

The Effect of Three Types of Manure on the Growth of Spinach (*Amaranthus* sp.).

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ABSTRACT

*The purpose of this study was to determine the effect of giving three types of manure on the growth of spinach (*Amaranthus* sp). The research was conducted at the Faculty of Agriculture, University of KH.A. Wahab Hasbullah from December 2022 to March 2023. The material used was pulled spinach seeds (*Amaranthus tricolor* L.) Panah Merah's brand is produced by P.T. East West Seed Indonesia, processed organic fertilizer made from cows of Faculty of Agriculture, University of KH.A. Wahab Hasbullah (PK1), goats obtained from P4S Bengkel Mimpi Malang (PK2), and chickens from processed livestock products (PK3). After 30 days of planting, it was found that the addition of manure from three types of ruminant waste had a better effect on plant height, number and leaf area of spinach than the control. Manure as raw material for goat manure had significant plant height (21.25 cm), number of leaves (8.33), and leaf area (3.72 cm²) compared to the other 2 treatments manure and control.*

Keywords : manure, ruminants, spinach

INTRODUCTION

Farmers' dependence on chemical fertilizers, demands the availability of these fertilizers in the market. However, this has not been able to fill the needs of farmers, so that in some areas there is a scarcity of fertilizer. Regulation of the Minister of Agriculture No. 01 of 2020 concerning the allocation of the highest Urea price for subvention fertilizer, which includes a regulation on subvention inorganic fertilizers, which makes it even more difficult for farmers to obtain this fertilizer. The availability of fertilizers is limited and very difficult to find, causing fertilizer prices in the market to soar. This condition is quite concerning because it coincides with low food commodity prices at the farm level with absorption tending to decrease.

The decline in food commodity prices is one of the reasons for reducing the cost of expensive fertilizers so that farmers use organic fertilizers. According to the Regulation of the Minister of Agriculture No. 2/Pert/HK.060/2/2006, organic fertilizers are fertilizers consisting mostly or throughout of organic matter, derived from plant and animal residues which have been engineered in the form of solid or liquid, used to supply organic matter. , has physical, chemical and biological soil properties.

The management of organic waste can provide benefits to mankind. One of the organic wastes that can be utilized as organic fertilizer is ruminant livestock manure such as cow, goat, buffalo manure, and the like. Livestock manure contains high levels of organic matter, protein and nutrients, and is good for microorganisms and plants. In addition, the advantage of using organic fertilizers is that sanitation and splendor of the environment can be maintained. Waste recycling can be useful for reducing negative impacts on the environment. Utilization of agricultural and livestock waste into organic fertilizer can be a good alternative

Manure plays a role in soil fertility through the addition of nutrients that are captured by bacteria in the soil (Lingga, 2010). In the process of making manure, 80% of ruminant waste is the main ingredient and a mixture of decomposers, cellulose solution as a support for the fermentation process, and other mixtures that can be derived from agricultural biomass. Several research results have been carried out on

the effect of adding manure. Hartati, (2022) reported that the effect of applying goat manure at 40 tons ha⁻¹ greatly affected the growth in height of caisim plants. Applying 40 tons ha⁻¹ of goat manure fertilizer gave an average plant height of 32.13 cm at 30 days after planting (dap) compared without fertilizer (25.34 cm). A dose of organic vermicompost fertilizer of 5 g/kg of soil increased the growth of spinach (*A. tricolor* L.) in the parameters of number of leaves, leaf area, dry weight of shoots and roots (Setiawati, *et al.*, 2018). Whereas in Putra's research, (2019) stated that the highest growth of mini elephant grass was in the treatment of 30 tonnes/ha of fertilizer with an average height of 59.62 cm compared to controls (57.44 cm) at 60 dap.

Based on the background above, a study was carried out on the effect of three types of manure with different ruminant raw materials. in spinach (*Amaranthus* sp.). The purpose of this study was to determine the effect of giving three types of manure on the growth of spinach (*Amaranthus* sp.)

METHOD

The research was conducted at the Agriculture's faculty, University of KH.A. Wahab Hasbullah from December 2022 to March 2023. The material used was pulled spinach (*A. tricolor* L.) Panah Merah's brand is produced by P.T. East West Seed Indonesia, processed organic fertilizer made from goat obtained from factory of Bengkel Mimpi Malang, cow from the Agriculture's faculty, University of KH.A. Wahab Hasbullah, and chickens from farms, latosol soil, water, polybags, planting equipment, writing instruments, and documentation tools. The method used was a completely randomized design (CRD) with three treatments manure and a control, each of which was repeated five times. The treatment was that each polybag was given 5 kg of soil, and each polybag was mixed with 1 kg; PK0 (control without adding manure), PK1 (adding cow manure), PK2 (adding goat manure), and PK3 (adding chicken manure). Then, in order to help speed up the breakdown of dormancy, the spinach seeds are soaked in warm water for ± two hours (Sidemen, *et al.* 2017). Keeping and maintenance is carried out until the plants are 30 hsi. The parameters of the observations made are; 1) plant height measured up to the age of 30 hsi, which is measured from the boundary between the roots and the stem, up to the highest part of the plant, 2) The number of leaves, counted every week during the vegetative phase until the beginning of generative which is marked by the appearance of flowers. The leaves that are counted are those that are optimally open (Juhriah, *et al.* 2018), and 3) leaf area is carried out by taking 3 sample plant leaves then averaged and the results will be multiplied by the number of sample plant leaves. Retrieval of data on the average leaf area of the formula is:

$$\text{Leaf area} = l \times w \times \text{coefficient} \times \text{number of leaves of the sample plants}$$

Information :

l = is the length of the sample leaf

w = is the width of the sample leaf

Coefficient = 0.75

(Source: Putra, 2019).

Observational data were analyzed with the F test level of 5%. The BNT test is carried out if there are significantly different results, with an error rate of 5%.

RESULT

After 30 dap, based on the observation parameters, it is known that the results of the effect of three types of manure on the growth of consumption spinach (*Amaranthus* sp.) are shown in table 1 below.

Table 1. the effect of three types of manure on the growth of consumption spinach (*Amaranthus* sp.)30 dap

Treatment	Observation Parameters *					
	high (cm)		Amount leaves (sheet)		Leaf area (cm ²)	
PK0	8.58	a	6.20	a	1.37	a
PK1	19.02	b	8.24	bc	3.66	b
PK2	21.25	b	8.33	c	3.72	b
PK3	19.11	b	8.16	bc	3.68	b

Description: PK0 (control without adding fertilizer), PK1 (adding cow manure), PK2 (adding goat manure), PK3 (adding chicken manure). *) the numbers in the same column followed by the same letter are not significantly different on the 5% BNT test.

Based on the results of the average plant height, it was found that the addition of manure increased plant height compared to the control. In these three treatments, although not significantly different, PK2 had higher plant growth (21.25 cm). The observation results show that the average number of spinach leaves is known, PK0 treatment has fewer leaves than the three treatments. The PK2 treatment had more leaves (8.33) than PK1 (8.24) and PK3 (8.16). In the observation of leaf area, PK1, PK2, and PK3 had a wider leaf area, respectively 3.66 cm², 3.72 cm², and 3.68 cm² compared to PK0 (1.37 cm²). Meanwhile, based on the observations of the three parameters, it was found that PK2 had significant plant height (21.25 cm), number of leaves (8.33), and leaf area (3.72 cm²) compared to the other 2 treatments manure.

The application of manure gave better growth than the control. Although the application of manure with three different ruminant raw materials did not have a statistical effect on the growth of the number of leaves, it tended to be more PK2 than the other treatments. This shows that goat manure is capable of being a good supplier of nutrients and nutrients

DISCUSSION

Giving manure helps the vegetative phase including the formation of leaves. Plant growth is faster if at the beginning of planting the plant has wide leaves. Plant growth is supported by photosynthetic substances was produced by plants. The higher levels of photosynthetic substances was produced by plants allows plants to form larger and more plant organs. In the vegetative growth phase, plants need a lot of N for the formation of stems and leaves (Marschner, 1986; Setiawati, *et al.* 2018). these elements and K are useful for stimulating growth to strengthen the leaves don't fall off (Lingga & Marsono, 2008; Setiawati, *et al.* 2018).

The addition of nutrients to the growing media also affects the height growth of the spinach plant stems. These two elements are needed for the growth of stems and branches in addition to the formation of carbohydrates to encourage the quantity of leaf growth (Sucipto, 2010; Silalahi, *et al.* 2018). The treatment of manure application on the average leaf area had a significant effect compared to the control. This can be attributed to the element N (Nitrogen) in the soil. Nitrogen plays an important role in plants to encourage the development of leaf area. Plants that are deficient in nitrogen will have few tillers, small leaf area and slow growth, as in controls. In addition, it will result in the color of the leaves turning yellow and starting to die or dry out from the tips to the middle of the leaf blade. Nutrients in conditions available in the planting medium are needed by plants to thrive. While the availability is less, it will result in plant growth that is not optimally. If the Nitrogen level in the soil is excessive, it will cause the plants to have green and dense leaves and make the plants collapse easily (Kaya, 2018).

Cows are a type of ruminant that is easy to breed. The nutrient content of cow dung is very beneficial if given to plant growth so that plants can grow more optimally. Cow dung contains several chemical constituents such as 0.40% Nitrogen, 0.20% Phosphorus, 0.10% Potassium and 85% water. (Wulandari, 2021). The nutrients contained in cow dung are quite rich, because the types of food have sufficient sources of nutrients, so it is good for use as a mixture in the manufacture of organic fertilizers.

Goat manure can fill the needs of soil nutrients on large areas of land because goat manure is easy to obtain and goats are the most common type of ruminant raised by the community. Goat manure consists of solid types in the form of feces 67% and liquid in the form of urine 33%. The nutrient content of goat consists of 0.6 – 1.5% Nitrogen, 0.3 – 0.13% Phosphorus, 0.17 – 1.8% Potassium, 60 – 85% moisture content (Wulandari, 2021). Goat manure can be used as the main ingredient of manure because it contains high potassium and slightly lower water content when compared to other animal manures, while the N and P content are relatively the same. Goat manure has a C/N ratio generally still above 30 while good manure must have a C/N ratio below 20. So goat manure requires a fermentation process to be used as manure. (Wijaksono *et al.*, 2016).

Chicken manure increases soil fertility because it has a source of macro and micro nutrients and is a substrate for soil microorganisms and increases their activity to accelerate the decomposition process (Odoemena, 2006; Silalahi, *et al.*, 2018). The nutrient contained of N, P, and K as macro nutrients are useful for plant growth, where N elements are useful for vegetative growth of plants, K is to strengthen

stem growth, and P is a stimulant of flowering and fertilization, rooting and seed formation (Yuwono, 2007 in Silalahi, *et al.*, 2018)

Spinach requires temperatures ranging from 25-35°C, but the optimal temperature is between 27-29 °C. Spinach can also grow well in a variety of soils, but loamy, fertile soil with a pH between 6-7 is preferred. If the pH is less than 6, the growth of the spinach will be abnormal, whereas if the pH is more than 7, the spinach may experience chlorosis, especially on the young leaves. (Jailani, *et al*, 2021). Spinach can grow at various altitudes, both lowland and high, but the most optimal altitude for growing spinach is below 1400 m above sea level. To support its growth, spinach requires suitable climatic conditions, such as full sun, and humidity around 40-60%. (Hairumi, 2022).. As the compost matures, the organic acids become neutral and the pH ranges from 6-8 (Rofi'i, *et.al.*, 2021).

The addition of organic matter has a strong effect on soil properties, not only for increasing soil nutrients (Roidah, 2012). furthermore, for example, the N urea content is 46 percent, organic matter is less than 30%, but urea only provides 1 nutrient (N), while organic matter provides almost all the elements a plant needs on a small scale. Therefore it takes a long time in soil management by using organic matter and retaining it in the soil.

CONCLUSIONS

The addition of manure from the waste raw materials of three types of ruminants had a better effect on plant height, number and leaf area of spinach (*Amaranthus* sp) than the control. Manure as raw material for goat manure had significant plant height (21.25 cm), number of leaves (8.33), and leaf area (3.72 cm²) compared to the other 2 treatments manure and control.

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