Green Reports

Ariviyal Publishing

Research Article

DOI: 10.36686/Ariviyal.GR.2023.04.10.056

Green Rep., 2023, 4(10), 31-35.

Adaptation Tests and Quality Standards of Cabbage in Village Sigi District

Ramli* and Adrianton

Department of Agriculture, University of Tadulako, Palu, 94118, Indonesia.

***Corresponding author E-mail address**: ramlimohali07@gmail.com (Ramli)

ISSN: 2582-6239

Crossref

Publication details
Received: 28th March 2023
Revised: 23rd April 2023
Accepted: 23rd April 2023
Published: 30th April 2023

Abstract: Cabbage is a vegetable plant that now many farmers earn in rural Indonesia and has been one of the prime sources of income for farmers to improve the standard of living. Granting of rice husk mulching of different weight giving real clout against the cabbage plant growth, and using rice husk mulching can also inhibit the growth of weeds and reduce the rate of evaporation so as to reduce the temperature of the ground surface and capable of storing the water higher. It can be seen from the results of observations of the amount of leaves, the leaves of the cabbage and crop, the volume of results of cabbage. The purpose of this research is to know the influence of weight of rice husk and mulch varieties towards growth and crop yield of cabbage (*Brassica oleracea* L.). This study used randomized block design (RBD), which consisted of two factors; the treatment was repeated three times. So have 27 in wall unit experiment. The results of this experiment showed the weight of rice husk mulching effect real against the number of leaves, broad leaves and cabbage crop volume. But rice husk mulching does not affect the yield per acre crop of cabbage.

Keywords: Adaptation of Quality cabbage; rice husk

1. Introduction

Cabbage (*Brassica oleracea* L.) is a vegetable that is familiar to the public, both consumers and producers. Cabbage is a vegetable crop that is now cultivated by many farmers in rural Indonesia and has become one of the mainstays of farmers' livelihoods to improve their standard of living.[1-22]

Efforts to increase food production capacity in the regions and improve food security and nutrition systems as well as increase income continue to be implemented, especially in food deficit areas to prevent and anticipate cases of malnutrition and malnutrition (Lembang Horticulture Research Institute, 2005).

Central Sulawesi regional cabbage production in 2012 was 4,379 tons, the same figure was also obtained in 2013. Cabbage production for Sigi Regency in 2015 according to data from the statistics office in the book (Sigi Regency in Figures 2014) was 5,225 tons on an area of 47 Ha with a productivity of 79.20 tons/Ha. (BPS Central Sulawesi, 2014)

Cabbage planting centers in Central Sulawesi are generally located at altitudes between 500 – 1,200 meters above sea level. However, in reality the condition of the area's management of vegetable crops is starting to show signs of ecosystem damage, because farmers continue to expand their planting land with land use change that does not consider the natural balance and soil fertility factors. Meanwhile, the horticultural cultivation system in the highlands is currently vulnerable to environmental damage because new land clearing does not pay attention to conservation aspects.

Anticipating natural damage and decreased production of vegetable crops, especially cabbage, it is necessary to re-establish the development of Palu lowland cabbage with altitudes ranging from 100 – 250 meters above sea level. The effort that needs to be done is to develop lowland cabbage varieties which are currently being developed in several regions in Indonesia. For the adaptation of these varieties, it is necessary to modify the microclimate around the plants, because it is known that the lowlands generally have quite high temperatures compared to the highlands.

Husk mulch is mulch derived from rice husk, small in size, dense but light. These properties make the husks used as mulch more easily lost by the wind. Sandy land is dry land dominated by wind with relatively high speed, which also plays a role in the loss of some of the husks used as mulch. The missing husks result in the soil surface not being completely covered. The possibility of evaporation is still higher than the soil mulched with straw. High evaporation causes reduced soil moisture, inhibits the absorption of nutrients, and disrupts the process of photosynthesis, which in turn can reduce cabbage yields. Mulch includes all materials or materials that are deliberately spread on the surface of the soil or agricultural land. The application of the mulch system on various farms is increasingly popular in the community. With the development of technology in agriculture, the types of mulch materials are increasingly diverse. The

mulch materials that are generally used are organic mulch materials such as rice straw, reeds, rice husks and synthetic chemicals such as polyethylene plastic or silver black plastic. Giving mulch to agricultural land aims to prevent evaporation, improve soil properties which will later affect the productivity of the soil in question and also prevent weed growth (Ronoprawiro, 1996; Umboh, 1999).

The purpose of organic mulch is to protect plant roots, maintain soil moisture, minimize rainwater that falls directly on the soil surface thereby minimizing nutrient leaching, erosion and maintaining soil structure, maintaining soil temperature stability, and contributing organic matter. Materials that are often used as organic mulch are rice straw and rice husk. In addition to reducing rice plant waste, rice husks that are spread over the soil surface can also function as mulch. It is hoped that the use of organic mulch can optimize the growth of cabbage plants so as to increase yields. Mulch can also play a positive role in soil and plants, namely protecting soil aggregates from the damaging power of raindrops, increasing water absorption by the soil, reducing the volume and velocity of surface runoff, maintaining temperature, soil moisture, maintaining soil organic matter content and controlling weed growth. Thus it can increase crop yields both in quality and quantity.

The purpose of this study was to determine the effect of rice husk mulch weight and varieties on the growth and yield of cabbage (*Brassica oleracea* L).

Its use is to be able to provide information to farmers about the benefits of using rice husk mulch on cabbage plants.

2. Methodology

This research was conducted from Maret to August 2022, in Rarapadende Village, West Dolo, Sigi Regency, and Central Sulawesi Province.

The materials used in this study were Grand 11 cabbage seeds, Talenta, Silvia, rice husk mulch, urea-based fertilizers, NPK, ponska, SP-36, KCl, insecticides and pesticides.

The tools used are hoes, pickaxes, sprayers, gembor, sprinkler, scales, meter, leaf area meter, ruler, protective roof, camera, plow, ruler and stationery.

This study used a randomized block design (RBD) consisting of two treatment factors, repeated three times. So that 27 research beds are needed.

The first factor is the use of three varieties of cabbage plants:

- V_1 = KK Cross
- V_2 = Cr-Ace
- V_3 = Green Gem

The second factor is the rice husk mulch treatment consisting of:

- M_1 = 3 kg/plot = 9 tons/ha
- M_2 = 3.5 kg / plot = 10.5 tons/ha
- M_3 = 4 kg/plot = 12 tons/ha

2.1. Research Implementation

2.1.1. Soil Processing

Land preparation is carried out starting with clearing the land using a sickle or hoe. After cleaning the land is plowed to make it loose and easy to plant. After the soil is loose, the beds are made. The depth of the hoed soil is 20-40 cm. making the beds used are 2 m wide and 2 m long. The height of the beds is 20 cm – 30 cm, with a distance of 50 cm between the beds

2.1.2. Seeding

Seeding is done simultaneously with tillage for planting. Because it is more efficient and the seeds will more quickly adapt to the environment. The first method of seeding is sowing the seeds and then covering them with 1-2 cm thick soil, then watering them, then observing that 3-5 days the seeds will grow, after 30 days of sowing the plants are transferred to beds.

Seeding is very important for cabbage cultivation. In addition to increasing plant uniformity, it also provides a better level of plant resistance. To start the nursery, we use a seedling medium in the form of a mixture of cocopeat, compost and NPK with a ratio of 2:1:10 grams. Put the seedling media mixture into a plastic bag (small polybag) then place the seedling media in a bed that has been covered with a roof to protect it from rainwater and maintain humidity (Zuldesigns, 1999).[22]

In addition to that way, nurseries can also be done by sowing seeds directly to the seedling beds with soil media, compost and NPK. Sow the cabbage seeds with a maximum distance of 2 cm, and then cover with fine soil up to 1 cm thick. To maintain humidity, do watering with water in the morning and evening at the same time as opening and closing the lid of the seedling beds (Lukito, 1988).[13]

2.1.3. Planting

Planting is done after the seeds have 4-5 strands and in each bed there are 16 cabbage plants.

2.1.4. Maintenance

In maintenance the first step that needs to be considered is watering, this watering depends on the season, if it's the rainy season then we need to reduce the existing water, but if it's the dry season we have to add water for the sufficiency of the cabbage plants we plant.

The next stage is embroidery - embroidery is the act of replacing plants with new plants. Stitching is done when the plant dies. Then fertilization after the plants are 2 weeks old, after fertilization is done weeding, usually weeding is done during the growth period of the cabbage plant and then loosening the soil, then pest and disease control.

2.1.5. Giving Mulch

After embroidery is done when the plants are 7 days old after planting, the cabbage plants can be given mulch. Rice husk mulch was previously weighed according to a predetermined weight and then sprinkled on the ground until it covered the soil surface.

2.1.6. Pest and Disease Control

Control of pests and diseases in cabbage plants is done by spraying before the pests attack the plants or routinely once every 1-2 weeks with a mild dose. For prevention, spraying is done as early as

Table 1. Average Number of Leaves (strands) of Several Cabbage Varieties at Various Weights of Rice Husk Mulch.

Treatment	Mulch Measure		
28 HST	**M_1**	**M_2**	**M_3**
V_1	13, 33 a	13.67 a	16,67b
V_2	14.67 a	15.33 a	14.33 a
V_3	15.33 b	14.00 a	14.33 ab
BNJ 5%		1.00	
35 HST	**M_1**	**M_2**	**M_3**
V_1	18.00 a	19.00 a	22,33 a
V_2	20,33ab	21.00b	19.33a
V_3	21.00b	19.67 a	20.00 a
BNJ 5%		1.23	

Note: the average number followed by the same letter in the same column (a, b), for each plant age, does not differ at the 5% BNJ test level.

possible with the right dose, so that pests can be overcome immediately. The types and doses of pesticides used to control pests vary depending on the pests controlled and the population level of these pests.

2.1.7. Harvest

Cabbage can be harvested after the heads are large, full and dense, when flicked with a loud ringing finger. The leaves are glossy green and the outermost leaves are withered. It can be harvested 3 months after planting or 4 months after sowing.

2.1.8. Observation Parameters

1) The number of leaves, calculated at the age of 21, 28, 35 HST
2) Leaf area, measured using a leaf area meter, at the age of 21, 28, 35 HST
3) The crop volume was observed at the end of the observation.
4) Fresh weight was observed at the end of the observation.
5) Yield per hectare, converted from yield per plot using the formula:

$$\text{Yield (Tons/Hectare)} = \frac{8000\ (\text{M}^2)}{\text{Tile Area}\ (\text{M}^2)} \times \frac{\text{Yield of Tiles (Kg)}}{1000\ \text{Kgs}}$$

2.1.9. Data analysis

To find out the effect of treatment on the observation parameters, each observation was analyzed (F test 0.05). If it has a significant effect, then proceed with the Real Honest Test (BNJ 0, 0, 5).

3. Results and Discussions

3.1. Results

3.1.1. Number of Leaves

The results of variance showed that the treatment had a significant effect at age 28 and 35 HST, but had no significant effect at 21 HST. The average number of leaves can be seen in Table 1.

Table 2. Average Leaf Area (cm^2) of Various Cabbage Varieties at Various Weights of Rice Husk Mulch

Treatment	Leaf Area (cm^2)		
	21 HST	**28 HST**	**35 HST**
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
BNJ 5%			1082.06
M_1	3644,6ab	7289.3ab	9808.8a
M_2	3602.7a	7238.8 a	9985.6a
M_3	4294.7b	8589.6b	11,250b
BNJ 5%	680.5	1338,28	1082.06

Note: The average number followed by the same letter in the same column, each treatment was not different at the 5% BNJ test level.

Table 3. Average Head Volume of Various Cabbage Varieties at Various Heavy Rice Husk Mulch.

Treatment	M_1	M_2	M_3
V_1	884.33a	710.00a	813.67 a
V_2	1117.00a	938.00a	1730.00b
V_3	1168,33b	824.33a	788.33 a
BNJ 5%		326.86	

Note: The average number followed by the same letter in the same column does not differ at the 5% BNJ test level.

BNJ test results 5%. Shows that at 28 HST the variety Grand 11 (V_1) with a weight of 4 kg rice husk mulch (M_3) produced a higher number of leaves and was different from the Talenta (V_2) and Silvia (V_3) varieties in the weight of rice husk mulch 4 kg (M_3). However, they were not different from the varieties (V_1, V_2, and V_3) in the weight of rice husk mulch of 3 kg and 3.5 kg (M_1 and M_2). At the age of 35 HST the Grand 11 variety (V_1) at a weight of 4 kg rice husk mulch (M_3) produced a higher number of leaves; different from the varieties (V_2 and V_3) in the weight of rice husk mulch of 4 kg (M_3). But it was not different from the varieties (V_1, V_2, and V_3) in the weight of rice husk mulch of 3123 kg and 3.5 kg (M_1 and M_2).

3.1.2. Leaf area (cm^2)

The results of variance showed that the treatment was at the age of 21, 28 and 35 HST has a real impact. The average leaf area can be seen in table 2.

BNJ5% test results (Table 2) Shows that at the age of 21 HST the highest average leaf area was in the Variety treatment (V_1), and not significantly with (V_2 and V_3) at the age of 28 days the highest average leaf area was in the variety treatment (V_1) and not significant with treatment (V_2 and V_3) and at 35 DAP the average yield of the highest leaf area was in the variety treatment (V_1) and different from the treatment (V_2 and V_3). In the same treatment the weight of mulch was 4 kg (M_3). Although the statistical analysis test showed no significant effect on V_2 and V_3, this was suspected because the seeds were the result of embroidery and environmental factors.

3.1.3. Crop Volume (ml)

The results of variance indicated that the treatment had a significant effect on the volume of cabbage crop heads.

Based on Table 3, the highest crop volume of cabbage plants was in the V_2 treatment with 4 kg (M_3) of mulch, namely 1.730.00 and the lowest was on V_1 with a weight of M_2 mulch, namely 710.00.

3.1.4. Fresh Weight Plant (kg)

Data on plant fresh weight observations can be seen in Appendix Table 3a, while the variance can be seen in Appendix Table 3b. The results of variance showed that the weight of rice husk mulch had no significant effect on the weight of mulch given to cabbage plants.

3.1.5. Results Hectares (Tonnes)

The results of variance showed that rice husk mulch dose had no significant effect on the fresh weight of cabbage plants per plot.

3.2. Discussion

The results of the 5% BNJ test indicated that the rice husk mulch dose of 4 kg (M_3) had a higher number of leaves. With Thus, the weight of 4 kg of rice husk mulch gave good results on the number of leaves. The thickness of the mulch of cabbage plants which were given rice husk mulch showed the highest value at the beginning of the observation. This is because rice husk covers the soil with a weight of 4 kg thicker or denser than mulch husk with a thickness of 3 kg.

Giving mulch on the soil surface can increase soil porosity and can facilitate the absorption of water into the soil thereby increasing the storage capacity of groundwater. Giving mulch can also affect soil moisture so as to create optimal conditions for plant growth. Mineral nutrition and water availability affect the growth of cabbage plants (Bilalis et al, 2002).[6]

BNJ test showed that 4 kg (M_3) rice husk mulch produced a higher leaf area than the other mulch weights. This is because the leaf area index (ILD) is a description of the ratio of leaf surface to the area of land occupied by plants. This ILD also describes the ability of plants to absorb solar radiation for the process of photosynthesis. The higher ILD indicates the more efficient absorption of sunlight, increasing the rate of photosynthesis. Applying rice husk mulch significantly increased the leaf area index (21-35 HST). Leaf area index of cabbage plants that were given rice husk mulch showed the highest number and was significantly different from the treatment without mulch, but not significantly different from cabbage that was given rice husk mulch (Gardner, Pearce and Mitchell, 1991).[9]

In table 2 the leaf area shows that the variety Grand 11 and Silvia gave high scores compared to Talenta varieties, this proves that the adaptability of these two varieties is better in the highlands compared to other varieties. The increase in leaf area in the absorption of CO_2 for photosynthesis is supported by an ideal leaf structure even under conditions of environmental stress, which is the ability of a plant to adapt to remain sustainable (Gardner et *al.,* 1991).[9]

The results of the 5% BNJ test showed that the dose of 4 kg of rice husk mulch with the Taleta variety resulted in a higher volume of cabbage plants added to the water compared to the Grand11 and Silvia varieties. This is because the talent variety responds better to the plant's environmental conditions which have a thick mulch thickness; in these conditions the plant can immediately take advantage of the optimum temperature around the crown and roots. Arifin (2003)[5] explained that the occurrence of temperature variations around plants is determined by the amount of solar energy absorbed by the canopy and the amount of energy emitted by the leaves.

BNJ 5% test showed that fresh weight and yield per hectare had no significant effect. Another reason was that rice husk mulch did not affect the production of cabbage plants. This amount is thought to suppress the temperature around the plant. Besides that, the morphology of the leaves cabbage which can cover the surface of the soil so that it is suspected that the function of mulch in controlling the temperature around the plants has not had an effect besides that the plants indicated excess water.

The plant growth rate shows the weight gain in the plant community per unit area of land in one unit of time. The plant growth rate was not significantly different in the varietal treatments, however significantly different in the mulch treatment. This shows that the three varieties have growth rates that are not different. Giving organic mulch, in addition to significantly increasing several growth components, can also significantly increase the growth rate of plants. Some growth components whose increase is influenced by organic mulch, although indirectly, namely plant height, number of leaves, leaf area (Sunghening, 2010).[20]

The application of organic mulch significantly also affected the increase in the number of leaves, leaf area and volume. An increase in the growth component will be followed by an increase in leaf area index and plant growth rate. In terms of root length, the use of mulch did not affect the increase, and did not affect the increase in the net assimilation rate or the harvest index.

4. Conclusions

Based on the results of plant research that has been done, it can be concluded that the application of rice husk mulch with different weights has a significant effect on the growth of cabbage plants. This can be seen from the observation of the number of leaves, leaf area
In the treatment of the Grand 11, Talenta and Silvia varieties, the three varieties had good growth using 4 kg rice husk mulch (M_3) and had a significant effect on the crop volume of cabbage plants using 4 kg rice husk mulch (M_3). The use of mulch with 4 kg can meet the water needs of cabbage plants and can provide nutrients found in rice husks.

Suggestion

Based on experience in the field, it is better to use mulch on sandy soil to reduce evaporation.

Conflicts of Interest

The authors declare no conflict of interest.

References

1 Andoko. 1993. *Commercial Vegetables*. Self-help Spreader. Jakarta. b) Arief, Arifin. 1990. Horticulture. Andy Offset. Yogyakarta. c) Cahyono, Bambang. 1995. How to Improve Cabbage Cultivation. D), Nusatama Library. Yogyakarta. d) Belief. 1981. Cabbage Brow Cabbage. Self-help Spreader. Jakarta

2 Abdul Rahman. *Techniques for giving organic fertilizers and mulch in Japanese cucumber cultivation*. Bull. Agricultural Engineering, 2005.
3 Asri A. *The Perfect Interpreter for Success in Cabbage Cultivation*. ARC Media. Jakarta, 2013.
4 Anonymous. 2004. *Local Cabbage Varieties Are Saving Researchers*. June, 28 2014.
5 Arifin. *The Concept of Plant Microclimate Manipulation in Supporting Increasing Farmers' Income. Inaugural Speech of Professor in the Field of Agroclimatology at the Faculty of Agriculture, Universital Brawijaya, Malang*, 2003.
6 Bilalis D.; Sidiras N.; Economou G.; Vakali C. Effect of Different Levels of Wheat Straw Soil Surface Coverage on Weed Flora in Vicia faba Crops. *J. Agron. Crop Sci.*, 2003, **189**, 233-241. [CrossRef]
7 Cahyono B. *How to Improve Cabbage Cultivation.* PustakaNusantara Foundation, Yogyakarta. 1995, 38-50.
8 Fauzan A. *Utilization of Mulch in Sustainable Agriculture Organic Agriculture. Journal of agronomy*, 2002, 5, 182-187.
9 Gardner F.P.; Pearce R.B.; Mitchell R.L. *Physiology of Aquaculture Plants.* Ui-Press. Jakarta, 2008.
10 Hope. *Effect of Mulching on P and N Mineral Content in Latosol Soil and* Corn Forage Productivity (*Zea mays* L). 1991, 6, 10-11.
11 Hanafi. *Organic Vegetable Cultivation*. Self-help Spreader. Jakarta, 1996.
12 Harris. *Instructions for Using Mulch*. Self-help Spreader, 2000.
13 Lukito. *Cultivation of Environmentally Friendly Vegetables,* 1998.
14 Noorhadi. *Study of Watering and Mulching against Microclimate in Chili Plants and Entiso Soil* l. Soil and Environmental Sciences, 2003.
15 Riren. *Cultivation and Arrangement of Highland Vegetables* i. Self-help Spreaders. Jakarta. 2007, 142.
16 Sueyani A.R. *Factors Affecting Cabbage Farming*. Thesis. IPB. Bogor. 2008.
17 Gratitude A.; Harsono E.S. *The Effect of Applying Manure and NPK on Some Chemical and Physical Properties of Sand Soil at Samas Beach, Bantul. Journal of Soil and Environmental Sciences*, 2008, 8(7), 138-145.
18 Wahyudi. *Tips for Growing Fruit and Vegetable Plants. Agromedia*, Jakarta, 2008.
19 *Classification and Morphology of Cabbage Plants* (July 23 2014). [Link]
20 Wiwara Sunghening. *The Effect of Organic Mulch on the Growth and Yield of Three Varieties of Mung Beans* (*vigna radiata* l. wilczek) in Sandy Land at Bugel Beach, Kulon Progo. *Journal of Agroecosystem*, 2010, 6(5), 9-10.
21 Yuwono N.W. *Building Soil Fertility on Marginal Land* l. *Journal of Soil and Environmental Sciences*, 2009, 9(7), 137-141.
22 Zuldesigns. *Utilization of Mulch in Sustainable Agriculture. Organic Farming*. *Journal of earth sciences,* 1999, 6(7), 182-187.