table 4. Diameter of sunflower stems in sandy soil at 7 MST

Chicken Manure Dosage (g/plant)	Maggot Compost Dosage (g/plant)				Average
	0	10	15	20	
0	20.14	21.16	22.20	23.13	21.66
10	21,22	21.53	23.54	23.76	22.51
20	22.56	22.80	23.36	23.78	23.13
30	22.79	23.73	23.68	23.72	23.48
Average	21.68	22.31	23.20	23.60	

The data in Table 3 shows that the increase in the average stem diameter is directly proportional to the increase in the dose of chicken manure and maggot compost given. This is because the sufficient nutrients are given to the soil so that the plants can carry out each growth process well. Sutedjo [10] explained that chicken manure contains quite high elements, namely 2.9%, which play an important role in the process of photosynthesis, respiration, transfer, energy storage, cell division and enlargement, as well as other processes in plants [20]. In addition [21] said that the N element is very important for plants in the formation of green leaf substances and triggers the formation of vegetative growth organs such as roots, leaves, branches and stems as well as the formation of protein compounds and amino acids in stimulating growth during the vegetative period [22]. In addition, [23] that the diameter of the plant stem can also be influenced by the environmental conditions in which the plant grows.

Total seeds per crop (seeds)

Based on statistical tests, the application of chicken manure and maggot compost significantly affected the total number of sunflower seeds grown in sandy soil. The total number of seeds per plant ranged from 980 to 1,131.33. The data can be seen in Table 4.

Table 5. Total sunflower seeds planted on sandy land

Chicken Manure Dosage (g/plant)	Maggot Compost Dosage (g/plant)				Average
	0	10	15	20	
0	980.00	997.67	1042.00	1093.33	1028.25 b
10	1082.33	1095.00	1115.67	1126.00	1104.75 ab
20	1100.67	1121.00	1131.33	1129.67	1120.67 a
30	1125.00	1130.67	1128.33	1126.00	1127.50 a
Average	1072.00 c	1086.09 c	1104.33 b	1118.75 a	

Description: Numbers followed by the same letter are not significantly different based on the 5% DMRT test. tn = not significantly different in the 5% F test.

Table 5 shows that the average number of sunflower seeds per plant increases with each increase in the dose of chicken manure and maggot compost. This is thought to be due to the sufficient availability of nutrients so that the plants can optimally utilize them for generative development that is comparable to their vegetative growth conditions. According to [18], plant growth that occurs during the vegetative stage will affect production increases during the generative stage. In addition, [24] stated that the yield of a plant can be maximized by increasing fertilization efficiency with several fertilizer additions.

Weight of 100 seeds (gr)

Chicken manure and maggot compost applied in several doses to sunflowers in sandy soil resulted in a seed weight of 3.40 g to 3.98 g per 100 seeds. The data can be seen in Table 6.

Table 6. Weight of 100 sunflower seeds in sandy soil

Chicken Manure Dosage (g/plant)	Maggot Compost Dosage (g/plant)				Average
	0	10	15	20	
0	3.40	3.50	3.50	3.74	3.54
10	3.52	3.66	3.71	3.82	3.68
20	3.71	3.84	3.98	3.90	3.86
30	3.82	3.84	3.87	3.82	3.84
Average	3.61	3.71	3.77	3.82	

The data in Table 6 above illustrates that the average weight of 100 sunflower seeds is 3.54 g to 3.84. These data are not very different even though each increase in the dose of chicken manure and maggot compost given can increase the weight of 100 sunflower seeds. This is thought to be due to the genetics

of the sunflower used so that adaptation is needed to maximize its potential. According to [25], the crop yield obtained is related to the ability of the sunflower variety planted to interact with the planting environment conditions. The nutrients provided are sometimes sufficient, but because of the appearance of the variety itself, the yield obtained is also affected. Machikowa and Saetang [26] stated that there is a relationship between seed weight and the diameter of the sunflower flower tube planted. In addition, seed size is a character related to yield. Hladni et al [27].

CONCLUSION

The application of chicken manure and maggot compost in several doses resulted in increased sunflower growth and yield in sandy soil with each dose. Maggot compost at a dose of 20 g/plant and chicken manure at a dose of 30 g/plant had an interaction on plant height. Meanwhile, at a dose of 20 g/plant of chicken manure fertilizer and 15 g/plant of maggot compost, there was an interaction on the number of sunflower seeds.

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