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# The effectiveness of organic fertilizers of chicken, cow and sheep manure against the growth of cabbage, caisim, chicory plants vegetatively

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**Abstract:** Flower cabbage (Brassica *oleracea var. botrytis,* L), caisim (Brassica *juncea* L), and chicory (*Brassica pekinensis* L) are types of vegetable plants with high public interest due to their good nutrition at a price economical. Fertilizer application is an important factor that can determine the productivity and quality of the crops produced. The purpose of the review is to collect information about the effect of organic fertilizers from chicken, cow and sheep manure on cabbage, caisim and chicory plants vegetatively. The writing method is carried out through the study of literature sourced from books, journals, proceedings, website and news portals. Based on the observed data, it was found that organic food can use chicken, beef and sheep manure as an ingredient for its manufacture. The composition of organic fertilizer content with manure material consists of macro nutrients such as Mg, S, Ca, N, P, K and micronutrients such as Zn, Mo, Cu, Co, B, Fe, and Mn. Application of organic fertilizer chicken and goat manure on cabbage, caisim, and chicory plants shows an influence on plant height and the number of leaves differs according to the dose of administration but the use of cow dung does not show a noticeable difference. The application of organic fertilizer for chicken and goat manure also has a noticeable effect on the wet weight and dry weight of plants with the best response, namely chicken manure. This condition is influenced by differences in the nutrient content in manure such as C-organic, Nitrogen, C/N Ratio, phosphorus, Potassium, and Water Content. The C-organic, Nitrogen, and Potassium content of goat manure has the highest value. While the highest phosphorus content, water content and C / N ratio are in chicken and cow manure. These ingredients are very important for plants including as a source of energy for microorganisms, stimulating plant vegetative growth, stimulating the formation of plant parts, the formation of proteins and carbohydrates, and as antibodies for plants. The conclusion of the review is that the use of organic fertilizers for chicken and goat manure affects the vegetative of plants, but the organic fertilizer of cow dung does not differ markedly from the vegetative growth of plants.

**Keywords:** Organic fertilizer, Plant Growth, Nutrition, Land improvement.

## Introduction

The development of the vegetable horticulture subsector is one of the important components in the agricultural sector as an effort to meet food needs in an area (Handayani et al. 2022). Flower cabbage (Brassica *oleracea var. botrytis*, L), caisim (Brassica *juncea* L ), and chicory (*Brassica pekinensis L* ) are types of vegetable plants with high public interest due to their high nutrition at a fairly economical price (Luthfiana et al. , 2019; Marginingsih et al. , 2018; Marian and Sumiyati 2019). The demand for vegetable crops will continue to fluctuate every year in line with Indonesia's population growth (Rusbiyati et al. 2018). Efforts that need to be made to overcome these challenges are to increase their productivity and appropriate cultivation techniques (Rusbiyati


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et al. 2018). The use of quality fertilizers is an important factor that can determine the productivity and quality of the crops produced (Mardiyah et al. 2021). The continuous use of artificial (inorganic) fertilizers has disadvantages and side effects, namely their high price, depending on plant availability, lowering soil pH, and resulting in soil nutrient imbalances (Setyaningrum and Ismail 2018). Therefore, it is necessary to make efforts to use organic fertilizers in increasing soil fertility that is more environmentally friendly (Mardiyah et al. 2021). One type of organic fertilizer that can be used is manure. Manure is the use of by-products in the livestock business, both poultry and non-poultry. The fertilizer has benefits as a supplier of macronutrient composition such as Mg, S, Ca, N, P, K and micronutrients such as Zn, Mo, Cu, Co, B, Fe, and Mn. These elements help maximize the ability to exchange cations from the soil and improve soil structure (Gunawan et al. 2022). Manure can be sourced from chicken, cow, and sheep manure. The use of this fertilizer, in addition to being good for plants, can also overcome the problem of livestock waste that has the potential to pollute the environment. Increasing knowledge about the effectiveness of organic fertilizers on plant growth and their benefits is an effort to support government policies in the use of organic fertilizers. The purpose of writing this article is to collect information about the effect of organic fertilizers from chicken, cow and sheep manure on cabbage, caisim and chicory plants vegetatively.

## Materials and Methods

Datacollection is carried out through literature studies from various reference sources including books, journals, proceedings and *websites* or news portals.

## Results and Discussion

### Nutrient Content in Fertilizers against Plants

Thenutrient content of fertilizer varies depending on the type of livestock and feed ingredients given. The nutrient content includes Nitrogen, phosphorus, Potassium, C / N ratio and Water Content (Shiddieqy *et al., 2022).* Comparison of fertilizer quality based on nutrients from cow, sheep and chicken manure has quality standard guidelines in SNI 19-7030-2004. Comparison of the quality of cow, goat manure including C-Organic, Nitrogen, Phosphorus, Potassium, C/N ratio, and moisture content compared to SNI 19-7030-2004 is presented in Table 1.

**Table 1.** Comparison of the nutritional content of cow, sheep and chicken manure with the SNI 19-7030-2004 quality standard (Novitasari 2021)

| Parameter | Dirt | | | SNI 19-7030-2004 | |
|---|---|---|---|---|---|
| | Sapi | Sheep | Chicken | Minimum | Maximum |
| C-Organic | 14. 78% | 23. 19% | 13. 38% | 9. 80% | 32% |
| Nitrogen | 1. 53% | 1. 99% | 1. 27% | 0. 40% | - |
| Phosphorus | 1. 18% | 1. 35% | 1. 76% | 0. 10% | - |
| Potassium | 1. 30% | 1. 82% | 0. 20% | 0. 20% | - |
| C/N Ratio | 14. 32 | 13. 38 | 11. 85 | 10 | - |
| air up to | 28. 73% | 34. 41% | 35. 67% | - | - |

Cattle, sheep, and chickens have a color that varies depending on the feed given (Aisyah, 2019). Cow dung generally has color variations from greenish to blackish. This can happen because cows are ruminants that feed on grass as the main feed. Mesasail (2019) also mentions that the feces of cows that have been exposed to air tend to darken in color. Variations and amounts of feed consumption by livestock also affect the nutrient content contained in their feces (Melsasail 2019). According to several studies, the nutrient content in manure consists of C-organic, nitrogen, Pospor, and Potassium.

### Carbon Organic

Soil **organic matter is a** complex organic compound that is or has undergone a decomposition process, both in the form of humukated humus and mineralized inorganic compounds (Melsassail 2019). C-Organic is the main constituent of organic matter. C-organic is used as an energy source for microorganisms (Widigdya, 2022). On Tabel 1. The highest C-organic **is** known to be contained in sheep manure, which is 23.19% while the lowest C-organic content **is** found in chicken manure, which is 13.38%. The role of C-organic in fertilizer is as a

prevention of land degradation so that soil fertility can be maintained properly (Widigdya 2022).

**Nitrogen**

Nitrogen is the main macronutrient that plants need inlarge quantities and is absorbed by plants in the form of ammonium (NH) and in the form of nitrate (NO) (Melsassail, 2019). Hanafiah (2007) explains that nitrogen functions in the formation of plant proteins and takes an important role in stimulating plant vegetative growth (Widigdya 2022). If there is a deficiency of the N element in plants, it can result in inhibition in the formation of chlorophyll, protoplasm, proteins, and nucleic acids (Emilga *et al*., 2022). The highest N content is found in sheep manure at 1.99% and the lowest N content in chicken manure at 1.27%. Generally, goat and sheep manure composed of feces, urine and feed residue contains higher nitrogen elements than those only derived from feces (Arum, 2022).

**Phosphorus**

Fosfor in the soil is divided into two, namely inorganic phosphorus and organic phosphorus. Inorganic phosphorus is mainly sourced from the results of apatite mineral preparations, from artificial fertilizers and the decomposition of organic matter. Most of the soil's inorganic phosphorus is present in calcium (Ca-P), Aluminum (AI-p) and iron (Fe-P) all of which are difficult to dissolve in water. Organic phosphorus levels in the soil can be found greater in the upper soil than in the sub-soil. Phosphorus has the function of stimulating root formation, strengthening stems, and stimulating the formation of flowers and fruits (Meriatna 2019). In table 3. The most abundant phosphorus content is found in chicken manure at 1.76% and the lowest phosphorus content is found in cow dung, which is 1.18%.

**Potassium**

Potassium or K is an important nutrient needed by plants. The presence of potassium in some soil types ranges from 0.5-0.25% (Melsassail 2019). Potassium has a function in the formation of proteins and carbohydrates, besides this element also has a function for the formation of plant antibodies to fight disease (Melsassail 2019). When plants lack potassium, they have physical characteristics such as leaves looking keriting and glossy. Sheep manure has the highest potassium content of 1.82% while chicken manure has the lowest potassium content of 0.20%.

**Effect of Organic Fertilizer on Plant Height and Number of Leaves**

Applying organic fertilizers to plants can increase plant growth and yield (Lusiana 2015). The observable components **of** the effect **of** applying various organic fertilizers on plants can be seen in Table 2-4.

**Table 2.** The effect of organic fertilizer feces of chickens, goats, and cows on the growth of cabbage plants.

| Parameter | Cabbage | | |
|---|---|---|---|
| | Chicken Feces | Goat Feces | Cow Feces |
| Plant Height | The application of chicken manure with varying doses from 10-35 tons of $^{ha-1}$ can increase plant height (Widodo, 2004; Sari *et al*., 2016). | Goat manure at a dose of 5 tons is able to increase plant height up to 31.52 (Yusuf *et al*., 2011). | The application of cow manure at a dose of 10 tons / ha has not shown a noticeable effect on plant height (Amran *et al*., 2018). |
| Number of leaves | The application of chicken manure has a noticeable influence on the number of leaves. This is because this type of fertilizer has 3 times more nitrogen (Sari *et al*., 2016). | The application of goat manure turns out to have a noticeable effect on the number of leaf blades. Plants applied with this fertilizer are able to increase the number of leaf blades by 18 strands (Chairani *et al*., 2017). | The application of cow manure has not been able to significantly increase the number of leaves (Jaenudin *et al*., 2018). |

**Table 3.** The effect of organic fertilizer feces of chickens, goats, and cows on the growth of caisim plants.

| Parameter | Caisim | | |
|---|---|---|---|
| | Chicken Feces | Goat Feces | Cow Feces |
| Plant Height | The application of chicken manure at different doses shows different caisim heights (Aryani *et al*., 2018). This can be influenced by the content of N, P, and K in fertilizers (Tomia, 2012) | The application of goat manure with a dose of 40 ha-1 gives the best plant height compared to applying fertilizer with doses of 10, 20 and 30 $^{ha-1}$ (Hartati *et al*., 2022). | The application of manure with a dose of 100g is able to have a noticeable influence on plant height, namely plant height reaching 32cm (Gole et al. 2019) |
| Number of leaves | The application of chicken manure turned out to be able to increase the number of leaf blades by 65.53% (Maryam *et al*., 2015). | The application of goat manure did not have a noticeable effect on the number of leaf blades of caisim plants (Hartanti *et al*., 2022) | Low effectiveness cow manure at the time of use for fertilizing on caisin plants compared to chicken manure (Maryam et al. 2015) |

Table 4. The effect of organic fertilizer feces of chickens, goats, and cows on the growth of chicory plants.

| Parameter | Chicory | | |
|---|---|---|---|
| | Chicken Feces | Goat Feces | Cow Feces |
| Plant Height | The application of chicken manure with varying doses turned out to have an effect on the height of chicory plants (Lathihah *et al*., 2018). | The application of goat manure to the height of chicory plants is not significantly different from the height of plants that use chicken fertilizer (Martadinata et al., 2021). | The application of chicken manure with varying doses turned out to have an effect on the height of chicory plants (Lathihah *et al*., 2018). |
| Number of leaves | The application of chicken manure with a dose of 15 tons / ha is able to increase the number of leaf blades by 14 strands (Martadinata *et al*., 2021). | applying goat manure dosing to the number of leaves on mustard greens, namely by giving a dose of 200g / plant which can have a good effect on mustard putih (Wahyuni et al. 2019) | Dosing 60 $^{kons-1}$ fertilizer produces the highest number of leaves for all plant ages ( Elsafiana et al. 2017) |

Tinggi tanaman applied organic fertilizer chicken, cow, and goat manure did not show different results. According to Yovan et al. (2022) this is influenced by the presence of nutrients in fertilizers that are already available to support its growth. Rahmat et al. (2014) have explained in

their article that in fertilizer there is a nitrogen content that canaffect vegetative growth both for the height and number of leaves in plants. The role of nitrogen also supports the formation of proteins and nucleic acids.

**The effect of different types of organic fertilizers on the wet weight of plants**

Wet weight is an indicator of growth assessment in plants that indicates an increase in plant biomass (Yani et al. 2018). Biomass growth in plants is related to nutrients available and used for plants. Here are the results of research on the effect of different types of organic fertilizers on the wet weight of agricultural crops (Table 5).

**Table 5.** The effect of different types of organic fertilizers on the wet weight of various agricultural crops

| Types of fertilizers | Plant Type | | |
|---|---|---|---|
| | Cabbage | Caisim | Chicory |
| Chicken droppings | The application of chicken manure at a dose of 14.6 tons / ha is able to increase the wet weight of cabbage up to 1.55 kg. However, the next dose decreased (Nuruddin et al. 2020). | The application of chicken manure bokashi fertilizer at a dose of 15 tons$^{ha-1}$ is able to increase the wet weight of mustard greens by 170.67 grams (Novia et al. 2021). | The application of different types of manure at the same dosage on chicory plants shows a noticeable difference in the wet weight of plants. The application of chicken manure gave the highest wet weight value of 237.88 grams (Lathifah and Jazilah 2019). |
| Sheep Manure | The application of goat manure at a dose of 15 tons / ha has not been able to provide a significant increase in the wet weight of cabbage when compared to the control treatment (Chairani et al. 2017). | The use of goat manure dose of 20 tounces $^{ha-1}$ can increase the wet weight of mustard greens by 1.28 grams (Hartati et al. 2022). | The application of goat manure with the same dose resulted in the lowest wet weight of chicory plants at 202.99 grams (Lathifah and Jazilah 2019). |
| Cow dung | The application of cow manure at a dose of 112.5 g / polybag or equivalent to 15 tons / ha has not been able to have a noticeable effect on the wet weight of cabbage plants when compared to control treatment (Yuniarti and Anggorowati 2012) | The administration of cow dung at a dose of 20 $^{tons.ha-1}$ did not provide a significant change in the wet weight of mustard greens when compared to the control treatment (Karnata and Wata 2021). | The application of cow manure with the same dose resulted in a wet weight of chicory plants of 213.67 grams (Lathifah and Jazilah 2019). |

Based on the results of several studies related to the effect of organic fertilizer types on the dry weight of plants, showing varied results. Generally, the best response is indicated by the use of organic fertilizers derived from chicken manure. According to Wijayanti (2019) the dry weight of the plant is influenced by the number of leaves on the plant. The greater the number of leaves, the dry weight of the plant will increase. In addition, leaf formationis strongly influenced by the content of the element nitrogen (N) in plants (Effendi 2022). This is in accordance with the statement of Novitasari & Caroline (2021) which states that the nitrogen content of chicken manure is relatively higher than other types of organic fertilizers. Some studies also mention that the application of organic fertilizers from goats has a positive influence on the dry weight of plants. This can be due to the high content of C-Organic in fertilizers derived from goat manure. Novitasari & Caroline (2021) in their research stated that the C-Organic content in goat manure is higher than other types of organic fertilizers. The content of C-Organics in the soil plays an important role in improving the physical properties of the soil, the biological activity of the soil, and the availability of nutrients for plants (Walida et al. 2020).

## Conclusions

Organic fertilizer is an alternative to inorganic fertilizer which has various benefits by not causing side effects such as inorganic fertilizers. Organic fertilizers of goats and chickens can make a noticeable difference in the growth of cabbage, caisim and chicory crops at different doses. The application of organic fertilizer cow dung does not differ markedly from the vegetative growth of plants. There needs to be more research on the application of organic fertilizers for chicken and goat manure and their impact on other crops and the environment to improve soil quality and become an environmentally friendly solution.

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