

The Effect of Rice Husk Mulch's Dosage on the Production Growth of Some Cabbage Varieties (*Brassica Oleracea L.*)

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Abstract: Cabbage is a vegetable crop that is now planted by many farmers in the rural area of Indonesia and has become one of the farmers' favorite to improve living standards. The provision of different weights of rice husk mulch have a significant effect on the growth of cabbage, and the use of rice husks mulch can also inhibit weed growth and reduce evaporation rate so as to reduce the surface temperature of the soil and able to absorb more water. It can be seen from the observation of number of leaves, leaf width, cabbage and cabbage production. The purpose of this research is to find out the effect of the weight of rice husk mulch and variety on the growth and yield of cabbage (*Brassica oleracea L.*). This research used a Randomized Group Design (RGD) consisting of two treatment factors, repeated three times, so there were 27 beds of experimental units. The results of this experiment indicated that the weight of rice husk mulch had significant effect on the number of the leaf, the leaf width and cabbage volume, but rice husk mulch did not affect the yield of per hectare of cabbage.

Keywords: cabbage, rice husk mulch and variety

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I. Introduction

Cabbage (*Brassica oleracea L.*) is a vegetable that has been familiar to the community, both among consumers and producers. Cabbage is a vegetable crop that is now planted by more farmers in the rural parts of Indonesia and has become one of the mainstays of farmers' livelihood to improve the standard of living. The Efforts to increase the capacity of food production in the regions and to increase food and nutrition security systems as well as to increase income continuously to be implemented, especially in areas of food deficit to prevent and anticipate the occurrence of malnutrition cases (Horticulture Research Institute Lembang, 2005).

The Central Sulawesi's cabbage production in 2012 was 4,379 tons; the same figure was obtained in 2013. Cabbage production for Sigi Regency by 2015 according to data from the statistical office in the book (Sigi Regency in Figures 2014) was 5,225 tons on the area of 47 Ha With a productivity of 79.20 tons ha⁻¹. (Central Sulawesi BPS, 2014).

The center of cabbage cultivation in Central Sulawesi is generally located at an altitude between 500 - 1,200 meters above sea level. But in fact the condition of the area began to show symptoms of ecosystem damage, because farmers continue to expand land cultivation with land use that does not consider the factors of natural balance and soil fertility. While horticultural cultivation systems in the highlands are currently vulnerable to environmental damage because new land clearing does not concern the conservation aspects.

Anticipating the natural damage and decreasing of the vegetable production, especially cabbage, it is necessary to re-develop the lowland cabbage with altitude ranging from 100-250 Mdp. The efforts that need to be done is to develop varieties of lowland cabbage which is currently being developed in several regions in Indonesia. For the adaptation of these varieties it is necessary to modify the microclimate around the plant, because lowland is generally has a high temperature compared to the highlands.

The husk mulch is mulch that comes from rice husk, small size, it is solid but light. These traits that cause the mulch that are used as mulch more easily lost by the wind. The sand is a dry terrain dominated by wind at relatively high speed, as well as playing role in the loss of some of the husk used as mulch. The lost of husks lead to the surface of the ground not perfectly covered. The possibility of evaporation is still higher than the soil given mulch straw. The high evaporation causes a decrease in soil moisture, inhibits nutrient uptake, and interferes with the process of photosynthesis, which in turn may decrease the yield of cabbage. Mulch covers all materials or materials that are deliberately spread over the surface of the soil or agricultural land. Implementation of mulch system on various farms increasingly popularizes. By the development of technology in the field of agriculture makes the mulch material more diverse. Mulch ingredients commonly used are organic mulch ingredients such as rice straw, reeds, rice husk and synthetic chemicals such as polyethylene plastic or silver black plastic. Giving mulch on agricultural land aims to block evaporation, improve soil properties that will affect the productivity of the soil and also prevent weed growth (Ronoprawiro, 1996; Umboh, 1999).

The provision of organic mulch has the objectives of protecting plant roots, maintaining soil moisture, minimizing rain water that directly fell to the soil surface so that minimize the leaching of nutrients, erosion and maintain the soil structure, maintain the stability of the temperature in the soil, and can contribute organic material. The materials often used as organic mulch ie rice straw and rice husk. In addition to reduce the waste of rice plants, rice husks are spread over the surface of the soil can also function as mulch. It is expected that the use of organic mulch can optimize the growth of cabbage so as to increase yields. Mulch can also play a positive role for soil and plants that protect the soil aggregates from the rain granules, increase the absorption of water by soil, reduce the volume and speed of the surface flow maintaining the temperature, Soil moisture, maintain the soil organic content and control the growth of weeds. Thus it can improve the crop yield both quality and quantity.

The purpose of this research was to determine the effect of rice husk mulch and varieties on growth and yield of cabbage (*Brassica oleracea* L). The aim is to inform farmers about the benefits of using rice husk mulch on cabbage plants.

II. Materials And Research Methods

2.1 Time and Place of the Research

The research was conducted from May to August 2014, in Bobo Village, Palolo Subdistrict, Sigi Regency, Central Sulawesi Province. This study used a Randomized Group Design (RGD) consisting of two treatment factors, repeated three times. Therefore, it needs 27 beds of experimental units.

The first factor is the use of three varieties of cabbage: $V_1 =$ Grand 11, $V_2 =$ Talenta and $V_3 =$ Silvia. The second factor is rice husk mulch treatment consisting of: $M_1 = 9 \text{ ton ha}^{-1}$, $M_2 = 10,5 \text{ ton ha}^{-1}$ and $M_3 = 12 \text{ ton ha}^{-1}$. To know the effect of treatment on observation parameters, then analysis is done in every observation (F 0,05 test). If the effect is real then proceed with Real Honest Test (HSD 0,0,5).

III. Results And Discussion

3.1 The Number of Leaves

The results of various investigation indicated that the treatment had a significant effect on the ages of 28 and 35 DAP, but had no significant effect on the age of 21 DAP. The average number of leaves can be seen in Table 1.

Table 1. Average Number of Leaves (Strands) Some Varieties of Cabbage at Various Weight of Mulch of Rice Husk

28 DAP Treatment	Dosage of the Mulch		
	M ₁	M ₂	M ₃
V ₁	13,33 a	13,67 a	16,67 b
V ₂	14,67 a	15,33 a	14,33 a
V ₃	15,33 b	14,00 a	14,33 ab
HSD 5 %	1,00		
35 DAP	Mulch (M ₁)	Mulch (M ₂)	Mulch (M ₃)
V ₁	18,00 a	19,00 a	22,33 a
V ₂	20,33ab	21,00 b	19,33 a
V ₃	21,00 b	19,67 a	20,00 a
HSD 5 %	1,23		

Note: the average number followed by the same letter in the same (a, b) column, each plant age is not different at HSD 5% testl.

HSD test results 5% shows that at the age of 28 DAP the Grand 11 (V1) varieties on the weight of 4 kg (M3) rice husks mulch resulted in higher number of leaves and different from Talenta (V2) and silvia (V3) varieties at 4 kg weight of rice husk husk (M3)). However, it is not different from Varieties (V1, V2, and V3) on the weight of rice husk mulch 3 kg and 3.5 kg (M1 and M2). At the age of 35 DAP the Grand 11 (V1) varieties on the weight of rice husk 4 kg (M3) gave a higher number of leaves contrast to the varieties (V2 and V3) on the weight of the 4 kg rice husks mulch (M3). But it is not different from Varieties (V1, V2, and V3) on the weight of rice husk mulch 3 kg and 3.5 kg (M1 and M2).

3.2 Leaf Area (cm²)

The results of various examination showed that the treatment at age of 21, 28, and 35 DAP had significant effect. The average leaf width can be seen in table 2.

Table 2. Average Leaf Area (cm²) Various Varieties of Cabbage at Various Weight Mulch of Rice Husk

Treatment	Leaf area (cm ²)		
	21 DAP	28 DAP	35 DAP
V ₁	4171,4	8342,8	10.980 a
V ₂	3577,6	7188,6	9.754 a
V ₃	3793,0	7586,08	10.309ab
HSD 5 %	Ns	Ns	1082,06
M ₁	3644,6ab	7289,3ab	9808,8 a
M ₂	3602,7 a	7238,8 a	9985,6 a
M ₃	4294,7 b	8589,6 b	11.250 b
HSD 5 %	680,5	1338,28	1082,06

Note : The average number followed by the same letter on the same column, each treatment is not different at the 5% HSD test.

HSD5% test result (Table 2) shows that at the age of 21 DAP the average yield of the highest leaf width in the treatment of variety (V1), and it is not significant to (V2 and V3, at the age of 28 days average of the highest leaf width in the treatment of variety (V1) and not significant by treatment (V2 and V3) and at 35 DAP the average yield of the highest leaf width in the treatment of variety (V1) and different from treatment (V2 and V3). At the same weight mulch treatment which is 4 kg (M3). Although in the statistical analysis test showed no significant effect on V2 and V3 it is suspected because the seeds are the result of embroidery and environmental factors.

3.3 Volume Crop (ml)

The result of variance examination showed that the treatment had significant effect on crop volume of cabbage.

Table 3. Average Crop Volume (ml) of Various Varieties of Cabbages at Various Weights Rice husk mulch

Treatment	M ₁	M ₂	M ₃
V ₁	884,33 a	710,00a	813,67 a
V ₂	1.117,00a	938,00a	1730,00b
V ₃	1.168,33b	824,33a	788,33 a
HSD 5 %		326,86	

Note : The average numbers followed by letters are similar to the those in the same column, are not different at the 5% HSD test.

Based on table 3. The highest cabbage volume was on treatment V2 with mulch weight of 4 kg (M3) which 1,730.00 and the lowest was at V1 with a weight of M2 mulch of 710.00. The results of variance examination indicate that rice husk mulch has no significant effect on fresh weight of cabbage plants per plot.

Discussion

The rate of growth of the plant shows the weight increase in the plant community of per land width in one unit of time. The rate of plant growth was not significantly different in the treatment of varieties, but was significantly different in mulch treatment. It shows, the three varieties have the same growth rate. Provision of organic mulch, in addition to affecting the growth of several components of growth significantly, can also affect the increase in the rate of plant growth significantly. Some components of growth that increase are influenced indirectly by organic mulch; plant height, leaf number, leaf area (Sunghening *et al*, 2010)

The provision of organic mulch also significantly influences the increase of leaf number, leaf width, and volume. The increase of the growth components will be followed by an increase in leaf width index and plant growth rate. At the root length, mulch usage does not affect the increase, nor does it affect the increase in net assimilation rate or harvest index.

The 5% HSD Test Result shows that the dosage of 4 kg of rice husk mulch (M3) has more number of leaf. Thus, the weight of the 4 kg rice husk mulch gives good results on the number of leaves. The thickness of cabbage given rice husk mulch shows the highest number at the beginning of observation. This is because rice husks cover the soil with a weight of 4 kg more thicker or dense than the mulch of husk with a thickness of 3 kg.

Giving mulch on the soil surface can increase the porosity of the soil and can facilitate the absorption of water into the soil thus increasing the shelf life of the groundwater. Giving mulch can also give effect to soil moisture so as to create optimal condition for plant growth. Mineral nutrition and water availability affect the growth of cabbage plants (Bilalis *et al* 2002).

The 5% HSD test results indicated that the weight of 4 kg (M3) rice husks mulch resulted in higher leaf width than other mulch weights. This is because the leaf width index (LWI) is a description of the leaf surface ratio to the land area occupied by the plant. This LWI also illustrates the ability of plants to absorb solar radiation for photosynthesis. The higher the LWI shows the more efficient the absorption of sunlight, increasing the rate of photosynthesis. Grain mulch mulching was able to significantly influence leaf index indices (21-35 DAP) significantly. An index of cabbage leaf area given mulch of rice husk showed the highest number and significantly different from mulch treatment, but not significantly different from cabbage given mulch of rice husk.

In table 2, the leaf width shows that the varieties of Grand 11 and silvia give higher value than Talenta varieties, this proves that the adaptability of both varieties is better in the highlands than other varieties. The increase in leaf width in CO₂ absorption for photosynthesis is supported by ideal leaf structure although under conditions of environmental stress which is the ability of a plant to adapt to be sustainable (Gardner *et al.*, 1991).

The 5% HSD test showed that the dosage of 4 kg rice husk mulch with talenta variety resulted in higher cabbage volumes being fed into the water than the Grand 11 and Silvia varieties. This is because the Talenta varieties respond more to the environmental conditions of plants that have thick of mulch, in that condition the plants can directly utilize the optimum temperature around the canopy and rooting. Arifin (2003) explains that the occurrence of temperature variation around the plant is determined by the amount of solar energy absorbed by the canopy and the amount of energy emitted by the leaves.

In the 5% HSD test showed that weight and yield per hectare had no significant effect. Other causes did not find the effect of rice husk mulch on cabbage production. The amount is expected to suppress the temperature around the plant. Besides, the morphological form of cabbage leaves that can cover the soil surface is suspected that the function of mulch in controlling the temperature around the plant has no effect and the plants indicated excess water. The result of research of Ali Rahmat *et al* (2014), found that there is no real effect between the mulch treatment of organic with no mulch on the observation of wet weight of pineapple 6 months after planting, it is suspected mulch function in controlling the soil temperature has no effect due to pore soil filled with water due to bulk The rain is high.

IV. Conclusion

In the treatment of the Grand 11 Varieties, Talenta and Silvia these three varieties had good growth on the use of rice husks mulch 12 tons ha⁻¹ (M3) and produced the highest crop volume on Talenta (V2) varieties given mulch of rice husk at 12 tons ha⁻¹ (M₃).

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