



The Effect of Using Several Types of Mulch to Control Weeds on The Growth and Yield of Mung Bean Plants

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Abstract:

Background. The use of mulch is one method of weed control and can increase mung bean yields.

Aims. This study aims to investigate the impact of various types of mulch on weed growth in mung bean plants.

Methods. This research was conducted in Kepongpongan village, Talun District, Cirebon Regency. The research was carried out from October to December 2024. The experimental design employed was a randomized block design (RBD) with four treatments and six replicates. The treatment factors studied consisted of M1 (no mulch), M2 (rice straw mulch), M3 (reed mulch), and M4 (black and silver plastic mulch).

Result. The results showed that this type of mulch against weeds can reduce the number of weed individuals. The use of mulch affects the weight of weeds, plant height, number of leaves, leaf area, flower age, pod weight, number of pods, seed weight, and weight of 100 seeds.

Conclusion. The use of plastic mulch in this study gave the best results.

Keywords: Kinds of mulch, Mung Beans, Weed



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INTRODUCTION

Green beans are plants that come from legume pods and are a type of cultivation and palawija plant that are widely known in the tropics. Green beans offer numerous benefits in daily life as a rich source of vegetable protein. Its high protein content makes mung bean seeds a viable alternative source to meet protein needs, other than animal protein. The most

economically valuable part of green beans is the seeds. Green bean seeds, boiled until soft, can be eaten as a porridge or consumed directly. The mature seeds that are eroded are used as the filling of onde-onde, bun, or gandas turi. Green bean sprouts are a common vegetable eaten in the East and Southeast Asian regions known as bean sprouts (Azhari et al., 2018).

Based on the mung bean production data released by the Cirebon Regency Agriculture Office, Talun District, from 2022 to 2023, no mung beans were produced (Cirebon Regency Agriculture Office, 2023). One of the obstacles for farmers in mung bean production is the problem during cultivation, primarily due to the presence of weeds (Sitorus, 2018). Weeds are plants that grow in a specific place at a particular time that humans do not desire. Not only do weeds grow on other plants, but they also grow and appear in various places. There are six ways to spread weeds. The way weeds are spread involves autochory, which occurs when weeds are dispersed by old pods that break open. Anemochory is the dispersal of weeds through seeds that have a parachute and are carried by the wind to various locations. Hydrochory is the spread of weeds due to thin seeds and stem fragmentation. Ornithocry is the process of spreading weeds caused by the flesh of sweet fruits. Zoochory is the spread of weeds through the process of digestive waste. And finally, anthropochory, the process of spreading weeds that is carried out deliberately by humans (Deden, 2020). Weeds that grow among plants are very diverse in type and dominance. Types of weeds that have a high dominance will be very detrimental and reduce crop yields. (S. Utami et al., 2020). The distribution of weeds between two areas differs according to the factors that affect it. Identification of weeds and the determination of dominant weed types is the first step in assessing the success of weed control. (Imaniasita et al., 2020). Weed control that farmers commonly carry out is mechanical and chemical control using herbicides, which have many weaknesses, including causing environmental damage, low biotic diversity, the death of non-target organisms, and increasing production costs. (Gebu, 2015). Therefore, it is necessary to make proper weed control efforts to increase mung bean production, one of which is the use of mulching.

Mulch is a covering material for cultivated plants that is intended to maintain soil moisture and suppress the growth of weeds and diseases, allowing plants to grow well (Setiyaningrum et al., 2019). The use of mulch aims to modify the environment to be suitable for plants, allowing them to grow properly (Rasyid, 2019). Based on the source of the material, mulch can be classified as organic, inorganic, or synthetic (Karnilawati et al., 2021). The use of organic mulch involves the incorporation of organic matter from plant

residues, including rice straw, sawdust, corn cuttings, pruning from fence plants, leaves, and twigs, which can be decomposed, thereby increasing the soil's organic matter content. The advantage of using organic mulch is that it is less expensive and readily available from the environment (Wulandari et al., 2018). The disadvantage of organic mulch is that it can only be used for 1 planting season. Inorganic mulch encompasses all rock materials in various shapes and sizes, such as gravel, coral, and coarse sand, whereas chemical-synthetic mulch comprises plastic materials and other synthetic chemicals (Muslim & Soelistyono, 2017). Advantages of plastic mulch according to (Fahrurrozi, 2018) namely increasing the initial yield and total yield of various crops, improving the quality of crop yields, making the plant ecosystem cleaner, reducing evaporation, reducing weed growth, reducing leaching and nutrient loss, reducing soil compactness, making plants in a condition rich in carbon dioxide, reducing insect populations, being able to increase crop yields in land area unity through sequential cropping, and extending, Growing season and Loss of plastic mulch is an investment cost that is too expensive both for the cost of purchasing mulch and paying labor in the installation of plastic mulch. Not only is the cost a factor, but plastic mulch can also be a waste because plastic is resistant to decomposition in nature.

METHODS

The research was carried out in Kepongpongan Village, Talun District, Cirebon Regency, from October to December 2024. In this study, the tools used include hoes, rulers, black and silver plastic mulch, mulch nails, and digital scales. Meanwhile, the materials used consist of Vima 5 mung bean seeds, NPK fertilizer, Rice Straw Mulch, and Alang alang. The experimental design used was a group random design (RAK) with six replicates and four treatments: M1 = no mulch, M2 = Rice straw mulch, M3 = alang-alang mulch, and M4 = silver black plastic mulch.

The land is cleared and then hoed or plowed until the soil becomes loose. The land was mapped into a total of 24 plots, each measuring 2 m in length and 3 m in width. Then, the mulch is spread evenly over the tile's surface. For mulch, the installation is done during the hot sun so that the mulch can expand, closing the gap appropriately. Mulch, Straw, and alang alang mulch are given 5 tons per hectare (3 kg per plot) each, while plastic mulch (size 200 cm x 300 cm with a thickness of 0.35 mm) is laid according to the map. Green bean seeds are soaked in water for 3 hours before planting. Then, a planting hole is made by digging 5 cm deep with a planting distance of 40 cm x 15 cm. For each planting hole, two

seeds are planted. Maintenance consists of watering, as well as controlling pests and diseases. Harvesting is carried out at the age of 58-65 HST. The data were tested using a variety of analyses, and if any differences were found, further tests were carried out using Duncan's Multiple Range Test (DMRT) at a 5% significance level. The observed aspects included the Number of Weed Individuals, Weed Type, Weed Weight, plant height, number of leaves, leaf area, flower age, seed weight per sample, weight of fresh pods per sample, and number of pods per sample for each treatment.

DISCUSSION

Type of weeds, individuals of weeds

The results in Table 1 indicate that six types of weeds are present, and each type of mulch has a distinct effect on individual weeds. The effect of using mulch type users on Weed Types and individuals is best at 15 HST is M4 with Only four types of weeds and the number of weeds is 69, while at 30 HST the best type of mulch is M2 with three types of weeds, however, the best number of individuals is M4 with 112 types of weeds, while at 45 HST the use of M2 is better in weed types, and the best number of individuals is M4 With a total of 109.

Table 1. The type and number of weeds treated with organic and inorganic mulch at 15 HST.

| Types of Weeds | Number of Weed Individuals | | | | Amount |
|--------------------------------|----------------------------|-----|-----|----|--------|
| | M1 | M2 | M3 | M4 | |
| <i>Marsilea crenata</i> | 42 | 3 | 3 | 0 | 48 |
| <i>Panicum repens L</i> | 29 | 2 | 11 | 21 | 63 |
| <i>Commelina diffusa</i> | 0 | 28 | 3 | 0 | 31 |
| <i>Cyperus rotundus L</i> | 67 | 45 | 78 | 24 | 214 |
| <i>Chrysopogon zizanioides</i> | 35 | 38 | 15 | 6 | 94 |
| <i>Portulaca oleracea</i> | 27 | 46 | 27 | 18 | 118 |
| Total Amount | 200 | 162 | 137 | 69 | 568 |

Table 2. The type and number of weeds treated with organic and inorganic mulch at 30 HST.

| Types of Weeds | Number of Weed Individuals | | | | amount |
|--------------------------------|----------------------------|-----|-----|-----|--------|
| | M1 | M2 | M3 | M4 | |
| <i>Marsilea crenata</i> | 75 | 0 | 0 | 0 | 75 |
| <i>Panicum repens L</i> | 81 | 0 | 30 | 15 | 126 |
| <i>Commelina diffusa</i> | 108 | 7 | 0 | 10 | 125 |
| <i>Cyperus rotundus L</i> | 127 | 56 | 79 | 26 | 288 |
| <i>Chrysopogon zizanioides</i> | 76 | 139 | 45 | 15 | 275 |
| <i>Portulaca oleracea</i> | 108 | 30 | 58 | 46 | 242 |
| Total Amount | 575 | 232 | 212 | 112 | 1131 |

Table 3. The type and number of weeds treated with organic and inorganic mulch at 45 HST.

| Types of Weeds | Number of Weed Individuals | | | | Amount |
|--------------------------------|----------------------------|-----|-----|-----|--------|
| | M1 | M2 | M3 | M4 | |
| <i>Marsilea crenata</i> | 84 | 0 | 5 | 5 | 94 |
| <i>Panicum repens L</i> | 121 | 180 | 116 | 5 | 422 |
| <i>Commelina diffusa</i> | 69 | 0 | 51 | 23 | 143 |
| <i>Cyperus rotundus L</i> | 139 | 129 | 67 | 39 | 374 |
| <i>Chrysopogon zizanioides</i> | 198 | 98 | 52 | 6 | 354 |
| <i>Portulaca oleracea</i> | 86 | 78 | 66 | 31 | 261 |
| Total Amount | 697 | 485 | 357 | 109 | 1648 |

This happens because the use of mulch can cover all soil surfaces, thereby inhibiting the germination of weeds due to the obstruction of sunlight. This is in agreement with (Herumia et al., 2017) The use of mulch aims to maintain soil moisture, stabilize soil temperature, reduce erosion rates, and suppress weed growth, thereby enhancing the effectiveness of nutrient absorption in the soil. This is in line with research. (Basuki et al., 2022) States that the use of straw mulch and silver black plastic mulch can decrease the appearance of different types and individuals of weeds. And (Nerty Soverda, 2015) The use of alang mulch can reduce the number of weed types and individuals.

Weed Weight

The results of the variety analysis showed that the use of mulch affected the weight of weeds. The weight of weeds, influenced by several types of mulch, is shown in Table 4.

Table 4. Effect of the use of mulch types on weed weight

| Types of Mulch | Weed Weight | | |
|---------------------------------|-------------|---------|----------|
| | 15 | 30 | 45 |
| M1 (No Mulch) | 40.7 c | 80.60 c | 279.06 d |
| M2 (Rice Straw Mulch) | 18.46 b | 35.98 b | 103.81 c |
| M3 (Alang alang mulch) | 16 b | 32.66 b | 68.77 b |
| M4 (Silver Black Plastic Mulch) | 7.2 a | 19.84 a | 32.15 a |

Notes: Different letter notations in the same column and row show a noticeable difference of 5% according to the DMRT (Duncan Multiple Range Test)

The use of mulch types M4, M3, M2 can reduce the weight of weeds. Because the mulch covers the entire surface of the soil, it prevents weeds from growing. This is in agreement with (Herumia et al., 2017). The use of mulch aims to maintain soil moisture, stabilize soil temperature, reduce erosion rates, and suppress weed growth, thereby enhancing the effectiveness of nutrient absorption in the soil.

Plant height

The results of the analysis of the variety of table 2 show that the use of different types of mulch affects the height of plants at 20, 30, and 40 HST. The height of the plant, influenced by several types of mulch, is shown in Table 4.

Table 4. The effect of the use of mulch types on plant height.

| Types of Mulch | Plant Height | | |
|---------------------------------|--------------|---------|---------|
| | 20 HST | 30 HST | 40 HST |
| M1 (No Mulch) | 13.36 a | 23.93 a | 34.90 a |
| M2 (Rice Straw Mulch) | 14.60 b | 28.80 b | 37.80 b |
| M3 (Alang alang mulch) | 16.26 c | 30.36 c | 38.73 b |
| M4 (Silver Black Plastic Mulch) | 18.60 d | 31.10 c | 41.26 c |

Notes: Different letter notations in the same column and row show a noticeable difference of 5% according to the DMRT (Duncan Multiple Range Test)

Table 4 shows that the use of different types of mulch M4, M3 and M2 can increase the height rate of plants compared to M1. This is because mulching can increase the availability of water for plants, reduce soil temperature fluctuations, control weed growth, and improve the physical properties of the soil. As explained (Mukhlisin & Rohmayyah, 2023) This happens because nutrients are sufficient and the roots of mung bean plants can absorb nutrients well, as a result of which metabolic activities in the plant body can run well

as well, as well as the formation of plant cells so that the growth response of mung bean plants can support an increase in plant height. According to the data above, the use of various types of mulch is more effective than not using mulch. This is in line with research. (Basuki et al., 2022) The use of black silver plastic mulch and rice straw is better than not using mulch. and research (Amanullah et al., 2022) The use of alang-alang mulch and plastic is better than not using mulch.

Number and area of leaves

The results of the variety analysis showed that the use of various types of mulch affected the number and area of plant leaves at 20 and 40 HST. The number and area of leaves, as affected by the use of several types of mulch, are presented in Table 5.

Table 5. The effect of the use of mulch on the area of leaves and the number of leaves.

| Types of Mulch | Leaf Area | | amount leaf | |
|---------------------------------|-----------|----------|-------------|--------|
| | 20 HST | 40 HST | 20 HST | 40 HST |
| M1 (No Mulch) | 17.44 a | 184.58 a | 1.33 a | 4.23 a |
| M2 (Rice Straw Mulch) | 21.89 b | 247.10 b | 1.70 b | 4.46 b |
| M3 (Alang Alang mulch) | 25.04 c | 312.60 c | 1.73 b | 4.53 b |
| M4 (Silver Black Plastic Mulch) | 29.36 d | 366.99 d | 1.90 b | 4.90 c |

Notes: Different letter notations in the same column and row show a noticeable difference of 5% according to the DMRT (Duncan Multiple Range Test)

The results showed that the use of mulch types M4, M3, and M2 could increase leaf area and leaf count compared to not mulching. The best leaf area and leaf count is M4. This happens because the mulch can maintain soil temperature and reflect sunlight, making photosynthesis more optimal. Conform to the opinion. (Aleksandro et al., 2016) Covering the soil with mulch can help retain soil moisture, reducing the direct influence of sunlight and thereby minimizing groundwater loss caused by evaporation. The same is true for research. (Royyani et al., 2018) The use of rice straw mulch and silver-black plastic mulch is better than not using mulch. and research (Amanullah et al., 2022) The use of alang-alang mulch and black silver plastic mulch is preferable to not using mulch.

Flower Age

The results of the variety analysis showed that the use of various types of mulch had a real effect on the lifespan of flowers. The age of flowers, as influenced by the use of mulch, is shown in Table 6.

Table 6. The effect of the use of mulch types on flower life.

| Types of Mulch | Flower Age |
|---------------------------------|------------|
| M1 (No Mulch) | 41.50 d |
| M2 (Rice Straw Mulch) | 39.59 c |
| M3 (Alang Alang Mulch) | 37.83 b |
| M4 (Silver Black Plastic Mulch) | 36.50 a |

Notes: Different letter notations in the same column and row show a noticeable difference of 5% according to the DMRT (Duncan Multiple Range Test)

From the data above, the flower life from the use of mulch types M4, M3, and M2 is better than M1. The best flower lifespan growth is M4 with a flower age of 36.50, and the use of mulch results in the lowest flower lifespan response of 41.50. This happens because the use of mulch helps maintain soil moisture, preventing water shortages, as evaporation into the air occurs primarily through the transpiration process. Through this transpiration process, plants can draw water from the soil, where various nutrients needed by plants have been dissolved, thereby accelerating the growth of flowers. Conform to the opinion. (Aleksandro et al., 2016) Covering the soil with mulch can help retain soil moisture, reducing the direct influence of sunlight and thereby minimizing groundwater loss caused by evaporation.

Weight and number of Pods

The results of the variety analysis showed that the use of mulch type had a significant effect on the weight and number of pods. The weight of pods and the number of pods, influenced by the use of mulch, are shown in Table 7.

Table 7. Effect of mulch type on pod weight and number of pods

| Types of Mulch | Weight Pods | Amount Pods |
|---------------------------------|-------------|-------------|
| M1 (No Mulch) | 49.57 a | 50.5 a |
| M2 (Rice Straw Mulch) | 54.24 b | 53.66 a |
| M3 (Alang Alang mulch) | 55.36 bc | 54.33 ab |
| M4 (Silver Black Plastic Mulch) | 58.38 c | 59.16 b |

Notes: Different letter notations on the same column and row show a noticeable difference of 5% according to the DMRT (Duncan Multiple Range Test)

According to the data in the table, the use of mulch is more effective than not using it because it aims to modify the environment to be suitable for plant growth, allowing plants to thrive properly (Rasyid, 2019). In addition, the use of mulch can increase crop yields (Kishore et al., 2022). According to the table, the use of M4 mulch yields the best results, with a pod weight of 58.38 and a number of pods of 59.16. In contrast, the lowest results are achieved with M1, which has a pod weight of 49.57 and several pods of 50.5.

Weight Seeds and weight 100 seeds

The results of the variety analysis showed that the use of mulch had a significant effect on the weight of the seeds and the weight of 100 seeds. The weight of seeds per sample and the weight of 100 seeds, influenced by the use of different mulch types, are presented in Table 8.

Table 8. The effect of the use of mulch on the weight of seeds and the weight of 100 seeds.

| Types of Mulch | Seed Weight | Weight 100 Pieces |
|---------------------------------|-------------|-------------------|
| M1 (No Mulch) | 37.06 a | 5.74 a |
| M2 (Rice Straw Mulch) | 42.94 b | 6.34 b |
| M3 (Alang Alang mulch) | 44.46 bc | 6.70 b |
| M4 (Silver Black Plastic Mulch) | 46.45 c | 7.71 c |

Notes: Different letter notations in the same column and row show a noticeable difference of 5% according to the DMRT (Duncan Multiple Range Test)

From the data in the table, the use of mulch is better than no mulch. Because the use of mulch aims to modify the environment to be suitable for plants, so that plants can grow properly (Rasyid, 2019). In addition, the use of mulch can increase crop yields. (Kishore et al., 2022). According to the table, the use of M4 mulch yields the best results, with a seed weight of 46.45 and a weight of 100 seeds of 7.71, while the lowest is M1, with a seed weight of 37.06 and a weight of 100 seeds of 5.74.

CONCLUSION

According to the study's results, the use of black and silver plastic mulch can reduce the number of weed types at 15 HST and decrease individual weed counts at 15, 30, and 45 HST. Moreover, the use of rice straw mulch can reduce the type of weed at 30 and 45 HST. The type of mulch affects the weight of weeds, plant height, number of leaves, leaf area, flowers, pod weight, number of pods, seed weight, and weight of 100 seeds. The best type of mulch in this study is the use of black and silver plastic mulch.

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