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The Effect of the Biochar Aand Chicken Manure Combination in Growth Media on the Growth and Yield of Green Paprika (Capsicum Annuum Var. Grossum L.)

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Abstract

Paprika (Capsicum annuum Var. Grossum L.) has great potential to be developed in Indonesia, considering the high demand for the commodity. However, the yield of paprika is still low, which is caused by inappropriate cultivation practices. In the green house cultivation system, the growth media is widely used. The growth and yield of paprika in this system is largely determined by the physical, chemical and biological characteristics of the selected growth medium. Therefore, engineering the composition of the most suitable growing media for the peppers plant can be selected as an option to increase paprika production. The purpose of this study was to determine the effect of the proportion of the combination of chicken manure and rice husk biochar in the growing media on the growth and yield of green peppers. This study was conducted from December 2022 to March 2023 in Pasir Langu Village, Ngamprah District, West Bandung Regency, West Java Province, at elevation 1400 m above sea level. The study was conducted using a randomized block design (RBD), which consisted of 8 treatments and grouped into 4 blocks. The treatments are the proportions of combinations (chicken manure : husk biochar) as follows: P1 (8:2), P2 (7:3), P3 (6:4), P4 (1:1), P5 (4:6), P6 (3:7), P7 (2:8), and P0 as control (soil growth medium). The results of this study indicate that the growths media from combinations of chicken manure and husk biochar has a significant effect on increasing the growth and yield of green pepper plants. The combination of chicken manure and rice husk biochar in a balanced proportion (1:1) was best in increased the yield of green peppers per plant by up to 150% compared to soil growing media.

Keywords

Capsicum annuum Var. Grossum L., Combination Proportions, Growing Media, Husk Charcoal, Chicken Manure.

A. Introduction

Paprika (*Capsicum annum* Var. Grossum L.) is a vegetable plant that relatively new known in Indonesia. According to Cahyono and Bambang (2018) paprika has great potential to be developed in Indonesia, given the high public interest in consuming paprika. In 2019 the development of paprika consumption in Indonesia reached 4.35 kg/capita, or increase of 3.17% from the previous year. Beside for consumption by the public society, the demand for paprika for hotels and supermarkets is also high, each star hotel requires an average of approximately 15 kg day^{-1}, and the supermarkets demand approximately 5 kg day^{-1} respectivelly. Domestic demand averages 105 kg week^{-1} (Handayani, 2020), and export demand averages 100 tons week^{-1}. Meanwhile, farmers' production in Indonesia is only able to meet 26 tons week^{-1}, so that the high demand for paprika cannot be fully met by national production. Beside not being able to meet domestic and export market demand, national paprika production is also unstable, even declining from 2019 to 2021 as shown in Table 1 (BPS, 2021).

Table 1. Harvested Area, Production and Productivity of Paprika 2017-2021

Years	Harvested Area (Ha)	Production (Tons)	Productivity (Ku Ha^{-1})
2017	103	4.650	232,83
2018	221	7.953	359,84
2019	231	8.789	380,46
2020	346	7.635	220,67
2021	133	2.019	151,8

Source: Badan Pusat Statistik (2021)

Factors causing the decline in national paprika production besides the reduced harvested area, there has also been a decrease in the yield. According to Fatimah's study (2018) the productivity level of paprika in Indonesia has not yet reached its yield potential because there are several limiting factors that cannot be solved effectively, one of which is the level of soil fertility or growing media that is not optimal. In their farming practice, some farmers planting peppers in field, and some others planting them in green houses. The growing medium is one of the most widely used materials for planting in green houses. To ensure good plant growth and yields, adequate understanding of the composition, function and intended use of the growth medium is required. One of the causes of the decrease in paprika productivity is the use of planting media that is not suitable for the growth needs of paprika plants.

A good grwing medium must function in retention and providing water and nutrients for plants, as a zone for gas exchange for plant root systems, and at the same time as an anchor for plant roots (Bloodnick, 2022). The physical characteristics of the growing medium are determined by the components of the substrate used and the proportions of the each substrate in a mixture. There are various substrates that can be used as components of the growing medium, both organic and inorganic. Organic substrates include: coconut coir, peat, sawdust, rice husk, rice husk biochar, bark, manure etc. Inorganic substrates include: pumice, sand, hydrogel, perlite, etc. There are types of substrates that retain water on their surface, while others retain water on the surface and within their structure, and there are those that retain water only slightly. Certain types of substrates vary in their water-holding capacity and physical structure, depending on the material they come from and how they are processed (Bloodnick, 2022). Recognizing the physical characteristics of the growing medium is important, especially the bulk density (BD), water holding capacity, and air porosity. Chemical characteristics that are important as a measure of the planting medium are its reaction (pH) and electrical conductivity (EC).

Pepper plants require growing media conditions that are well drained, but still moist, which contain lots of organic matter and are rich in nutrients, in full sun (at least 8 hours day^{-1}). Pepper plants also need warm soil temperatures (around 27^{o}C) for germination, average daytime temperatures of 21-27^{o}C, and nighttime temperatures not lower than 16^{o}C (Balogh, 2022). According to Shaikh (2022) pepper plants like clay soil with a high water holding capacity. In sandy soil, under severe drought stress, peppers cannot grow. Therefore, to ensure good growth, it is necessary to mix some organic materials into the growing media, such as compost, manure, biochar (char produced by pyrolysis process), and other organic materials. Each type of organic matter has its own characteristics that are different from other types of organic matter. Which type of organic material is suitable to be used as a compositional component in pepper growing media is not known with certainty. Although so far it has been recognized that the synergistic effect of a combination of biochar and compost as a very promising and efficient soil improvement method (Qian et al. 2023). Qian et al. (2023) also reported that in general the biochar–compost mix reduced the rate of mineralization of soil organic matter, reduced phosphorus deficiency and aluminum toxicity, and significantly increased crop yields in most tropical soils. Combining biochar and compost tends to perform better than biochar alone or compost alone in soils contaminated with heavy metals or organic pollutants.

Song and Zhung (2023) reported that various proportions of the combination of biochar and cow manure not only increased soil bulk density, increased water holding capacity, pH, electrical conductivity, available phosphorus, available potassium from green waste compost substrates, but also increased chlorophyll-a content, chlorophyll-b, total chlorophyll, total fresh weight and total dry weight of *Centaurea cyanus*.

Physically the application of biochar can affect soil structure, soil hydraulic properties, and the subsequent consequences affect soil hydrological processes. The high porosity and specific surface area of biochar were identified as being responsible for the varying effects of biochar on soil porosity (Hardie et al. 2014). Liu et al. (2022) reported that soil water repellency increased with increasing doses of biochar application. While Gray et al (2014) suggested that the absorption of water by biochar is influenced by the effects of porosity and hydrophobicity. Obia et al (2016) reported that applying biochar increased the stability of soil aggregates by 7-9% in soil planted with corn and 17-20% in soil planted with soybeans, after being planted with 2 growing seasons. Total porosity and available water holding capacity increased 3% for every percent addition of biochar to both plants. Meanwhile, the soil bulk density (BD) decreased by 3-5% for each percent addition of biochar. The decrease in soil BD occurs because biochar causes soil aggregation which can help root growth and with more available water, can increase plant growth and yield. Organic amendments such as biochar and compost have been demonstrated to improve crop productivity. Zulfiqar et al. (2021) also reported that the application of biochar and biochar + compost significantly increased in the net photosynthetic rate of plants by more than 28%, chlorophyll a and b content of 92% and 78%, respectively, and carboxylation efficiency of 50% compared to those grown on loamy sand soil without the addition of organic matter. Furthermore, organic amendments significantly reduced plant oxidative stress. The conclusion is the application of biochar and/or compost is an efficient and sustainable method to improve metabolite content and reduce oxidative stress in *Alpinia zerumbet* (Zingiberaceae) plants.

Rice husk charcoal is a type of biochar that is widely available in Indonesian farmers society. Rice husk biochar is a pyrolysis product from rice husk at relatively low temperatures. Rice husk biochar is rich in carbon which is resistant to weathering, so it has the potential to retain soil organic matter content for a longer period. Chicken manure, which is waste generated from both laying and broiler farms, and has great potential to be used as organic fertilizer (Saragih, 2019), can also be used as an option in the composition component of pepper growing media.

A study by Syahid et al. (2018) showed that the application of chicken manure at a dose of 20 ton ha^{-1} and rice husk charcoal at a dose of 10 ton ha^{-1} could help grow in height and the highest number of leaves and highest yield of the large chili plants. Satriyo and Aini (2018) also reported that the combination of chicken manure and husk biochar helps the growth and production of cayenne pepper plants. Giving a combination of chicken manure and husk biochar can increase the quality and quantity of cayenne pepper plants. Treatment of 50% chicken manure + 50% husk biochar yielded the highest number of pods.

The results of Adelina's research (2019) showed that the application of rice husk biochar and chicken manure at a dose of 500 g plant^{-1} of rice husk biochar and 500 g plant^{-1} of chicken manure were able to increase growth and yields of fresh weight harvested large chilies with an average 520,67 g plant^{-1}.

The results of previous research show the benefits of applying biochar and manure to various plants, either alone or in combination, which generally improve plant growth and yield. However, the use of rice husk biochar and chicken manure as a substrate component of the composition of the growing media for paprika plants is not known with certainty. This study was conducted to determine the effective proportion between manure and husk biochar in the composition of growing media for paprika plant that grown in green houses, as an effort to increase the growth and yield of the paprika plants. The purpose of this study was to determine the effect of the proportion of the combination (mixture) of chicken manure and rice husk biochar in the planting medium on the growth and yield of paprika plants in green house planting system.

B. Material and Methods

Site and Time Experiment

This experiment was conducted in a green house located in Pasir Langu Village, Ngamprah District, West Bandung Regency, West Java Province. The site area is at elevation of 1400 m above sea level, with temperatures ranging 14-26°C, average rainfall of 2050 mm year^{-1}, and the soil type is Andisol. The experiment was conducted from December 2022 to March 2023.

Experiment Tools and Materials

The tools used in this experiment were polybags 30x30 cm size, electrical weigher, nylon rope, roll meter, cord of wire, hoe, knapsack sprayers, labels, note-taking tools and cameras. The materials used were chicken manure, rice husk biochar, NPK (15-15-15) chemical fertilizer and the seeds of the cardinal star paprika variety.

Research Method

This study was conducted using an experimental method using a non-factorial Randomized Block Design (RBD) (Gaspersz, 2006), which consisted of 8 treatments and 4 block replications, so there were 32 experimental unit plots, and in each plot there were 10 plants. The treatments concluded of the seven different proportion mixtures of chicken manure and husk biochar in the growing media and a control treatment (P0, soil only). The seven treatments namely: P1 (8:2), P2 (7:3), P4 (6:4), P5 (4:6), P6 (3:7), and P7 (2:8).

Analisis Data

The linear model of the Randomized Block Design (RBD) according to Gasperz (2006) is as follows:

$X_{ij} = \mu + t_i + \beta_j + €_{ij}$

Observational data were analyzed using one-way ANOVA using the SPSS application. If the ANOVA detects a difference in the effect of the treatment, a further test is carried out by comparing between the average values of the observed variables using Duncan's Multiple Range Test (DMRT) to identify which treatment is significantly different.

Experimental Implementation

Seed Preparation

At this stage, the selection of paprika seeds is carried out to remove bad seeds. Selection is done by soaking the seeds in warm water. The good seeds are the seeds that sink. The floating seeds are discarded. The good seeds are then sown on the seedling tray.

Growing Media Preparation

The growing medium was prepared according to the treatment. The P0 treatment was made by placing soil taken from the top soil layer which had been crushed and mixed thoroughly into a 30x30 cm poly bag until it was filled with 80% of its maximum filling capacity. While the P1-P7 treatments, which consisted of a mixture of chicken manure and rice husk biochar was made according to its proportion (volume-based) combination of the treatment, and then filled into polybag so that the total volume was equivalent to 80% of its maximum filling capacity of the polybag. Before being put into polybags, the substrate mixture is mixed thoroughly first. After all the growing media treatments were prepared, as many as 32 experimental unit plots and each plot has 10 plants, the polybags were then arranged according to the non-factorial RAK layout, with a spacing of 25x50 cm in the plots.

Seedling Transplanting

Green pepper plant seedlings are planted by inserting healthy plant seedlings into the hole made in the middle of the growing medium in a polybag with a depth of ± 4 cm, then closing the hole with its planting medium and slightly compressing it to ensure contact between the roots of the seedlings with growing medium materials. Each polybag is planted with 1 paprika plant seedling. After transplanting is complete, the growing media are doused with sufficient water, so that the growing media are ensured to be moist and well aerated.

Fertilization

To meet the nutritional needs of paprika plants, they were given NPK (15-15-15) compound booster fertilizer with a total dose of 25 g plant^{-1}, applied 2 times, namely 10 g plant^{-1} at 2 weeks after planting (WAP) and at 6 WAP 15 g plant^{-1}.

Maintenance of Plants

Plant maintenance includes replanting, weed control, watering, installation of support ropes, twisting, selection of branches and pruning.

Stitching is done when there are plants that do not grow well or die to maintain a uniform plant population in all plots. Stitching is done by replacing damaged or dead plants with healthy seedlings and the same age as the plants being replaced. Stitching is done at the age of 3-7 days after planting (DAP).
Weed control is done manually, namely by removing weeds that grow inside polybags or outside polybags.

Watering the pepper plants is done every morning or evening so that the growing media conditions remain moist. Watering is done manually using an manual watering tool (emrat).

The installation of the paprika plant support rope is carried out at the age of 7-14 DAP using a small rope by tying it to a wire that is stretched above the ceiling of the green house parallel to the row of plants, and the lower end of the rope is tied to a small bamboo stake that is stuck on the bottom side polybags.

The tying of the stems is done so that the plants can stand upright following the support ropes, and are able to support the fruit. The trick is to tie the plant stems to the rope at a certain distance. Paprika plants cultivated in green houses are indeterminate (do not stop growing in height) so that the longer they grow, the taller they will be. Therefore tying the stems is done every 3 days and starts when the plants are 30-50 DAP.

Branch selection and pruning are intended to remove shoot buds or prune unwanted branches, and let the desired branches develop to produce maximum fruit. Selection of branches and pruning is done by considering the conditions of the available growing space, so that the contact between adjacent plant branches is reduced in such a way. This activity is carried out since the pepper plants are 2-3 weeks after planting (WAP).

Harvest

Peppers in this study were harvested as green peppers. Fruit that is ready to be harvested is characterized by a really solid shape, hard and thick flesh, shiny green skin color, and easy cutting of the fruit stalk. Harvesting is done by cutting the fruit stalks using garden shears, and is done carefully so that the fruit stalks are not deformed and do not cause a decrease in the quality and selling price of the fruit. Harvesting is done in the morning when the air temperature in the greenhouse is still low and the humidity is quite high. Harvesting is done several times according to the presence of fruit ready to be harvested. Each harvested fruit is counted and weighed.

Observational Variables

Variables observed in this study included: plant height and number of leaves at 15, 30, 45, and 60 DAP; number and weight of fruit yield per plant.

C. Results and Discussion

Pepper Plant Height

The effect of different proportions of the combination of chicken manure and rice husk biochar in the growing media significantly increased plant height growth at 15, 30, 45 and 60 DAP (Table 2). Plant height in all growing media consisting of a combination of chicken manure and rice husk biochar were significantly higher than the control (P0, soil growing medium). This indicated that the growing media which is physically more porous is more suitable for pepper plants than the poor porosity one.

Table 2. Mean Height of Pepper Plants (Capsicum annuum L. Var. Grossum).

Treatment		Mean Height of Pepper Plants (cm)		
	15 DAP	**30 DAP**	**45 DAP**	**60 DAP**
P0	11,98d	47,15g	67,83f	87,80f
P1	19,53a	64,53b	97,25b	107,93b
P2	18,55b	59,75e	92,10e	101,35e
P3	18,75b	63,63c	96,48b	107,73b
P4	19,85a	66,15a	99,15a	111,93a
P5	17,98c	61,55d	94,48c	105,38c
P6	18,10c	59,23f	92,95d	103,80d
P7	19,45a	64,20b	97,35b	107,88b

Explanation:

- Means followed by the same letter in the same column are not significantly different according to Duncan's Multiple Range test at the 5% level.
- Combination treatment (Chicken manure : husk biochar): P1 (8:2), P2 (7:3), P3 (6:4), P4 (1:1), P5 (4:6), P6 (3 :7), P7 (2:8), and P0 control (soil only).
- DAP = Days After Planting

The means plant height in Table 2 shows that the highest plant height was consistently achieved by treatment P4 (a combination of chicken manure and rice husk biochar in equal proportions, 1:1), and was significantly different from the other treatments, except at 15 DAP it was not different significantly from P1 (8:1) and P7 (2:8), where the plants were still in the early growth stage. This indicates that the combination of chicken manure and husk biochar in balanced proportions is the most effective in providing moisture, aeration and nutrition for pepper plants. In this treatment of growing media, the distribution of macro and micro pores is in optimal proportions, so that this media is able to hold water available in sufficient quantities and without reducing aeration or oxygen supply for the growth of plant roots. While the combination treatment with unbalanced proportions, both the dominant manure and the dominant husk biochar, each had its drawbacks. In the dominant form of manure, it is possible that the porosity is slightly less, so that the oxygen supply for plant roots is less than optimal. Meanwhile, in the growing media where husk biochar is dominant, there is a possibility of excessive porosity, so that the ability of the media to hold available water is lower than what the plants need.

The total organic matter content (by volume) in all treatments was the same, except for treatment P0 (control). The control treatment which consisted only of soil, without being given organic amendment, had a much higher bulk density (BD), and the total porosity was much lower than the other treatments which consisted of a combination of chicken manure and husk biochar, so that the drainage and aeration were bad. In addition, the physical condition of the soil becomes denser which makes it more difficult for plant roots to penetrate. Likewise chemically, the P0 treatment will have a lower nutrient holding capacity, so that the nutrients are more easily leached out, especially nitrogen (N) and potassium (K), so that the plant's need for these two nutrients is insufficient. In accordance with the statement of Nabilah et al., (2018) that sufficient nitrogen content in plants will support the growth of plant height and stem diameter, but if the availability is low it can cause stunted plants.

The effect of different proportions of the combination of manure and husk biochar on the growth of plant height varies. At 15 and 30 DAP, the plant height at P1 (8:2) was not significantly different from that at P7 (2:8), but at P2 (7:3) and P3 (6:4) they were significantly higher than at P6 (3:4) and P5 (4:6). At 45 DAP, plant height at P1 (8:2) was not significantly different from P7 (2:8). While the plant height at P2 (7:3) was significantly lower than at P6 (3:7), but at P3 (6:4) it was significantly higher than at P5 (4:6). At 60 DAP, plant height at P1 (8:2) was not significantly different from P7 (2:8), whereas at P2 (7:3) it was significantly lower than at P6 (3:7), on the contrary at P3 (6: 4) significantly higher than P5 (4:6). Overall, there was an indication of a tendency that the growing media with a more dominant proportion of chicken manure than rice husk biochar had a better effect on plant height growth. This difference is thought to be due to the nutrient content in the chicken manure being higher than the husk biochar, so it can provide more nutrients for plants.

Number of Leaves per Plant

The number of plant leaves in all treatments of growth media composed of a combination of chicken manure and husk biochar (treatments P1 to P7) was significantly more than that of P0 (control) (Table 3), at 15, 30, 45, and 60 DAP. This fact reinforces the belief that using a growing medium from a combination of chicken manure and rice husk biochar is important as a method for increasing pepper yields.

At 15, 30, and 45 DAP the number of leaves in treatment P4 (a combination of chicken manure and rice husk biochar in a balanced proportion, 1:1) was consistently significantly higher than the other treatments (Table 3). This fact indicates that a balanced proportion of the combination of chicken manure and rice husk biochar in the growing media is better than other growing media treatments. Whereas at 60 DAP, the number of leaves in P4 was the most, but not significantly different from treatment P1 (8:2). This difference in response is probably due to changes in the nature of the plants, where at 60 DAP the plants have reached the generative phase, and the rate of vegetative growth, including leaf formation has slowed down, making it less responsive to differences in growing media conditions.

Tabel 3. Average Number of Plant Leaves of Pepper Plants (Capsicum annuum Var. Grossum L).

Treatment	Average Number of Plant Leaves			
	15 DAP	**30 DAP**	**15 DAP**	**30 DAP**
P0	7,60d	13,73e	22,90f	31,65e
P1	14,45b	23,10b	32,50c	48,00a
P2	13,63b	21,10c	30,43e	44,13c
P3	13,63bc	22,73b	32,30c	47,13b
P4	15,50a	24,68a	33,95a	48,45a
P5	13,03c	21,20c	31,55d	44,13c
P6	13,03c	20,10d	30,38e	43,10d
P7	14,05b	23,00b	33,40b	47,28b

Explanation:

- Means followed by the same letter in the same column are not significantly different according to Duncan's Multiple Range test at the 5% level.
- Combination treatment (Chicken manure : husk biochar): P1 (8:2), P2 (7:3), P3 (6:4), P4 (1:1), P5 (4:6), P6 (3 :7), P7 (2:8), and P0 control (soil only).
- DAP = Days After Planting

Similar to the response of plant height growth, the response of the number of leaves to the different proportions of the combination of chicken manure and rice husk biochar also varied. At 15 DAP, the number of leaves in P1 (8:2) was not significantly different from P7 (2:8), likewise in P3 (6:4) it was not significantly different from P5 (4:6), but in P2 (7:4: 3) significantly higher than P6 (3:7). At 30 DAP, the number of leaves in P1 (8:2) was not significantly different from P7 (2:8), whereas in P2 (7:3) and

P3 (6:4) there were significantly more than P6 (3:7) and P5 (4:6). At 45 DAP, the number of leaves at P7 (2:8) and P5 (4:6) was significantly more than at P1 (8:2) and P3 (6:4), while at P2 (7:3) it was not significantly different with P6 (3:7). At 60 DAP, the number of leaves at P1 (8:2), P2 (7:3), and P3 (6:4) was significantly more than P7 (2:8), P6 (3:7), and P5 (4:6). So overall, similar to the effect on plant height, the number of leaves in the growing medium with the proportion of chicken manure combination being more dominant than husk biochar tends to be more than the growing medium where husk biochar is more dominant than chicken manure. This is because chicken manure can supply more nutrients than husk biochar.

Plants that have a greater number of leaves and leaf area will produce more photosynthates because they contain more total chlorophyll (Garfansa et al., 2017). Therefore, the P4 treatment (1:1) which is able to produce the highest number of leaves is also very likely also can give the most results. It is also in accordance with the study of Nazirah et al (2021), which states that the number of leaves is related to the process of photosynthesis, the more the number of leaves, the more light the plant gets, the thicker and greener the leaves, the more photosynthetic is produced. Hidayat et al (2018) stated that nitrogen is available to plants in sufficient quantities can expedite plant metabolism so that stem growth is higher and affects the number of leaves.

Fruit Yield Weight per Plant

Differences in the composition of the growing media have a significant effect on the yield weight of peppers per plant (Table 4). All treatments of growing media consisting of a combination of chicken manure and husk charcoal (P1 to P7) produced significantly more green peppers compared to the control treatment (P0, consisting only of soil). This fact further strengthens the evidence that soil growing media alone, without the addition of organic fertilizer is not suitable for the growth of pepper plants. In line with its effect on growth variables, the highest fruit yield per plant was also achieved by treatment P4 (balanced combination of chicken manure and husk charcoal, 1:1) and significantly different from other treatments. The yield of green peppers in the P4 treatment reached 1.05 kg plant^{-1}, or 150% higher than the control treatment (0,42 kg plant^{-1}).

Table 4. Average Yield Weight of Paprika Fruit per Plant

Treatment	Yield Weight paprika fruit (kg plant^{-1})
P0 Control (growing media)	0,42d
P1 chicken manure: husk biochar (8:2)	0,85b
P2 chicken manure: husk biochar (7:3)	0,68c
P3 chicken manure: husk biochar (6:4)	0,80b
P4 chicken manure: husk biochar (1:1)	1,04a
P5 chicken manure: husk biochar (4:6)	0,84b
P6 chicken manure: husk biochar (3:7)	0,78b
P7 chicken manure: husk biocha (2:8)	0,81b

Explanation:

Numbers followed by the same letter in the same column were not significantly different according to Duncan's multiple combination test at the 5% level.

The fact that the proportions of the combination of chicken manure and rice husk biochar in balanced (P4, 1:1) gave the best effect. This can be explained by the findings reported by Song and Zhung (2023), in which various combination proportions of biochar and cow manure had an effect on increasing soil density, increasing the water holding capacity, pH, electrical conductivity, available phosphorus, available potassium from the green waste compost substrate, so that it also has the effect of increasing the content of chlorophyll-a, chlorophyll-b, and total chlorophyll. With the increase in the content of chlorophyll-a, chlorophyll-b, and chlorophyll-total, it then affects the increase in photosynthate products, so that plant growth becomes better and peppers have thicker flesh, stronger skin and quality. This influence is also in line with the results of Zulfiqar et al. (2021) that the application of biochar and biochar + compost significantly increased the net photosynthetisc rate of plants by more than 28%, increased the content of chlorophyll a and b respectively 92% and 78%, and carboxylation efficiency of 50% compared to those grown on sandy loam soils without adding organic matter.

In contrast, the growing media in the control treatment (P0, soil only) had physical characteristics that were not suitable for the growth of pepper plants, which were characterized by higher bulk density (BD), low air porosity, poor drainage, capacity to store and provide water and nutrients low, resulting in stunted root growth.

The effect of differences in the proportions of the combination of chicken manure and rice husk biochar was significant on the yield weight of green peppers per plant, where the fruit weight at P4 (1:1) was significantly higher than that of the other treatments. Fruit weight at P6 (7:3) was significantly higher than at P2 (7:3). While the fruit weight at P1 (8:2) and P3 (6:4) was not significantly different compared to P 6 (3:7) and P5 (4:6). It appears that there is a tendency for differences in response between the growth variables (plant height and number of leaves) and crop yields for differences in the proportions of combinations of chicken manure and husk biochar.

Number Of Fruits Of The Plant

The effect of the proportion of the combination of chicken manure and husk charcoal significantly increased the number of green peppers compared to the control (P0) (Table 5). The number of fruit in all combination treatments of chicken manure and husk charcoal was significantly higher than without the addition of organic fertilizer/amendment (P0). The highest average number of fruits was achieved in treatment P4 (1:1), namely 4.18 plants-1, or 90% more than P0, but not significantly different from P1 (8:2) and P5 (4: 6).

Tabel 5. Average Number of Fruits per Plant

Treatment	Average Number of Fruits Plant^{-1}
P0 control (growing media)	2,20e
P1 chicken manure: husk biochar (8:2)	4,25ab
P2 chicken manure: husk biochar (7:3)	3,70d
P3 chicken manure: husk biochar (6:4)	3,85cd
P4 chicken manure: husk biochar (1:1)	4,18a
P5 chicken manure: husk biochar (4:6)	3,98abc
P6 chicken manure: husk biochar (3:7)	3,88bcd
P7 chicken manure: husk biochar (2:8)	3,93bc

Explanation:

Numbers followed by the same letter in the same column were not significantly different according to Duncan's multiple *combination test at the 5% level.*

A greater number of fruit, but not accompanied by a higher fruit weight indicates that the fruit size or density is relatively lower, which means the quality of the fruit yield is less than optimal. Thus, even though the number of fruits in P4 was not significantly different from P1 (8:2), P5 (4:6), and P7 (2:8), the quality of P4 (1:1) was still better.

The difference in the proportions of the combination of chicken manure and husk biochar had a significant effect on the number of green peppers per plant. The number of fruits per plant in treatment P4 (1:1) was significantly higher than P2 (7:3), P4 (6:4), P6 (3:7), and P7 (2:8). There was no clear trend as to whether the growing media that dominant chicken manure proportion better than the dominant husk biochar one in affected on paprika fruit yield. What is clear is that P4 (1:1), which has balanced proportions, is the best in its effect on paprika fruit yield.

D. Conclusions and Suggestion

Conclusions

From the results of this study it can be concluded that application of the difference proportions of the combination of chicken manure and husk biochar significantly increased the growth and yield of green pepper plants in the green house planting system. The balanced proportions of chicken manure and rice husk biochar (1:1) gave the best effect on plant growth and were able to increase the weight and number of green peppers yield, up to 150% and 90% respectively compared to growth media of soil only without the added of organic amendment.

Suggestion

Growing media from a combination of manure and husk biochar in balanced proportions (1:1) can be used as an option to increase the yield of paprika (*Capsicum annuum* Var. Grossum L.) in green house cultivation systems.

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