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# Utilization of Combinations of Organic Matter in Chrysanthemum Plant Cultivation

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**A B S T R A C T**

Chrysanthemums are a vital commodity in Indonesia's floriculture industry. Their cultivation, primarily managed by small-scale farmers with limited resources, often results in suboptimal quality. Increasing chrysanthemum production and quality requires adopting appropriate, locally sourced organic materials as soil amendments. This study evaluates the impact of different organic material combinations and their dosages on chrysanthemum growth and yield. A field experiment was conducted in a greenhouse using a Nested Experiment with a Randomized Factorial Design. The results indicate that combinations of organic materials significantly influence flower stalk length, weight, and fresh flower weight. The highest economic fresh flower weight (132.13 g) was achieved using a combination of chrysanthemum residue, hydroponic media, and leaf litter at a dose of 1.5 tons per hectare, showing a 10.87% yield increase over the lowest treatment. These findings highlight the potential of organic matter integration to enhance chrysanthemum quality and farmer profitability.

**Contribution to Sustainable Development Goals (SDGs):**
**SDG 2** – Zero Hunger
**SDG 8** – Decent Work and Economic Growth
**SDG 12** – Responsible Consumption and Production
**SDG 13** – Climate Action
**SDG 15** – Life on Land

## 1. INTRODUCTION

### 1.1. *Research Background*

Chrysanthemums are among the most popular and important cut flowers as a source of the country's foreign exchange. Chrysanthemums are ornamental plants known for their flowers' diversity and beauty. It's no wonder that chrysanthemums are the most important cut flower in international trade after roses and carnations. The trend of demand for chrysanthemum cut flowers for export tends to increase every year. Indonesia is an exporter of cut chrysanthemums, and domestic chrysanthemum cultivation is required to be able to meet the needs of the international market so as not to be left behind other cut chrysanthemum supplier countries, such as Malaysia. Chrysanthemum production and post-harvest techniques must be considered to meet domestic and foreign markets [1]. Chrysanthemum production has not been able to meet market needs because productivity is still low. Not all potential areas have been planted with ornamental plants due to various considerations, such as their location far from the marketing center, lack of adequate infrastructure, and limited knowledge of cultivation, harvesting, and post-harvest handling. The increase in production needs to continue through intensification. Increasing production through intensification is often met with problems, including the provision of planting material (cuttings), planting spacing regulation, soil moisture regulation with mulch, determination of appropriate organic fertilizers as well as optimal doses, pre and post-harvest (sorting, grading and packaging), and production system management. These cultivation factors cause low production and quality of chrysanthemums, which affect the selling price of chrysanthemums such as cut flowers [2]. During the process of growth and development, plants are affected by various environmental factors, such as soil fertility, high (low) temperatures, strong (weak) light, drought (floods), high salt content, heavy metals, and pathogenic bacteria (or viruses) [3].

Chrysanthemums are a commodity that has a high enough economic value so that it has the potential to be developed commercially as a fundamental component in agribusiness, both as cut flowers, potted ornamental plants, and medicinal plants [4]. It is mentioned that Chrysanthemum morifolium is one of the four central cut flowers in the world and has significant ornamental and economic value. The fragrance of flowers is an essential character of chrysanthemums, especially for edible teas and chrysanthemums, and fragrance also greatly determines their commercial value. Today, chrysanthemums are widely used as fragrances and medicines [5].

The rapid development of tourism also has an impact on the variety of horticultural products needed to meet the demands of the market with quality and guaranteed product continuity related to Bali is a tourism area, so the potential of the chrysanthemum market is very promising for individual consumers such as florists, wedding events and big days. As well as institutional consumers (hotels, banks, government offices, and private). So that the development of ornamental plants is directed to refer to market needs, comparative profits, and economic value, in addition, the development is in line with the potential of resources, agroclimatic conditions, agroecosystems of an area, supporting facilities and infrastructure, and market prospects.

The main obstacle to chrysanthemum cultivation in the new center is the limited knowledge of cultivation technology (pre-harvest and post-harvest). Therefore, efforts to introduce cultivation technology must be made so that farmers are interested in adopting it and developing it into the chrysanthemum cultivation production system.

Organic matter can come from animal manure, plant material, and harvested waste. Plant material can come from fallen leaves of forest plants, crop waste in the form of rice straw, crop residues, corn stalks, and others, and hydroponic media cultivation waste such as husk charcoal and cocopeat. Soil treated with organic fertilizer can bind water more than soil with low organic matter content. Organic fertilizers are the best and most natural soil amendment materials than artificial soil amendment materials. In general, organic fertilizers contain low macronutrients but a sufficient amount of micronutrients that are indispensable for plant growth. Nitrogen and other nutrient elements are released by organic fertilizers slowly through the mineralization process. Thus, if given continuously, it will help build soil fertility. Using biological and organic fertilizers is one of the modern trends to reduce environmental pollution, fight unsuitable conditions, and increase plant growth. Organic fertilizers are important in agriculture, as they are biodegradation products of plant and animal waste and are organic materials that promote plant growth by equipping plants with the necessary nutrients and improving chemical, physical, and biological properties [6].

One of the consequences of the lack of organic matter in the soil will cause soil fertility to be low and the application of chemical fertilizers to be less practical. Some of the things that cause the soil to have a low organic matter content are the high intensity of planting, especially with improper cultivation techniques, which will even cause damage to the soil itself, the use of chemical fertilizers with excessive doses for a long period, without being balanced with the application of organic fertilizers can also make the soil more acidic and the absorption of nutrients is disturbed and the rest of the plant is not returned to the soil. Based on these problems, it can be formulated as follows:

1. How does using a combination of organic materials affect the growth and yield of Chrysanthemum Plants?
2. Can the dosage of each combination of organic ingredients increase the yield of chrysanthemum plants as cut flowers?.

The study aims to obtain a combination of organic materials that are ideal for chrysanthemum cultivation in specific locations, as well as the dosage that is tested to improve the yield and quality of chrysanthemum plants.

The urgency of this research is that in the introduction of new businesses, especially chrysanthemum cultivation as cut flowers, more persistence is needed so that the increase in production, productivity and quality of chrysanthemum products can be significantized, so it is necessary to carry out a strategy so that the obstacles and problems in the cultivation of chrysanthemum plants that often occur in the development of new commodities to farmers can be minimized so that the improvement of farmers' welfare through the development of chrysanthemum farming can be Manifest. The application of cultivation technology findings is expected to have a significant impact on increasing the income or welfare of local farmers so that farmers will be interested in adopting the technology and developing it into the production system on their farmland. The innovations were obtained by combining organic ingredients and the best dosage to increase the growth and yield of chrysanthemum plants as cut buga. It also provides recommendations for the best research results of combinations of types of organic ingredients and doses of each combination of organic materials to increase the growth of chrysanthemum crops.

The final result of this study will be very beneficial for efforts to increase the production and quality of horticultural plants, especially chrysanthemum ornamental plants, in an attempt to meet the needs of local, national, and international markets.

### *1.2. Research Objective*

This study investigates the role of organic amendments in improving soil health, optimizing nutrient availability, and increasing chrysanthemum productivity. Organic materials such as leaf litter, chrysanthemum harvest residue, and hydroponic media waste can enhance soil structure and provide essential nutrients. The objectives of this research are:

1. To assess the impact of different organic material combinations on chrysanthemum growth and yield.
2. To determine the optimal dosage for maximizing chrysanthemum quality and economic viability.

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## 2. MATERIALS AND METHODS

A greenhouse experiment (Figure 1) was conducted using a Nested Experiment with a Randomized Factorial Design. Three types of organic amendments were tested: (1) Leaf litter, (2) Chrysanthemum harvest residue, and (3) Hydroponic media waste (husk charcoal). The treatments included various dosage levels nested within the organic material combinations. Observations included plant height, flower stalk length, flower weight, stem diameter, and flower diameter. Data were analyzed using variance analysis, followed by LSD or Duncan's multiple range test (5%) for mean separation.

The materials used in the study include White Giant variety chrysanthemum seeds, inorganic fertilizers and rasamala leaf litter, chrysanthemum crop residues, hydroponic planting media (husk charcoal), pesticides, dolomite, and fungicides. The implementation of the experiment includes the preparation of planting media, fertilization, planting, treatment, plant maintenance (watering, embroidery, weeding, pest and disease control), observation of plant growth and development and harvesting.

The observed variable is the length of the flower stalk (cm). Before harvest, measure the length of the flower stalk from the ground level to the highest tip of the flower. Measured from the base of the stem to the tip of the highest flower. The weight of the flower stalk (g) was measured by weighing all plant samples with an electric scale at harvest. Rod diameter (cm). Measure the diameter of the stem with the caliper before harvest by measuring the stem of the plant between the maximum height. Flower diameter (cm). Measured using the caliper of a flower that has been in full bloom on each flower bud. Fresh weight of economical flowers (g). Measured .

Observation data were analyzed using variance analysis if the treatment had a significant or very significant effect, followed by the test of the smallest significant difference of the level.

Tall Planting Plant Long Flower Stalk Weight Fresh Flower Economy

**Figure 1**. Greenhouse experimental set-up

## 3. RESULT AND DISCUSSION

### *3.1. Factors affecting rice production*

The statistical analysis revealed significant effects ($P<0.05$) of organic material combinations on all measured variables except flower diameter. The highest fresh flower weight (132.13 g) was recorded with the combination of chrysanthemum residue, hydroponic media, and leaf litter at a dosage of 1.5 tons per hectare, reflecting a 10.87% yield increase compared to the lowest treatment (117.77 g).

Among individual organic amendments, hydroponic media waste significantly enhanced plant growth, likely due to its high silica content, which improves soil aeration and root development. The integration of leaf litter also contributed to increased nutrient availability, supporting vegetative growth and flower formation.

One of the challenges in chrysanthemum cultivation is soil-borne diseases, which can be exacerbated by the use of organic materials if not properly managed. The presence of beneficial microorganisms in composted organic matter can mitigate disease risks while improving soil microbiota balance. Additionally, previous studies have shown that the application of compost and biochar enhances water retention, reduces nutrient leaching, and promotes healthier root systems.

The findings of this study align with previous research, indicating that organic fertilizers gradually release essential nutrients, fostering sustained plant growth. Furthermore, integrating organic matter into chrysanthemum farming systems offers economic and environmental benefits by reducing dependency on synthetic fertilizers, lowering production costs, and minimizing environmental pollution.

The significance of applying the combination of organic sources and the effect between doses on each type of organic source on all observed variables is presented in Table 1. Meanwhile, the influence between combinations of organic sources and between doses on each combination of organic sources on the average of all observed variables is presented in Tables 2 and 3.

The results of the statistical analysis showed that the influence of the combination of organic material sources had a significant effect ($P<0.05$) on all variables observed except for the length of flower stalks (cm), flower stalk weight (g) and economic flower fresh weight (g) had a significant effect ($P>0.05$). The effect between doses on each combination of organic matter, chrysanthemum harvest residue and leaf litter had an insignificant effect ($P0<0.05$) on all variables observed except for the very significant flower diameter ($P>0.01$). The effect between doses on each combination of organic materials, chrysanthemum harvest residues, and hydroponic media had a significant ($P>0.05$) to very significant ($P>0.01$) effect on all variables observed. The effect between doses on each combination of organic materials left over from chrysanthemums, hydroponic media, and leaf litter had a significant ($P>0.05$) to very significant ($P>0.01$) effect on all variables observed in Table 1.

**Table 1.** The significance of the results of the analysis of the variation of the use of combinations of organic matter and the effect between doses on each type of organic matter source in chrysanthemum crop cultivation on all observed variables.

| | Variable | Organic ingredient combination (K) | Effect between doses on each combination of organic matter | | |
|---|---|---|---|---|---|
| | | | D dl Kd | D dl Km | D dl Kmd |
| 1 | Maximum Plant Height (cm) | Ns | Ns | * | ** |
| 2 | Flower stalk length (cm) | * | Ns | ** | ** |
| 3 | Number of Flowers (florets) | Ns | Ns | * | * |
| 4 | Flower diameter (cm) | Ns | ** | * | * |
| 5 | Flower stalk weight (g) | * | Ns | * | * |
| 6 | Fresh weight of economical flowers (g) | * | Ns | * | ** |

Description: * = has a significant effect, ** = has a very significant effect, ns = not significant, D = Dose, S = Leaf litter, P = Rest of chrysanthemum harvest, H = Rest of hydroponic medium.

**Table. 2.** The effect between combinations of organic matter and between doses on each type of organic material source on the average maximum plant height (cm), flower stalk length (cm), flower stalk weight (g), and number of flowers (florets)

| **Influence between combinations of organic sources** | | | |
|---|---|---|---|
| Treatment | Maximum plant height (cm) | Flower stalk length (cm) | Number of Flowers (florets) |
| Leftover chrysanthemum harvest + leaf litter ($K_d$) | 106.56 A | 126.29 b | 12.49 A |
| Leftover chrysanthemum harvest + hydroponic medium ($K_m$) | 113.93 A | 140.46 A | 13.77 A |
| Rest of chrysanthemum harvest + hydroponic medium + leaf salad ($K_{md}$) | 125.56 A | 139.56 A | 14.13 A |
| LSD 5% | Ns | 10.71 | Ns |
| **Effect between doses on each combination of organic sources** | | | |
| Dosage dl Leftover chrysanthemum harvest + leaf litter | | | |
| 2 ton $Ha^{-1}$ | 102.20 A | 124.05 A | 11.33 A |
| 4 ton $Ha^{-1}$ | 107.98 A | 128.25 A | 12.17 A |
| 6 ton $Ha^{-1}$ | 109.50 A | 126.58 A | 13.97 A |
| Dosage dl Chrysanthemum harvest residue + hydroponic medium | | | |
| 1 ton $ha^{-1}$ | 106.67 C | 133.81 b | 12.83 b |
| 2 ton $Ha^{-1}$ | 113.63 b | 143.17 A | 13.03 b |
| 3 ton $Ha^{-1}$ | 121.50 A | 144.40 A | 15.43 A |
| Dosage dl Leftover chrysanthemum harvest + hydroponic medium + leaf salad | | | |
| 0.5 kg $ha^{-1}$ | 132.43 c | 132.43 c | 12.43 c |
| 1.0 kg $ha^{-1}$ | 139.93 b | 139.93 b | 14.17 b |
| 1.5 kg $ha^{-1}$ | 146.30 A | 146.30 A | 15.80 A |
| LSD 5% | 5.84 | 3.80 | 1.31 |

Remarks: The numbers in the same column for each factor followed by the same letter did not differ significantly in the 5% LSD test.

**Table 3.** The effect between combinations of organic material sources and between doses of each type of organic material source on the average flower diameter (cm), flower stalk weight (g), and economic flower fresh weight (g)

| | **The influence between combinations of organic ingredients** | | |
|---|---|---|---|
| Treatment | Flower diameter (cm) | Flower stalk weight (g) | Fresh weight of economical flowers (g) |
| Leftover chrysanthemum harvest + leaf litter ($K_d$) | 7.03 A | 117.89 b | 109.82 b |
| Leftover chrysanthemum harvest + hydroponic medium ($K_m$) | 8.11 A | 127.64 ab | 121.40 ab |
| Rest of chrysanthemum harvest + hydroponic medium + leaf salad ($K_{md}$) | 8.36 A | 136.29 A | 122.99 A |
| LSD 5% | Ns | 10.80 | 11.86 |
| **Effect between doses on each combination of organic sources** | | | |


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| | | | |
|---|---|---|---|
| Dosage dl Leftover chrysanthemum harvest + leaf litter | | | |
| 2 Ton $Ha^{-1}$ | 5.63 c | 114.20 A | 109.67 A |
| 4 Ton $Ha^{-1}$ | 7.37 b | 117.50 A | 107.83 A |
| 6 Ton $Ha^{-1}$ | 8.10 A | 121.97 A | 111.97 A |
| Dosage dl Chrysanthemum harvest residue + hydroponic medium | | | |
| 1 ton $Ha^{-1}$ | 7.50 b | 121.80 b | 115.50 c |
| 2 ton $Ha^{-1}$ | 8.33 A | 126.30 b | 120.87 b |
| 3 ton $Ha^{-1}$ | 8.50 A | 134.83 A | 127.83 A |
| Dosage dl Leftover chrysanthemum harvest + hydroponic medium + leaf salad | | | |
| 0.5 kg $ha^{-1}$ | 7.90 b | 131.07 c | 117.77 b |
| 1.0 kg $ha^{-1}$ | 8.23 b | 136.03 b | 119.07 b |
| 1.5 kg $ha^{-1}$ | 8.95 A | 141.77 A | 132.13 A |
| LSD 5% | 0.42 | 4.64 | 5.11 |

Remarks: The numbers in the same column for each factor followed by the same letter did not differ significantly in the 5% LSD test.

Chrysanthemum plants require a growing medium, which is generally a mixture of soil and organic matter. Organic matter is needed in addition to improving the physical structure of the rhizosphere, it can also provide additional microelements for plants. The use of inappropriate organic matter in the type and amount of chrysanthemum plants often raises a new problem: an increase in the incidence of soil-borne disease attacks. Some diseases transmitted through the ground or air are known to have a very detrimental attack rate. Several soil-borne diseases are known to attack chrysanthemum plant nurseries, including those caused by Phomopsis sclerotiodes, Fusarium spp, Phythium sp Rhizoctonia solani, and Sclerotinia sclerotiorum. All of these diseases need to be treated seriously because the rate of spread and damage can result in crop failure that is detrimental to chrysanthemum farmers. At the nursery stage, the growing medium is prioritized to get healthy young plants that are able to grow well after being planted on the production medium. Planting media, a mixture of soil and organic matter, has provided two advantages: acting as a root growth medium and providing nutrients and water for plant roots to be absorbed. However, organic matter can also be a medium for the development of soil-borne diseases, which are a threat to chrysanthemums.

Planting media in the form of a mixture of soil with organic matter has the advantage of holding as much water as possible and removing excess water that is not needed. A good medium also plays a role in stimulating root growth, easily holding nutrients and easily releasing them to be absorbed by plant roots. From the results of field tests carried out at the Experimental Garden of the Ornamental Plant Research Installation, Segunung, in 1999, it is known that the use of gliocompost can increase the growth, health, and production of chrysanthemum plants [7]. Applying compost fertilizer to chrysanthemum plants significantly affects branch length, number of leaves, branch diameter, flower stalk length, and secondary branch flower diameter. Teak leaf litter compost is known to contain macro elements N, P, K, C, K, Ca, and Mg. Nutrient content in 10-year-old teak leaf litter shows the yield of elements N (0.52-1.28%), P (0.04-0.14%), K (0.06-0.52%), C (46.49-52.32%), Ca (1.69-2.64%), and Mg (0.10-0.45%) (Supriyo and Prehaten, 2014). The results showed that the decomposition of teak leaf litter and the release of its chemical and nutrient composition could fertilize the soil in dry tropical deciduous forest areas with a higher N content of around 1.02-1.36% [8].

After harvesting cut chrysanthemums, there are still many stems and leaves left because not all plants are used, so the remains of the stems are left and, in the end, are only burned or left as waste or garbage that will only pollute the environment. If waste is left unhandled and prolonged, this is not good for the environment and also for the soil that will be replanted so it also has an impact on the products produced will also be bad in the future. The advantages of this compost fertilizer are environmentally friendly, can increase income, and can increase soil fertility by repairing soil physical damage due to excessive use of inorganic (chemical) fertilizers. In addition, compost can also be used to increase environmental carrying capacity, increase crop production, increase farmers' income, and reduce pollution to the environment. [9].

Meanwhile, the use of chrysanthemum leaf extract as an organic liquid fertilizer has a significant effect on the fresh weight of the planted flowers, and has a very significant effect on the economic fresh weight of the flowers in chrysanthemum plants. Furthermore, it was stated that chrysanthemum leaf extract contains elements such as: N, P, K, Mg, Ca with a content of N of 1.421%, P of 0.2262%, K of 4.819%, Mg of 0.1883%, and Ca of 0.419% [10].

The waste of hydroponic media for pepper plants has great potential to be used as an organic fertilizer because the medium used uses husk charcoal, usually this waste is only used once after the pepper plant is harvested, entrepreneurs rarely use this media for the second time because they are worried that it can transmit pests and diseases. After harvesting, this waste is collected and accumulated as a residue after cultivation is carried out, and if left to accumulate for too long, it can pollute the surrounding environment. Husk charcoal is used as a planting medium because it has a high carbon content. Husk charcoal is widely used as a mixture of planting medium and pure soilless planting medium. and is often used as a hydroponic planting medium and soil-based planting media. Husk charcoal is a good planting medium because it has a SiO2 content of 52% and a C element of 31%. The nutrient content in husk charcoal includes potassium 0.31%, N 0.32%, P 0.15%, Ca 0.96% and pH 8-9.

Husk charcoal has the characteristics of light with a specific gravity of 0.2 kg/l and coarse, causing high air circulation and high water retention ability. A black color can absorb sunlight well; a high pH can be used to raise the pH of acidic soils. The existence of 16.98% silica element content can improve the physical properties of the soil and affect the solubility of P in the soil. If the silica element in the soil is less than 5%, the upright plant will be less vigorous and easily collapse. Husk charcoal also has difficulty absorbing water, can retain soil moisture, and is not easily damaged or decomposed. The benefits of husk charcoal are that it can keep soil conditions loose, maintain moisture, act as an absorbent to reduce the number of pathogenic microbes, and increase the absorption and binding power of soil to water. Husk charcoal treatment had a significant effect ($P < 0.05$) on the maximum plant height, flower stalk length, and flower diameter and had a very significant effect ($P < 0.01$) on the variables of stem diameter, flower stalk weight, and economic flower freshness. The treatment of 300 kg ha-1 husk charcoal produced the highest economical fresh weight of 80.78 g, and there was an increase in yield of 53.73% when compared to the lowest husk charcoal treatment [11]. Rice husk biochar has a C-organic content of 30.76%, so biochar has a long stay in the soil and its use as a soil amendment will be able to change the soil's physical, chemical, and biological properties. Based on the C-organic content, each plant's biochar dose will be determined by the amount of C-organic content of the soil [12]. Biochar has micropores that can be used as a habitat for microorganisms, which results in reduced competition between microorganisms so that it can increase soil biological activity. The higher the activity of soil microorganisms, the higher the availability of nutrients in the soil so that plants can absorb nutrients well and increase production. Various studies have shown that the application of biochar has significant agronomic benefits [13] [14].

Different growing media offers a valuable alternative to conventional soil in quality flower production due to its water-holding capacity, aeration, and good nutrient status. The composition of cocopeat, cascing and leaf mold planting media increases water retention and aeration of the media. The results showed vegetative growth with maximum plant height when the first buds appeared, plant height at harvest, number of primary branches per plant, number of secondary branches per plant, number of leaves per plant, leaf biomass, average leaf fresh weight, dry root weight and flowering parameters with maximum flower lifespan, flower diameter, number of flowers per plant, number of flower buds, average fresh weight of flowers, flower yield per plant and age of flower vases in the case of Cocopeat + Vermicompost + Leaf mold (2:1:1) medium composition among all planting media compositions. The combination of cocopeat with casing and leaf mold (2:1:1) was found best for lighter media weight, better development of plant morphology, and flower quality [15]. Most soils are too acidic, which decreases the productive efficiency of the plant. There are several ways to improve soil acidity so that plant nutrients are available. Wood ash is a residue produced by burning plant biomass and is used to enhance soil acidity for use as fertilizer. Applying organomineral wood ash on plants is another alternative fertilizer that reduces the dose of wood ash and mineral fertilizers. Biomass production is greatly affected by fertilization alone, and the application of organominerals results in higher biomass production. Incubated ash is more appropriate because it produces a higher yield [16].

## 4. CONCLUSION

The application of organic matter combinations significantly enhances chrysanthemum growth and quality. This study demonstrates that different organic material sources have a substantial impact ($P<0.05$) on most observed variables, except for stem length (cm), flower diameter (cm), and fresh flower weight, which were only moderately influenced ($P>0.05$).

The highest economic fresh flower weight (122.99 g) was achieved using a combination of chrysanthemum residue, hydroponic media, and leaf litter, representing a 10.71% increase compared to the lowest recorded treatment (109.82 g). The impact of dosage on each organic material combination varied: chrysanthemum harvest residue and leaf litter showed minimal effects ($P0<0.05$) on most variables except for flower diameter, which exhibited a highly significant response ($P>0.01$). Meanwhile, the combination of chrysanthemum harvest residue and hydroponic media significantly ($P>0.05$) to very significantly ($P>0.01$) influenced all observed variables, with a dose of 3 tons $ha^{-1}$ yielding the highest economic flower weight of 127.83 g—an increase of 9.65% compared to the lowest dose (115.50 g).

The most effective treatment was the combination of chrysanthemum harvest residue, hydroponic media, and leaf litter at a dose of 1.5 tons $ha^{-1}$, which resulted in the highest fresh flower weight (132.13 g), showing a 10.87% increase over the lowest treatment (117.77 g). These findings highlight the potential of organic matter integration to optimize chrysanthemum production while promoting sustainable agricultural practices.

These results emphasize the importance of organic amendments in enhancing productivity and profitability for smallholder farmers engaged in floriculture. Future research should investigate the long-term effects of organic amendments on soil health, nutrient cycling, and disease resistance to further improve chrysanthemum cultivation efficiency.

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