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Physical And Chemical Properties Of Press Seeding Media With Various Organic Compositions

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Abstract

Basically, nurseries have problems in the form of high transportation costs, less number of workers and a higher percentage of damaged seedlings. It is necessary to develop technology for growing media for seedlings which easy to transport and inexpensive, so that transportation costs would be cheaper and could provide large quantities with a limited number of workers. BPDAS WSWS Lampung developed Press Seedling Media (MSC). MSC used to replace polybags in nurseries, the size was 2cm x 2cm and designed as a medium for seedlings as well as growing media, so there is no weaning activity. Which made MSC was very efficient, besides reducing the cost of transporting seeds to the field. However, scientific studies on the effectiveness of MSC have not been carried out, as well as studies on the composition of MSC, so this study aims to determine the physical and chemical properties of press seedling media with various compositions of organic matter as growth media for forestry plants. The physical properties studied included the hardness of the media, volume weight and chemical properties including the nutrient content of the press seedling media. The results showed that the hardness value average were 2 - 4 and a weight of the media average 1.50g/cm2 - 1.84g/cm. The soil chemical elements pH (5.55-7.73) N total (0.06-0 .15), P(2.17-39.28), K (0.76-1.62) and C organic (1.38-4.01).

Keywords Press Seedling Media, Rice Husk Charcoal, Rice Husk, Media

INTRODUCTION

This study demonstrates that financial literacy, perceived behavioral control, and intention play important roles in encouraging digital payment usage behavior. Financial literacy has a positive and significant effect on digital payment usage behavior but does not have a significant effect on intention. This finding indicates that an understanding of financial benefits, costs, security, and risks can be directly applied to decisions regarding digital payment usage without necessarily passing through the formation of intention (Ajzen, 1991; Mishra et al., 2024).

Subjective norms do not have a significant direct effect on digital payment usage behavior but have a positive and significant effect on intention. Meanwhile, perceived behavioral control has a positive and significant effect on both intention and digital payment usage behavior, indicating that individuals' abilities, skills, resources, and sense of control are important factors in digital payment adoption (Ashour et al., 2023; Niswah et al., 2019). Intention is also found to have a positive and significant effect on actual behavior, thereby reinforcing the Theory of Planned Behavior that intention represents a proximal determinant of behavior (Ajzen, 1991).

The mediation analysis shows that intention does not mediate the relationship between financial literacy and digital payment usage behavior but does mediate the relationships between subjective norms and perceived behavioral control and digital payment usage behavior. This finding confirms that the mediating function of intention is specific and does not apply uniformly to all factors shaping behavior (Tian et al., 2022). Overall, this study reinforces the relevance of the Theory of Planned Behavior in explaining digital payment usage while demonstrating that financial literacy, social influence, perceived behavioral control, and intention operate through different mechanisms in shaping actual usage behavior.

METHODS

The materials used in this study consisted of topsoil, rice husk charcoal, and rice husks. The equipment included a seedling media molding tool with a capacity of 50 units per molding process, a hoe, watering can, bucket, mixing tool, camera, and a pocket soil penetrometer for measuring media hardness. Media preparation began with collecting topsoil at a depth of 20 cm. The topsoil was then loosened and sieved to obtain a uniform media texture so that the media would remain compact without becoming excessively hardened or forming lumps. The topsoil was thoroughly mixed with organic materials according to the predetermined compositions. The prepared media were then placed into the molding tool and shaped. The resulting molded seedling media (MSC) were square-shaped with dimensions of 2 cm × 2 cm, as shown in Figure 1.

The MSC treatments consisted of five treatments: (P0) 100% soil, (P1) 25% soil + 75% rice husk, (P2) 50% soil + 50% rice husk, (P3) 25% soil + 75% rice husk charcoal, and (P4) 50% soil + 50% rice husk charcoal. Each sample consisted of 25 MSC units; therefore, a total of 625 MSC units were produced in this study. The observed parameters included soil hardness, which was measured using a pocket soil penetrometer; media weight, which was determined by weighing the MSC; and soil

color. The observation data were analyzed using ANOVA, followed by the Honest Significant Difference (HSD) post hoc test. The nutrient content of the MSC was also analyzed in the laboratory, including pH, total nitrogen (N), phosphorus (P), potassium (K), and organic carbon (C).

FINDINGS AND DISCUSSION

The results of the study showed that the hardness level of MSC had the highest value in MSC with a composition of 50% soil + 50% rice husk charcoal, while the lowest value was found in MSC mixed with a rice husk composition. In addition, the results of the study showed that the weight of MSC had the highest value in MSC with a composition of 50% soil + 50% rice husk charcoal and had the lowest value in the composition of 25% soil + 75% rice husk.

Table 1. Recapitulation of the Observation Results of Media Hardness, Weight, and Color of MSC

Treatment	Media Hardness (g/cm^2)	MSC Weight (g/cm^2)	Color
Soil (100%)	3.50 a	1.69 a	Red
25% soil + 75% rice husk	2.00 a	1.50 a	Brown
50% soil + 50% rice husk	2.00 a	1.74 a	Brown
25% soil + 75% rice husk charcoal	3.00 a	1.69 a	Brown
50% soil + 50% rice husk charcoal	4.25 b	1.84 a	Black
HSD 5%	4.03	1.96	

Note: Values followed by the same letter are not significantly different according to the Honest Significant Difference at the 5% level.

The firmness value was used to assess how firmly the media could maintain its shape (not disintegrate). The results of the soil hardness observations showed that the MSC treatment had the highest value at a hardness level of 4.25 g/cm^2, namely in the treatment of 50% soil + 50% rice husk charcoal (Table 1), indicating that the MSC media could maintain its shape (firm, not disintegrate), where a good hardness or firmness value ranges from 4–5 (Marlina et al., 2015). According to Oktafri et al. (2015), mixing organic materials into the media will produce media with an increasingly high pressure-resistance capacity, so that mixing organic materials will make the media not easily disintegrate when molded using a molding tool. MSC with a composition of 50% soil + 50% rice husk charcoal has the advantage of being very easy to shape and

lightweight and has high absorption capacity, so that rice husk charcoal when used as MSC will have high density or hardness.

The results of the study by Kusmarwiyah and Erni (2017) showed that the addition of rice husk charcoal to soil media will increase soil pores, thereby improving root respiration, increasing soil moisture, and encouraging the growth of microorganisms in the growing media. Sukaryorini and Arifin (2017) stated that mixing organic materials provides a better response to the structure and shape of the growing media. The structure and shape of the growing media that allows roots to move in all directions will be able to help achieve maximum growth in plants (Pratiwi, 2017). Sofyan et al. (2014) stated that the use of organic materials in the form of rice husks and rice husk charcoal is indeed a suitable alternative for plant growing media. According to Naibaho et al. (2015), good growing media will be able to provide the nutrients needed by plants to support root growth and plant growth. Hidayah and Irawan (2017) stated that good media are lightweight, inexpensive, easy to obtain, loose, and able to provide nutrients for plants. Several things that must be considered in utilizing organic materials are: (1) using organic materials mixed with soil at a certain ratio; (2) not using organic materials as growing media in an amount of 100%; (3) not using organic materials that are still fresh; (4) it is highly recommended to use organic materials that have decomposed; (5) naturally decomposed organic materials can be used directly; (6) using organic materials will be better if the materials are first made into compost (Indriyanto, 2013). Thus, it can be concluded that MSC media have a good level of hardness without inhibiting root growth with loose and soft physical properties.

Meanwhile, MSC weight ranged from 1.50–1.84 g/cm², so that MSC has not been able to provide optimal growth for growth, this can be seen from the relatively light weight of MSC due to the relatively small size of MSC, which is only 2 cm × 2 cm. Kosasih and Heryati (2015) stated that the size of the media must be in accordance with what is required by the plant, namely in the form of pore space so that it can absorb nutrients maximally. With a mixture of organic materials in the form of rice husks and rice husk charcoal, the media will become lighter, so that root growth will not be disturbed because mixing organic materials makes the MSC media lighter. With its relatively small size and weight, this becomes an advantage of MSC, namely the benefit in the process of procuring seedlings in large quantities and in terms of costs it will be cheaper, and the transportation system will also be easier. With the very small size and weight of MSC, it will help the transportation process compared to using polybags, thereby saving transportation costs and allowing a large number of seedlings to be transported.

According to Erizilina et al. (2018), one of the physical properties of soil used to describe soil characteristics is color. The darker the soil color, the more fertile the soil

is considered to be. For soil color in the lower layer, the organic matter content tends to be low due to the high content and form of iron (Fe) compounds. Meanwhile, soils with poor drainage systems will increase iron (Fe) compounds (Rahmi et al., 2014).

In general, the MSC produced had nutrient contents ranging from very low to low (Table 2).

Table 2. Results of the Analysis of Nutrient Content in MSC

Treatment	pH	Total N	P	K	Organic C
P0	6.09 (slightly acidic)	0.06 (very low)	2.17 (very low)	0.76 (high)	1.46 (low)
P1	5.84 (slightly acidic)	0.10 (low)	2.94 (very low)	1.13 (very high)	3.38 (high)
P2	5.55 (acidic)	0.07 (low)	10.7 (low)	1.62 (high)	1.79 (low)
P3	6.01 (slightly acidic)	0.15 (low)	16.39 (low)	1.25 (very high)	1.38 (low)
P4	7.73 (slightly alkaline)	0.13 (low)	39.28 (medium)	1.02 (very high)	4.01 (high)

Note: (P0): MSC in the form of soil (100%).

(P1): MSC with a composition of 25% Soil + 75% Rice Husk.

(P2): MSC with a composition of 50% Soil + 50% Rice Husk.

(P3): MSC with a composition of 25% Soil + 75% Rice Husk Charcoal.

(P4): MSC with a composition of 50% Soil + 50% Rice Husk Charcoal.

The classification of nutrient contents was based on Hardjowigeno (1995).

The C/N ratio is an indicator that shows the process of N mineralization and immobilization by microbial decomposers of organic materials. If the C/N value is below 20, it indicates N mineralization; a C/N value above 20 indicates N immobilization, while a C/N value between 20–30 indicates a balance between mineralization and immobilization. Thus, the C/N value of an organic material will affect the rate of availability of N and other nutrients (Bashri et al., 2014). In the use of organic materials, this needs to be considered if the C/N value is more than 20 because it triggers competition between plants and microorganisms to absorb the available

nutrients. Therefore, the use of organic materials containing high C/N will slow down nutrient availability (Hanafiah, 2007).

The results of the analysis of nutrient content in MSC showed that the N, K, and C contents produced higher percentages in MSC mixed with organic material in the form of rice husk charcoal compared to MSC without organic material. This may be because the burned rice husk had undergone a burning process, resulting in high C content and being easily decomposed; in addition, this process causes the media to have high absorption capacity so that it can absorb the nutrients available around it to be stored and utilized by plants (Agustin et al., 2014).

The pH value shows an indicator of soil fertility because it can describe the nutrient stock in the soil. This pH value greatly influences root growth; a pH between 5.0–8.0 will have a direct effect on root growth (Hanafiah, 2007) because this pH value is an ideal value for plant growth (Agustin et al., 2014).

Thus, it can be concluded that MSC is in accordance with its function, namely as a growing medium that has a high level of hardness so that it can maintain its shape (firm or not easily disintegrate) and has sufficient chemical properties to support plant growth, so that it can become a solution to problems in nurseries.

CONCLUSION

The results of this study indicate that the molded seedling media (MSC) has a good level of hardness and can maintain its shape without easily disintegrating, with the highest hardness value of 4.25 g/cm² found in the treatment consisting of 50% soil + 50% rice husk charcoal, while the MSC weight ranged from 1.50–1.84 g/cm². The addition of rice husk and rice husk charcoal also affected the physical and chemical properties of the MSC, particularly its nutrient content, with the treatment containing rice husk charcoal showing higher N, K, and organic C contents than MSC without organic material. The MSC had pH values ranging from 5.55 to 7.73 and nutrient contents ranging from very low to medium, depending on the treatment. Overall, MSC can function as a growing medium with sufficient physical and chemical properties to maintain its shape, support plant growth, facilitate seedling production and transportation, and provide a potential solution for nursery management.

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