Jurnal Agricultural Biosystem Engineering
https://jurnal.fp.unila.ac.id/index.php/ABE/index
ISSN 2830-4403
Received: February 21, 2024
Accepted: March 3, 2024
Vol. 3, No. 1, March 18, 2024: 70-76
DOI: http://dx.doi.org/10.23960/jabe.v3i1.8869

The Effect of Planting Media Composition and Liquid Fertilizer Dosage on Sand Media on The Growth of Mustard Plants (Brassica juncea L.*)*

Basri Wahyu Utomo[1], Ridwan[1], Elhamida Rezkia Amien[1*], Sandi Asmara[1], M. Amin[1]

[1] Jurusan Teknik Pertanian, Fakultas Pertanian, Universitas Lampung

**Corresponding Author:* elhamida.rezkiaamien90@fp.unila.ac.id

Abstract. *The aim of this study is to analyze the potential of sand as a planting medium with the addition of cocopeat, obtain the dose of liquid organic fertilizer for sand media, and find the suitable combination of cocopeat for sand media. The method used is a Complete Randomized Design (CRD) Factorial with 2 factors. The first factor is the combination of planting media (sand and cocopeat) and the second factor is the dose of liquid organic fertilizer. The first factor consists of 3 levels: M1 (sand and cocopeat), M2 (sand and cocopeat mixed), and M3 (cocopeat and sand). Each planting medium has a height of 11 cm. The second factor has 3 levels: P1 (LOF 10 ml/l), P2 (LOF 20 ml/l), and P3 (LOF 30 ml/l). The initial stages carried out in this research include preparing the planting media, seed sowing (for approximately ±16 days), transplanting, and maintenance (watering and fertilization). Observations include monitoring every 3 days (plant height, number of leaves, and leaf width) and final observations (total weight of fresh mustard plants, weight of upper and lower mustard plant parts). The planting media (sand, cocopeat) influenced all parameters. The optimum dose of liquid organic fertilizer is a dose of 30 ml/liter. The most optimal interaction of planting media factors with the dose of liquid organic fertilizer is sand media, cocopeat, and a dose of 30 ml (M1P3) with an average total fresh weight of 4.14 grams.*

Keywords: *Cocopeat, LOF, Planting media, Sand.*

1. Introduction

The current agricultural land area is decreasing. The Central Statistics Agency recorded a decrease in paddy fields of 0.7 million hectares from 2018 to 2017. In 2017, the area of paddy fields reached 7.75 million hectares, and this figure drastically decreased in 2018, with a total of 7.1 million hectares (Mulyanti et al., 2020). This decline is due to land use conversion. An alternative that can

be done is to utilize sandy land.

Sandy land is a potential area that can be used for agriculture. According to Suhening et al. (2012), sandy land in coastal areas is problematic due to its high salt content. To turn sandy land into cultivated land, improvements are needed to make the land suitable for agriculture. Ningrum (2018) stated that to convert sandy land into cultivated land, interventions are needed to address soil physical properties, fulfill nutrient requirements, lower air temperature, adjust air humidity, and regulate light intensity. Sandy land has nutrient content of 1.9% N, 33.6 ppm P, and 0.2% K. These values are far from the required nutrient content for plant cultivation (Sunardi and Sarjono, 2007). The addition of organic matter can be a solution to increase nutrient content in sandy land.

Cocopeat is a source of organic material with abundant availability. Cocopeat can be used as a mixing material to produce high water absorption capacity, thus maximizing water absorption. Additionally, Cocopeat contains natural nutrients that can be utilized by plants (Ariessandy et al., 2022). Cocopeat can be used as a mixing medium to help improve the physical properties of sand so that it can be used for cultivation activities. To demonstrate the potential of sand as a planting medium, in this experiment mustard plants were chosen because mustard plants (*Brassica juncea* L.) are one of the vegetables widely favored by the people of Indonesia due to their high antioxidant content (Zamriyetti et al., 2019). This research aims to analyze the potential of sand as a planting medium with the addition of cocopeat, obtain the appropriate dose of liquid organic fertilizer (LOF) for sand media, and find the suitable combination of cocopeat for sand media.

2. Research Methodology

This research was conducted at the Agricultural Engineering Department Greenhouse, Universitas Lampung (Unila), for approximately 2 months. The tools used included glass pots with dimensions of 111025 cm, a digital scale with a capacity of 10 kg, ruler, measuring cups of 10 ml and 1000 ml, shovel, and bucket. The materials used were sand media, cocopeat, green mustard (Brassica juncea L.) seeds, liquid organic fertilizer (LOF) with the brand NASA (pH 5.61 with content of N, P2O5, K2O, organic C, Fe, Mn, Zn, Co, and Mo).

This study employed a Complete Randomized Design (CRD) Factorial method with 2 factors. The first factor was the combination of planting media (sand and cocopeat), and the second factor was the dose of liquid organic fertilizer. The first factor consisted of 3 levels: M1 (sand and cocopeat), M2 (sand and cocopeat mixed), and M3 (cocopeat and sand). Each planting medium had a height of 11 cm (see Figure 1). The second factor had 3 levels: P1 (LOF 10 ml/l), P2 (LOF 20 ml/l), and P3 (LOF 30 ml/l). Based on the two factors above, 9 treatment combinations were obtained, with each treatment repeated 4 times, resulting in 36 experimental units with 1 mustard plant in each unit.

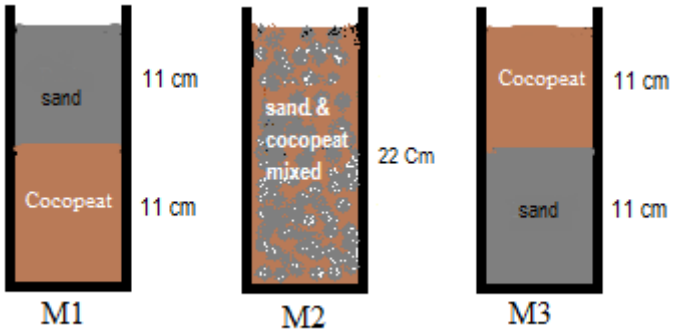

Figure 1. Treatments composition

The initial stages conducted in this research include preparing the planting media, seed sowing (for approximately ±16 days), transplanting, and maintenance (watering and fertilization). Observations include monitoring every 3 days (plant height, number of leaves, and leaf width) and final observations (total weight of fresh mustard plants, weight of upper and lower mustard plant parts).

3. Results and Discussion

Based on the ANOVA results of the influence of the first factor (planting media) and the second factor (LOF dose), as well as their interaction on the measured parameters, the summarized results are obtained as shown in Table 1.

Table 1. Summary of ANOVA test

No.	Parameter	Planting media	LOF Dose	Planting media+LOF
1.	Plant Height	bn	bn	tbn
2.	Leaf Number	bn	tbn	bn
3.	Leaf Width	bn	tbn	bn
4.	Total Shoot Weight	bn	tbn	tbn
5.	Root Length	bn	tbn	tbn

Note: bn : significant and tbn : not statisfically significant

The planting media has a significant effect on all 6 research parameters, including plant height, leaf number, leaf width, total shoot weight, and root length. The LOF dose shows a significant influence on plant height. Meanwhile, their interaction significantly affects leaf number and leaf width.

3.1. Plant Height

Based on the ANOVA test, planting media and LOF significantly affect plant height. Plant height measurements in Figure 2a (treatment M1 = sand, Cocopeat) show an increase from 3 Days After Planting (DAP) to 33 DAP, with an average height reaching 17 cm in LOF treatments P1, P2, P3. Treatment M1 has taller plants compared to M2 and M3. Plant height in Figure 2b with treatment M2 (sand and Cocopeat mixture) shows a different trend. Overall, there is an increasing trend in height. However, treatment P3 is higher (±12 cm) compared to P1 (±10 cm) and P2 (±8 cm). In Figure 2c with treatment M3, it results in the lowest average plant height, with an average height reaching 8 cm.

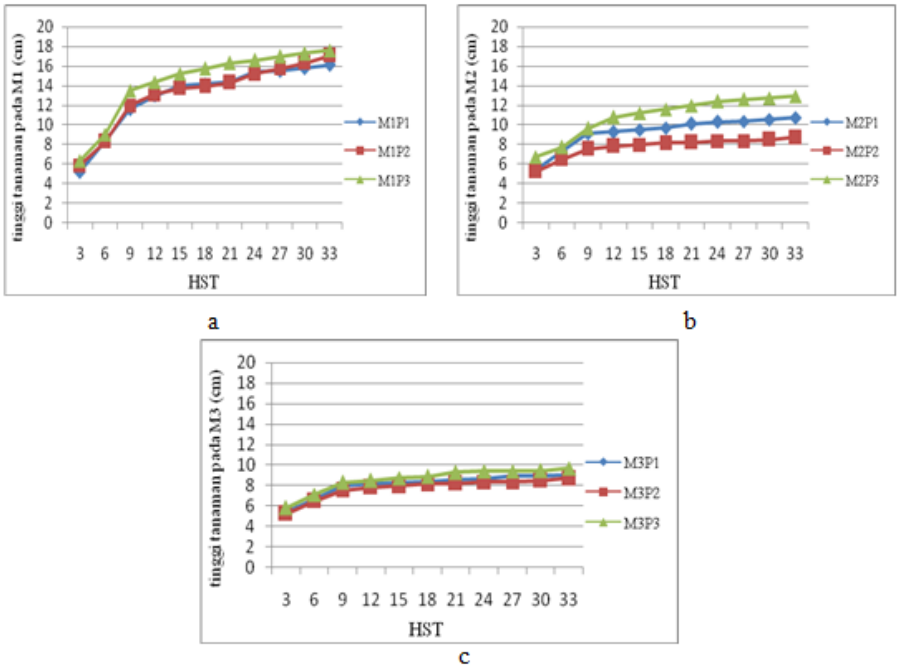

Figure 2. Plant height in treatment (a) M1, (b) M2, and (c) M3

According to Gardner et al. (1991), the process of height increase occurs due to cell division, an increase in the number of cells, and cell enlargement. Additionally, it is also influenced by nutrient intake. It is strongly suspected that M1, with sand as the upper layer providing space for root growth and Cocopeat below helping to maintain nutrient availability, can enhance cell growth and elongation, resulting in optimal plant height growth. This is supported by the statement from Umar et al. (2016) that Cocopeat is a lightweight planting medium, capable of retaining up to 73% of water and sufficient nutrients, ensuring that plants do not suffer from water and nutrient deficiency. The high microclimate temperature in the greenhouse is 27°C, while the optimal temperature for mustard is approximately 21°C.

3.2. Leaf Number

The ANOVA results (Table 1) indicate that both the planting media and the combination of planting media + LOF significantly affect the number of leaves in mustard plants. Figure 3a shows that treatment M1 (sand, Cocopeat) has a higher number of leaves compared to M2 and M3. At 3 Days After Planting (DAP), treatments M1 and M2 have 3 leaves each, while M3 has 2 leaves. The increase in the number of leaves starts at 6 DAP. Treatment M1 has an average total number of leaves of 6 (Figure 3a). Treatment M2 has an average total number of leaves of 5 (Figure 3b), while M3 has 4 leaves. The number of leaves produced in this experiment is far below the number of leaves typically seen in mustard plants in the market. It is predicted that this is due to the low nutrient volume. According to Fahmi et al. (2010), nitrogen and phosphorus are essential nutrients for plants in large quantities. Nitrogen deficiency leads to slow growth and stunted plants, while phosphorus deficiency hinders root development and overall plant growth.

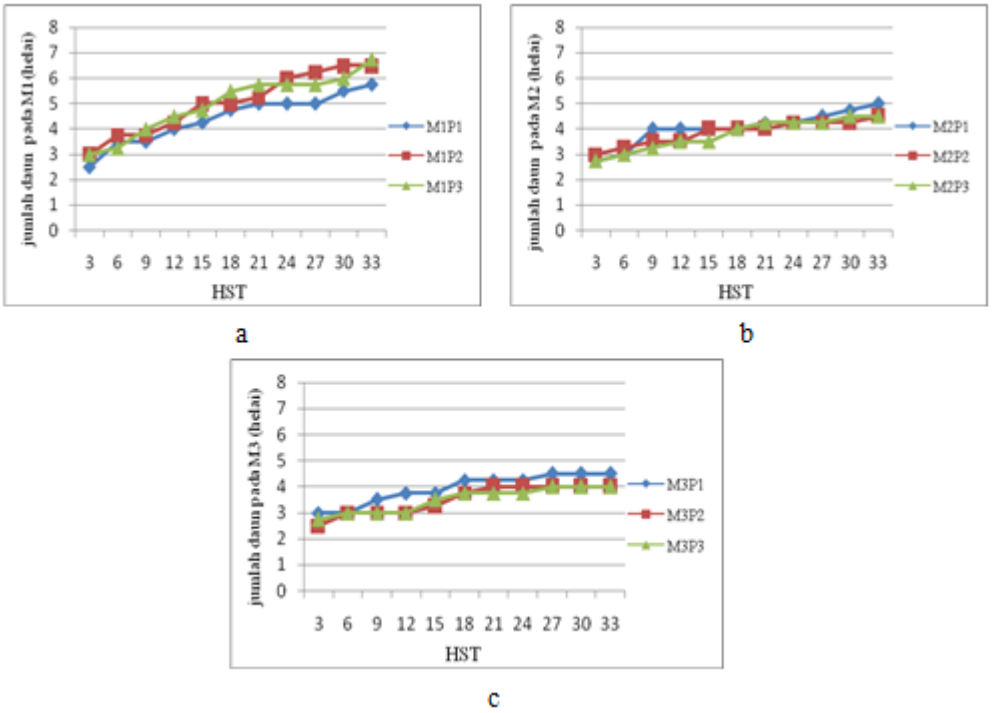

Figure 3. The number of leaf in treatments (a) M1, (b) M2, and (c) M3

3.3. Leaf Width

Based on the ANOVA results, both the planting media and the combination of planting media with LOF significantly affect the leaf width. The leaf width in treatment M1 shows an increase of 2 cm, where at 3 Days After Planting (DAP), the leaf width is 2 cm (Figure 4a). In treatments M2 and M3, there is no increase in leaf width; from 3 DAP to 33 DAP, the leaf width remains at 2 cm. The leaf width obtained in this study is significantly lower compared to mustard plants available in the market. This could be attributed to the low Nitrogen (N) content in the media. Mastur et al. (2015) explained that the appropriate amount of Nitrogen (N) significantly affects the vegetative phase of plants (leaf width and number of leaves).

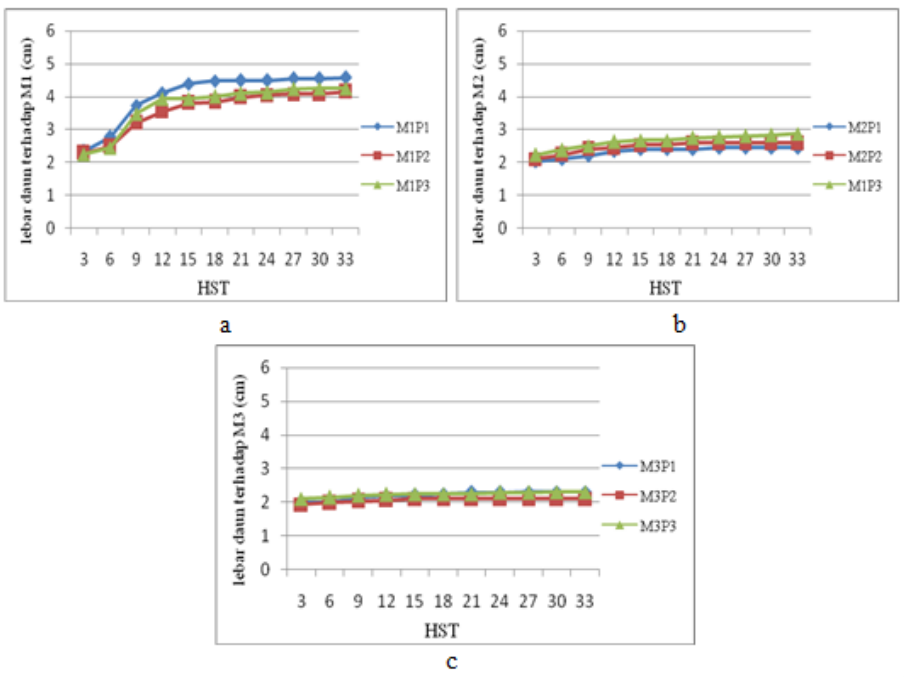

Figure 4. Leaf width in treatments (a) M1, (b) M2, and (c) M3

3.4. Total Plant Stover Weight

Figure 5 shows that the lowest total shoot weight of mustard is found in treatment M3 with a composition of cocopeat and sand media. Treatment M1 yields the highest total shoot weight with a composition of sand and cocopeat media. This high total weight is influenced by plant height, leaf number, and leaf width, where treatment M1 shows high values for all three parameters.

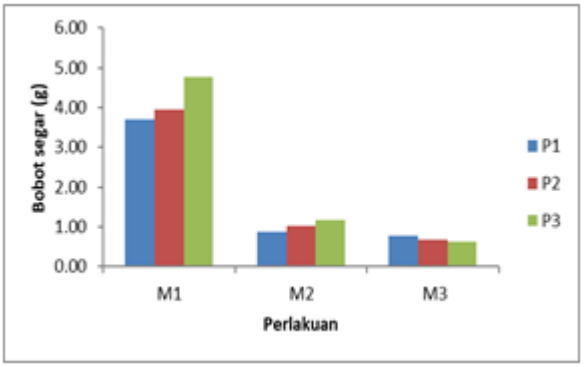

Figure 5. Total plant stover weight of mustard

3.5. Root Length

Mustard plants in treatment M2 exhibit longer root lengths compared to treatments M1 and M3 (Figure 6). This is likely due to the pore space generated between the mixture of the two planting media (sand and cocopeat), allowing the roots to develop optimally. According to research conducted by Mariana (2020), planting media influences the root length of plants.

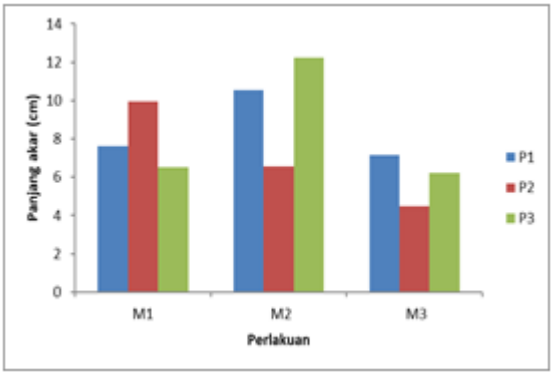

Figure 6. Root length of mustard plants

4. Conclusion

The planting media (sand, Cocopeat) has an influence on all parameters. The optimal dose of liquid organic fertilizer is 30 ml per liter. The most optimal interaction between the planting media and the dose of liquid organic fertilizer is using sand media, Cocopeat, and a dose of 30 ml fertilizer (M1P3), resulting in an average total fresh weight of 4.14 grams.

Reference

Ariessandy, I., Triyono, S., Amien, E.R., Tusi, A. (2022). Pengaruh Jenis Media Tanam Hidroponik Agregat dan EC Larutan Nutrisi Terhadap Pertumbuhan dan Produksi Melon (*Cucumis melo* L.). *J. Agricultural and Biosystem Engineering*, 1(1). 20-31

Fahmi Arifin., Syamsudin.,Sri Nuryani H.U., Bostang Radjagukguk. (2010). Pengaruh Interaksi Hara Nitrogen dan Fosfor Terhadap Pertumbuhan Tanaman Jagung (*Zea mays* L.) pada Tanah Regosol dan Ultisol. *Byologic News*, 10(3). 297-304

Gardner, F.P., Pearce R.B., Mitchell R.L., Susilo, H., Subiyanto. (1991). *Fisiologi Tanaman Budidaya*. UI-Press. Jakarta.

Mariana. (2020). Pengaruh Media Tanam Terhadap Pertumbuhan Stek Batang Naga Merah (*Hylocereus polyrhizus*). *Agrosamudra Jurnal Penelitian*, 7(1). 24-30.

Mastur, Syafaruddin, Syakir, M. (2015). Peran dan Pengelolaan Hara Nitrogen pada Tanaman Tebu untuk Peningkatan Produktivitas Tebu. *Perspektif*, 14(2). 73-86

Mulyani, S., Fathani, A.T., Purnomo, E.P. (2020). Perlindungan Lahan Sawah dalam Pencapaian Ketahanan Pangan Nasional. *Jurnal Rona Teknik Pertanian*, 12(2). 29-41

Sunardi dan Y. Sarjono. (2007). Penentuan Kandungan Unsur Makro Pada Lahan Pasir Pantai Samas Bantul Dengan Metode Analisis Aktivasi Neutron (AAN). *Prosiding PPI-PDIPTN*. Yogyakarta.

Sunghening, W., Tohari., Shiddieq, D. (2012). Pengaruh Mulsa Organik Terhadap Pertumbuhan dan Hasil Tiga Varietas Kacang Hijau (Vigna radiata L. Wilczek) di Lahan Pasir Pantai Bugel, Kulon Progo. *Jurnal Agronomi*. 4(1). 16–24.

Umar, U.F., Akhmadi, Y.N., Sanyoto. (2016). *Jago Bertanam Hidroponik untuk Pemula*. Agromedia Pustaka, Jakarta.

Zamriyetti, Siregar, M., Refnizuida. (2019). Pertumbuhan dan Produksi Tanaman Sawi (*Brassica juncea* L.) dengan Aplikasi Beberapa Konentrasi Nutri AB Mix dan Monosodium Glutamat pada Sistem Tanam Hidroponik Wick. *Agrium*, 22(1). 56-61.