IBJ
Indonesian Biodiversity Journal
http://ejurnal.unima.ac.id/index.php/ibj

indonesian.biodivers.j.
Vol. 5, No. 2. August 2024
ISSN :2722-2659

THE EFFECT OF RICE HUSK CHARCOAL ON THE GROWTH AND PRODUCTION OF WHITE CHILI CAYEY (*Capsicum frutescens* L)

Evaristus Makalew*[1], Orbnus Naharia[2], Fanny N. Nanlohy[3]

[1] Biology Student, Faculty of Mathematics, Natural Sciences and Earth, Universitas Negeri Manado, Indonesia.
[2,3]Biology Departement, Faculty of Mathematics and Natural Sciences and Earth, Universitas Negeri Manado, Indonesia.

**Corresponding author: makalewevaristus@gmail.com*

Received: May 30, 2023 *Accepted: August 5, 2024*

Abstract

The aim of this research is: to determine and analyze the effect of giving rice husk charcoal on the growth and production of white cayenne pepper plants (*Capsicum frutescens* L). The method used in this research is the experimental method with a completely randomized design (RAL) approach. This shows that rice husk charcoal and planting media have different average values for plant height, number of leaves, number of branches, number of fruit and weight of white cayenne pepper. At the 12th week of observation, the M2ASP2 treatment had the highest value compared to other treatments, namely124.65 ± 31.73cm. Meanwhile treatment M1 ASP 0has the lowest value, namely79.23 ± 21.9cm.

Keywords: Rice Husk Charcoal Plant Production Growth of White Cayenne Pepper (*Capsicum frutescens* L).

INTRODUCTION

The development of the population in Indonesia has an impact on the availability of food. The availability of food cannot be separated from the strategy in preparing the ingredients in the community. The development of types of food needs to be considered in terms of nutritional content, ease of cultivation and in accordance with the economic conditions of the community in general. (Central Bureau of Statistics 2023), Taufik (2011) stated that one of the commodities that is popular and often cultivated by Indonesian people is chili. Chili is one of the leading national commodities and is rich in vitamin C. According to Syukur (2012), the chili planting area is also wide because it can be cultivated in the lowlands and highlands, and can also be planted in narrow areas of land such as home gardens.

Fertilization as one part of agricultural intensification efforts is an effort that aims to increase the supply of nutrients needed by plants to increase production and quality of crops. As agriculture is currently developing towards sustainable agriculture, one alternative is the use of organic and inorganic materials as a source of nutrients to increase the growth and yield of chilies (Kiswondo, 2011). Other benefits of husk charcoal as a planting media mixture include: Maintaining loose soil conditions, stimulating the growth (proliferation) of microorganisms that are useful for plants, regulating soil pH in

indonesian.biodivers.j.
Vol. 5, No. 2. August 2024
ISSN :2722-2659

certain conditions, retaining moisture, fertilizing the soil and plants, increasing plant production, as an absorbent for suppressing the number of pathogenic microbes, as a hydroponic growing medium, increasing absorption and binding capacity (Setiawan, 2021).

Based on the results of observations, there are several problems in cultivating white cayenne pepper plants. Cultivation of chili plants in Indonesia still uses chemical fertilizers which can damage the environment and the soil where cayenne pepper plants grow. The very high residue left behind when applying chemical fertilizers degrades the soil which causes the loss of nutrients in the soil. Adding rice husk biochar to the soil can be a soil conditioner, and can be useful for increasing soil fertility and trapping nutrients in the soil for plant absorption. To replace chemical fertilizers which contain high residues, they can be replaced with organic rice husk charcoal fertilizers which contain the nutrients needed by plants and have low residues.

The aim of this research is, firstly, to determine and analyze the effect of giving rice husk charcoal on the growth and production of white cayenne pepper plants (*Capsicum frutescens* L) where this research is to determine the vegetative growth of white cayenne pepper plants starting from plant height, number of leaves, number of branches, and the number of fruits. Second, to find out and analyze whether there is an influence of the planting medium of rice husk charcoal on the growth and production of white cayenne pepper plants (*Capsicum frutescens* L). The parameter used to determine whether there is an influence of the planting medium on the growth and production of chili plants is the number of fruit. Third, the parameters used to determine and analyze whether there is an effect of the combination of rice husk charcoal and planting media on the growth and production of white cayenne pepper plants (*Capsicum frutescens* L) are the number of leaves, height of the chili plant, number of branches and number of fruit.

RESEARCH METHODS

The place of this research was carried out in the city of Tomohon and the research period was carried out for 4 months starting from June to September 2022. The tools and materials in this research were, Polybags, Mistar, Chili, Rope, Rice, Rice Husk Charcoal.

The research used a Completely Randomized Design (CRD) with a 2x4 factorial pattern repeated 4 times. The first treatment factor was Charcoal Husk on (ASP) which consisted of ASP0 = no treatment, ASP2 = 2 kg of planting, ASP4 = 4 kg of landscaping, ASP6 = 6 kg of planting, the second factorial was the planting medium (M), which consists of M1 (soil) and M2 (soil: rice husk charcoal (ASP).

Data collection

Data on the growth of white cayenne pepper plants was obtained through data on plant height (cm), measured from the base of the stem to the tip of the highest shoot and measurements were carried out every week. The number of leaves (strands) is calculated by adding up all the leaves on the plant and measurements are taken every week. The number of branches (twigs) is calculated by adding

up all the twigs on the plant and measurements are carried out every week, the number of fruit and fruit weight are calculated by adding up all the fruit and twigs on the plant and measurements are carried out in the 12th week of the chili plant. can be harvested.

Observed Variables

The variables observed consisted of plant height (cm), number of leaves (strands), number of branches, number of fruit, fruit weight.

Data analysis technique

The data analysis technique in this research begins with descriptive analysis, namely interpreting the output of the analysis of rice husk charcoal (ASP) on the growth of chili plants. Then proceed with statistical analysis using the Two-way Analysis of Variance (ANOVA) test and the Independent-Samples Test with the assumption that the data is normally distributed. The research data was obtained from data on plant height (cm), number of leaves (strands), number of branches, number of fruit and fruit weight.

RESULTS AND DISCUSSION

The Effect of Spreading Rice Husk Charcoal and Planting Media on the Growth and Production of White Cayenne Pepper (*Capsicum frutescens* L.)

The parameters used to determine whether there is an effect of the combination of rice husk charcoal and planting media on the growth and production of chili plants are the number of leaves, height of chili plants, number of branches and number of fruit.

Table 1. Effect of the combination of rice husk charcoal and planting media on chili plant height (cm) n=4**.**

Treatment	Observations Week To					
	2	4	6	8	10	12
M1 ASP 0	3.08 ± 0.51	4.43 ± 0.91	6.95 ± 2.36	28.38 ± 3.81	38.93 ± 11.09	79.23 ± 21.9
M1 ASP 2	3.35 ± 0.3	7.32 ± 1.70	17.55 ± 1.68	58.33 ± 20.87	77.33 ± 28.82	124.65 ± 31.73
M1ASP 4	4.40 ± 1.03	7.975 ± 1.27	12.63 ± 1.65	64.40 ± 13.31	93.48 ± 14.68	83.85 ± 90.71
M1 ASP 6	3.68 ± 1.04	5.98 ± 1.35	7.40 ± 1.76	28.58 ± 9.2	32.10 ± 26.46	118.20 ± 44.4
M2 ASP 0	3.08 ± 0.51	4.43 ± 0.91	7.03 ± 2.31	31.88 ± 4.02	42.73 ± 11.83	83.18 ± 22.47
M2 ASP 2	3.35 ± 0.3	7.83 ± 0.9	17.55 ± 2.31	58.33 ± 20.87	77.33 ± 28.82	124.65 ± 31.73
M2 ASP 4	4.45 ± 1.02	8.90 ± 1.84	17.725 + 3.72	67.60 ± 12.16	97.65 ± 15.09	85.93 ± 92.63
M2 ASP 6	3.68 ± 1.04	6.28 ± 1.38	9.01 ± 1.47	30.68 ± 8.14	32.10 ± 26.46	122.88 ± 46.33

Source: Primary data processed by researchers in 2023

Information: ASP0 = Treatment without fertilizing rice shell charcoal, ASP2 = Giving ASP 2 kg/polybag, ASP4= Giving ASP 4 kg/Polybag, ASP6= Giving ASP 6 kg/Polybag.

indonesian.biodivers.j.
Vol. 5, No. 2. August 2024
ISSN :2722-2659

Plant height

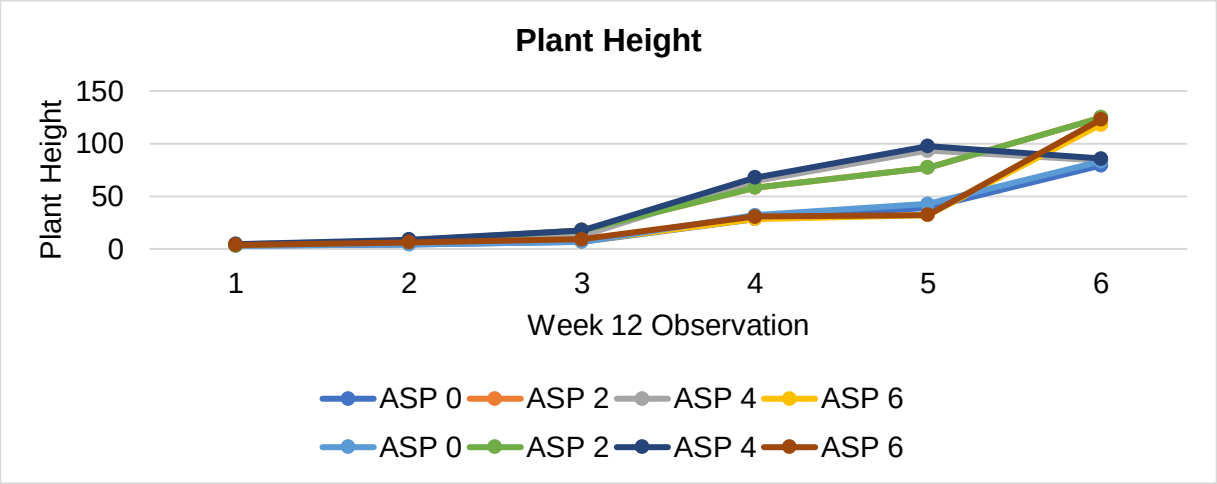

Figure 1. Graph of the effect of the combination of rice husk charcoal and planting media on the average height of white cayenne pepper plants at week 12 (n=4)

Table 1 and Figure 1 show that the combination of rice husk charcoal and planting media has different average height values for white cayenne pepper plants. At the 12th week of observation, the M2ASP2 treatment had the highest value compared to other treatments, namely124.65 ± 31.73cm. Meanwhile treatmentM1 ASP 0has the lowest value, namely79.23 ± 21.9 cm. The data obtained from the combination of rice husk charcoal and planting media on the height of chili plants were analyzed statistically. Because the results of the Kolmogorov-Smirnov Test showed that the data on chili plant height values were normally distributed, the analysis was continued with the Two-way Analysis of Variance (ANOVA) test which had a significance degree (α) = 0.05. According to Martanto (2001), giving husk charcoal to chilies has a significant effect on the growth rate of plant height and suppresses pest and disease attacks.

Number of Leaves

The results of the number of leaves of white cayenne plants with different rice husk charcoal are shown in Table 2 and Figure 2, that the combination of rice husk charcoal and planting media has a different average number of leaves on white cayenne pepper plants. At the 12th week of observation, the M2ASP4 treatment had the highest value compared to other treatments, namely 97.50 ± 25.74sheet. Meanwhile treatmentM1 ASP 0has the lowest value, namely 22.75 ± 9.74. Data on the combination of rice husk charcoal and planting media on the number of leaves of chili plants obtained were statistically analyzed. Because the results of the Kolmogorov-Smirnov Test showed that the data on chili plant height values were normally distributed, the analysis was continued with the Two-way Analysis of Variance (ANOVA) test which had a significance degree (α) = 0.05, according to (Noble 2020), explained that one way to improve planting media that has poor drainage is to add husk charcoal

to the media.

Table 2. Effect of giving rice husk charcoal on the number of leaves of chili plants n=4.

Treatment	Observations Week To					
	2	4	6	8	10	12
M1 ASP 0	3.25 ± 0.05	4.25 ± 0.05	7.25 ± 0.96	13.50 ± 3.79	16.25 ± 4.43	22.75 ± 9.74
M1 ASP 2	4.5 ± 0.58	6.75 ± 1.71	11.75 ± 0.96	20.00 ± 2.16	30 ± 3.46	61.75 ± 21.96
M1 ASP 4	5.25 ± 1.26	7.75 ± 1.5	10.5 ± 2.38	20.50 ± 7.72	38.5 ± 12.79	95.00 ± 25.53
M1 ASP 6	4.00 ± 0.82	5.50 ± 1.29	9.75 ± 4.57	13.75 ± 5.56	19 ± 11.4	72.25 ± 40.93
M2 ASP 0	3.50 ± 0.58	5.00 ± 0.82	7.25 ± 0.96	15.75 ± 4.57	18 ± 3.56	26.25 ± 10.05
M2 ASP 2	4.50 ± 0.58	8.75 ± 0.96	13.25 ± 0.96	22 ± 2.71	33.25 ± 3.59	64.75 ± 22.40
M2 ASP 4	5.25 ± 1.26	7.75 ± 1.5	12.5 ± 2.38	22.5 ± 7.55	43 ± 12.88	97.50 ± 25.74
M2 ASP 6	4.25 ± 0.5	6 ± 0.82	11.5 ± 4.8	16 ± 7.39	20 ± 10.74	76.00 ± 39.76

Source: Primary data processed by researchers in 2023

Information: ASP0 = Treatment without rice husk charcoal fertilization, ASP2= Giving ASP 2 kg/Polybag, ASP4= Giving ASP 4 kg/Polybag, ASP6= Giving ASP 6 kg/Polybag.

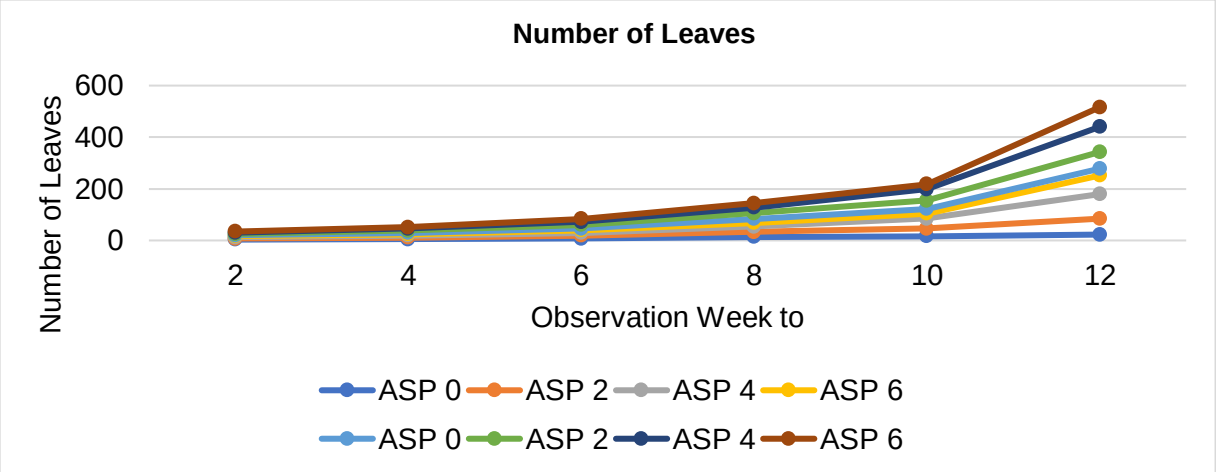

Figure 2. Graph of the effect of the combination of rice husk charcoal and planting media on the average number of leaves of white cayenne pepper plants at week 12 (n=4)

Number of Branches

Table 3 and Figure 3 show that the combination of rice husk charcoal and planting media has a different average number of branches for white cayenne pepper plants. At the 12th week of observation, the M2ASP4 treatment had the highest value compared to other treatments, namely22.25 ± 6.65twig. Meanwhile treatmentM1 ASP 0has the lowest value, namely4.75 ± 2.63. TwigData on the combination of rice husk charcoal and planting media on the number of chili plant branches obtained were statistically analyzed. Because the results of the Kolmogorov-Smirnov Test showed that the data on chili plant height values were normally distributed, the analysis was continued with the Two-way Analysis of Variance (ANOVA) test which had a significance degree (α) = 0.05.(Mahdiannoor 2011), states that the

function of Nitrogen for plants is generally necessary for the formation or growth of the vegetative parts of plants and plays an important role in the formation of chlorophyll to increase the photosynthesis process which in turn will increase plant growth such as stems, roots and leaves.

Table 3. Effect of giving rice husk charcoal on the number of branches of chili plants n=4

Treatment	Observations Week To					
	2	4	6	8	10	12
M1 ASP 0	1.50 ± 0.58	1.50 ± 0.58	1.50 ± 0.58	1.50 ± 0.58	1.50 ± 0.58	4.75 ± 2.63
M1 ASP 2	1.25 ± 0.50	1.50 ± 0.58	2 .00 ± 0.82	2.00 ± 0.82	3.50 ± 1.29	10.50 ± 2.38
M1 ASP 4	1.25 ± 0.50	1.50 ± 0.58	2.25 ± 0.50	2.50 ± 1.00	6.50 ± 2.38	18.50 ± 4.80
M1 ASP 6	1.50 ± 0.58	1.00 ± 0.00	1.25 ± 0.50	2.00 ± 0.82	2.75 ± 0.96	12.00 ± 8.04
M2 ASP 0	1.50 ± 0.58	1.75 ± 0.50	1.50 ± 0.58	1.50 ± 0.58	1.50 ± 0.58	6 .00 ± 2.83
M2 ASP 2	1.00 ± 0.00	1.75 ± 0.50	2.00 ± 0.00	2.00 ± 0.00	4.00 ± 0.82	13.25 ± 3.30
M2 ASP 4	1.25 ± 0.50	2.00 ± 0.00	2.00 ± 0.00	3.00 ± 2.00	7.75 ± 2.22	22.25 ± 6.65
M3 ASP 6	1.00 ± 0.00	1.00 ± 0.00	1.25 ± 0.50	2.00 ± 0.82	3.75 ± 2.06	15.75 ± 10.84

Source: Primary data processed by researchers in 2023

Information: ASP0 = Treatment without rice husk charcoal fertilization, ASP2= Giving ASP 2 kg/Polybag, ASP4= Giving ASP 4 kg/Polybag, ASP6= Giving ASP 6 kg/Polybag.

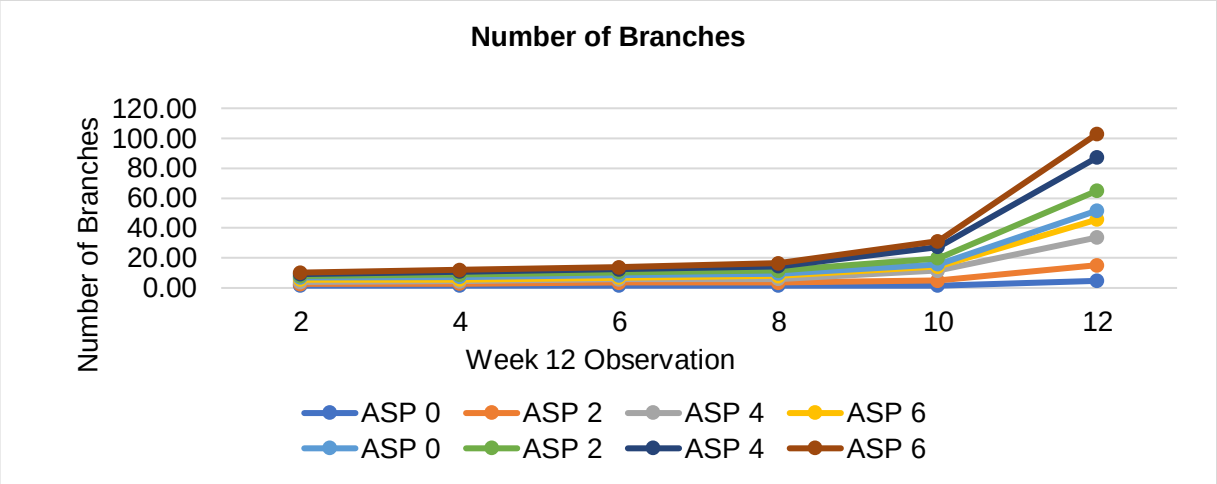

Figure 3. Graph of the effect of the combination of giving rice husk charcoal and planting media on the average number of branches of white cayenne pepper plants in the 12th week (n=4)

Number of Fruits

Table 4 and Figure 4 show that the combination of rice husk charcoal and planting media has a different average number of white cayenne pepper plants. At the 12th week of observation, the M2ASP4 treatment had the highest value compared to other treatments, namely15.25 ± 1.71fruit While treatmentM1 ASP 0has the lowest value, namely6 .00 ± 1.83. fruit. According to(Lutfi, 2017). If it is not accompanied by sufficient efficient potassium, nitrogen and phosphorus will be low and high production

indonesian.biodivers.j.
Vol. 5, No. 2. August 2024
ISSN :2722-2659

will not be possible. Data on the combination of rice husk charcoal and planting media on the number of chili plants obtained were statistically analyzed. Because the results of the Kolmogorov-Smirnov Test showed that the data on chili plant height values were normally distributed, the analysis was continued with the Two-way Analysis of Variance (ANOVA) test which had a significance degree (α) = 0.05.

Table 4. Effect of giving rice husk charcoal on the number of fruit on chili plants n=4

Treatment	Number of Fruits
M1 ASP 0	6 .00 ± 1.83
M1 ASP 2	8.75 ± 3.10
M1 ASP 4	10.75 ± 3.10
M1 ASP 6	12.75 ± 2.99
M2 ASP 0	8.50 ± 2.08
M2 ASP 2	10.25 ± 3.20
M2 ASP 4	15.25 ± 1.71
M2 ASP 6	14.50 ± 2.89

Source: Primary data processed by researchers in 2023

Information: ASP0 = Treatment without rice husk charcoal fertilization, ASP2= Giving ASP 2 kg/Polybag, ASP4= Giving ASP 4 kg/Polybag, ASP6= Giving ASP 6 kg/Polybag.

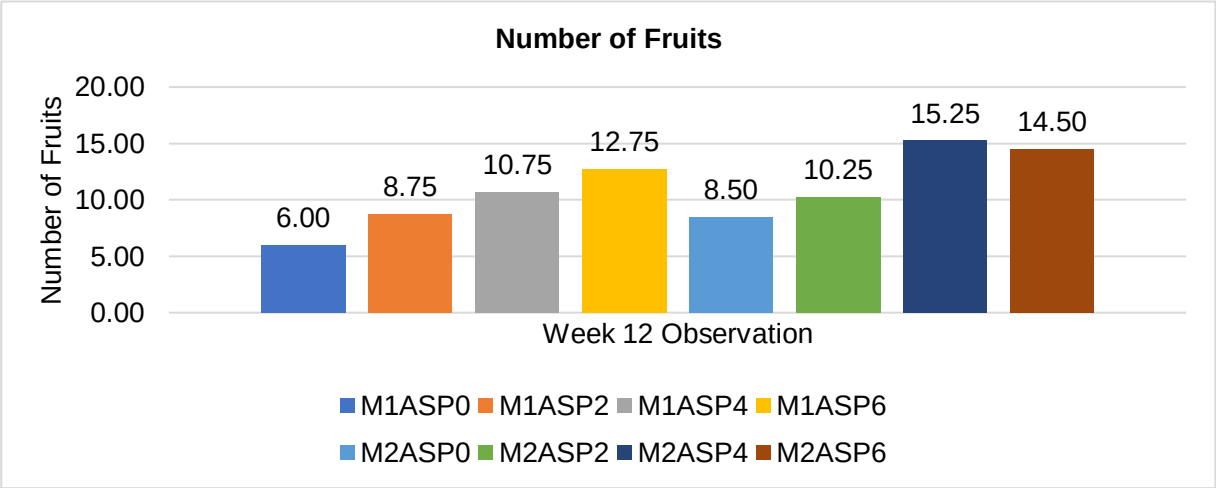

Figure 4. Diagram of the effect of the combination of rice husk charcoal and planting media on the average number of white cayenne pepper plants in the 12th week (n=4)

Fruit Weight

Table 5 and Figure 5 show that different types of rice husk charcoal have different average fruit weights for chili plants. At the 12th week of observation, the ASP3 treatment had as much fruit weight as8.28 ±1.88when compared with other treatments. Meanwhile, the lowest fruit weight was obtained in the ASP0 = treatment4.53 ± 1.37. Data on the effect of giving rice husk charcoal on the growth of fruit weight of white chili plants were obtained, and the data were analyzed statistically. Because the results of the Kolmogorov-Smirnov Test showed that the data on the fruit weight values of chili plants were normally distributed, the analysis was continued with the Two-way Analysis of Variance (ANOVA) test which had a significance degree (α) = 0.05. According toNasir and Amri 2022, After undergoing the burning process, rice husk charcoal contains compounds such as cellulose. Burnt husk has the advantage of being sterile and contains many light nutrients for mobilization. Rice husk ash is very rich in Si, which in its oxidation improves the soil and is also beneficial for fruit quality. (Nugroho, 2019

indonesian.biodivers.j.
Vol. 5, No. 2. August 2024
ISSN :2722-2659

Table 5. Effect of giving rice husk charcoal on fruit weight of white cayenne pepper plants n=4

Treatment	Fruit Weight
M1ASP0	4.53 ± 1.37
M1ASP2	6.7 ± 1.64
M1ASP4	8.28 ± 1.88
M1ASP6	4.53 ± 1.76
M2ASP0	4.63 ± 1.01
M2ASP2	6.38 ± 2.19
M2ASP4	7.63 ± 0.59
M2ASP6	3.63 ± 0.94

Source: Primary data processed by researchers in 2023

Information: ASP0 = Treatment without rice husk charcoal fertilization, ASP2= Giving ASP 2 kg/Polybag, ASP4= Giving ASP 4 kg/Polybag, ASP6= Giving ASP 6 kg/Polybag.

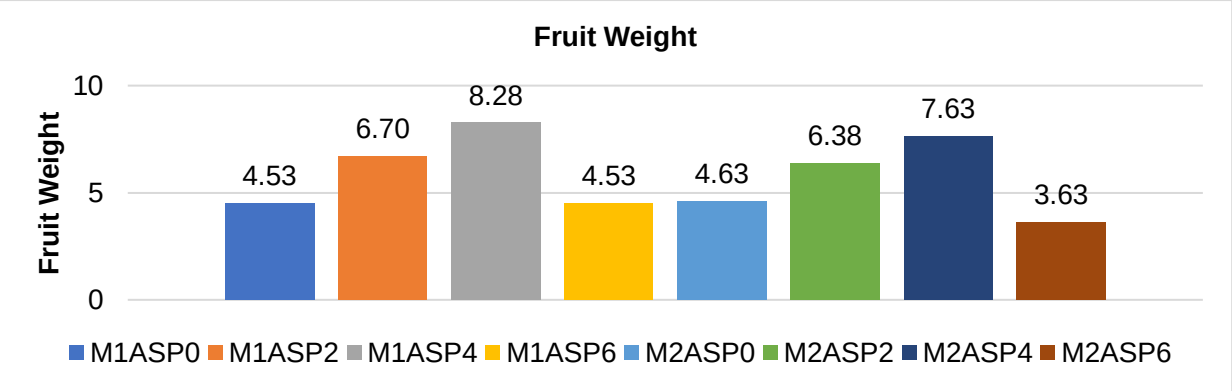

Figure 5. Diagram of the effect of giving rice husk charcoal on the average weight of chili fruit (twigs) in the 12th week (n=4)

From the results of the Two-way Analysis of Variance (ANOVA) test, the effect of giving rice husk charcoal on the number of fruit on chili plants obtained a probability value (p) = 0.002, where in this test the p value <α (0.05) so that H0 was rejected which means giving charcoal Rice husks have no effect on the fruit weight of white cayenne pepper plants. The effect of giving rice husk charcoal on the fruit weight of chili plants was analyzed using the Duncan test because the data variance was homogeneous. The results of the analysis showed that the ASP4 treatment and the ASP2 treatment were not significantly different.

CONCLUSION

Based on the results and discussion, the researcher concluded that there was an effect of spreading rice husk charcoal and planting media on the growth and production of white cayenne pepper plants (*Capsicum frutescens* L). It was discovered that at the 12th week of observation, the M2ASP2 treatment had the highest value when compared to other treatments that is 124.65 ± 31.73 cm. Meanwhile treatmentM1 ASP 0has the lowest value, namely79.23 ± 21.9cm.

REFERENCEz

Lolomsait, Yuven. 2016.The Effect of Rice Husk Charcoal Dosage and Frequency of Spraying Liquid Organic Fertilizer on the Growth and Yield of Red Chili Plants (*Capsicum annum* L.). Sandalwood Savanna 1 (04): 125–27. https://Doi.Org/10.32938/Sc.V1i04.74.

Mahdiannoor. 2011. Growth and Yield Response of Large Chili Plants (*Capsicum annum* L.) to the

indonesian.biodivers.j.
Vol. 5, No. 2. August 2024
ISSN :2722-2659

Application of Rice Husk Charcoal and Doses of Duck Manure in Lebak Swamp Land. Agroscientiae. Vol. 18(3): 164–171.

Martanto. 2001. The Effect of Husk Ash on Plant Growth and the Intensity of Fusarium Wilt Disease on Tomatoes. Irian Jaya Agro Journal. Vol.8(1): 37- 40.

Muliawan, Wawan, 2020. Noble, Wawan. 2020. The Effect of Adding Rice Husk Charcoal on the Growth of Cayenne Pepper (*Capsicum frutescens* L.) in the Biology Education Garden at Hamzanwadi University in 2020. *Cocosbia 5(2*): 18–24.

Nasir, Yusrianto, And Amri. 2022. The Effect of a Combination of Organic Planting Media on the Growth of Cayenne Pepper (*Capsicum frutescens* L.). Biomes: Journal of Biology and Its Learning Vol. 4(1): 1–12.

Noble, Wawan. 2020. The Effect of Adding Rice Husk Charcoal on the Growth of Cayenne Pepper (*Capsicum frutescens* L.) in the Biology Education Garden at Hamzanwadi University in 2020. Cocosbia 5(2): 18–24.

Setiawan, F. 2021 Hidden Contents and Benefits of Husk Charcoal.https://dpp.bangkaselatankab.go.id/post/detail/964-kandungan-and-the-hidden-benefits-of-charcoal-husk

Syukur, M., Rahmi, Y. and Rahmansyah, D. 2012. Successful Chili Harvesting Every Day. Jakarta: Self-Help Spreader

Taufik, M. 2011. Analysis of Farming Income and Postharvest Handling of Red Chili. Makassar. *Journal of Agricultural Research and Development Vol.30(2):* 66-72.

Zahanis. 2019. Effeck of Rice Hush Charcoal Dosage on the Growth and Yield of Cayenne Pepper Varietiest (*Capsicum frutescens* L). Embrio Journal, No. 11: 11-23.