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RESPONSE OF POTATO GROWTH AND YIELD ON FIRST GENERATION (G1) IN VARIOUS PLANTING MEDIA COMPOSITION

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Abstract

Potato is a horticultural commodity that contains carbohydrates, protein and other nutrients. Potatoes have the potential to be developed to support diversification and food security programs.. This research aims to find out the suitable planting media, so that it can overcome the limitations and provide quality potato seeds. The research was conducted in March-August 2024 in Alahan Panjang, Solok. The treatments were several compositions of *cocofiber (CF)* and cocopeat *(CP)* planting media arranged in a completely randomized design with 6 treatments and 4 replications, namely the composition; *CF* 100%, *CP* 100%, *CF 20%+CP* 80%, *CF 40%+CP* 60%, *CF 60%+CP* 40%, and *CF 80%+CP* 20%. The data obtained were statistically analyzed using the F test and DNMRT further test at the 5% level. The results showed that in general the use of 100% cocopeat plant media was the best composition, while Cocopeat 80% + Cocofiber 20%, gave the best growth of plant height, number of leaves, stem diameter and number of branches

Keywords: cocofiber, cocopeat, growing media, potatoes, seeds

1. Introduction

Potato (*Solanum tuberosum* L.) is an important horticultural commodity as a source of carbohydrates, protein, and nutrients. Potato plants have great potential to be developed to support food diversification programs. The increase in demand for this commodity is a consequence of the continuously growing population. Pusdatin (2021) reports that the average potato consumption in Indonesia is 2.2 kg per capita per year. According to data from the Central Statistics Agency (BPS), potato production in Indonesia in 2021 reached 1.36 million tons, an increase of 6.1% compared to the previous year, which was 1.28 million tons.

The use of high-quality potato seeds, especially G1 (Generation One) seeds, is crucial to achieve optimal productivity. G1 seeds are high-quality seeds that are disease-free and have better yield potential compared to seeds of later generations (Wahyuni et al., 2019). According to Yuliana et al. (2020), using high-quality seeds can increase crop yields by up to 25% compared to later-generation seeds. Another study by Putri et al. (2018) found that disease-free seeds produce tubers of uniform size, increasing the economic value of the harvest.

Another important factor in potato cultivation is the growing medium. Optimal growing media plays an essential role in supporting potato tuber growth and yield. One commonly used alternative growing medium is cocopeat and coconut fiber (cocofiber), derivatives of coconut husk fibers. Cocopeat has high water absorption capacity, helping to retain moisture well, while cocofiber provides better aeration structure to support air circulation in the growing medium (Rahardjo & Nugroho, 2018). A study by Zulkifli et al. (2020) shows that a specific ratio combination of cocopeat and cocofiber can enhance root nutrient absorption capacity.

Additionally, Wahyudi et al. (2021) revealed that cocopeat contains potassium which aids in the plant's photosynthesis process, while cocofiber serves as a natural aeration provider, reducing the risk of root rot. According to research by Nurhayati et al. (2020), using organic growing media such as cocopeat and cocofiber can increase plant growth by up to 15% compared to conventional growing media.

The appropriate composition of the growing medium significantly affects potato cultivation results. A medium that is loose, well-drained, and rich in organic matter will enhance the success of potato seedling development by directly impacting the process of tuber formation and production (Hamdani et al., 2019). The use of a combination of cocopeat, cocofiber, and organic fertilizer has also been shown to increase tuber production by up to 20% compared to soil-based media (Utami & Prasetya, 2021).

Another study by Firmansyah et al. (2021) mentioned that a growing medium with stable moisture, like cocopeat, is ideal for potato plants in high-rainfall areas. Meanwhile, Wijaya et al. (2019) added that cocofiber can increase the plant's resilience to environmental stresses such as drought and root diseases. Therefore, determining the optimal composition of cocopeat and cocofiber is essential to improve the productivity of first-generation potatoes.

This study aims to determine the effect of various cocopeat and cocofiber compositions on the growth and yield of first-generation potato tubers while providing recommendations for the most effective growing medium to support the production of high-quality potatoes on limited land.

2. Materials and Methods

Faculty of Agriculture and Green House PATPKP, Andalas University. The experimental location is in Nagari Alahan Panjang, Gumanti Valley District, Solok Regency, with an altitude of 1616 m above sea level.

The tools used in this study consisted of one aeroponic installation device, ph meter, EC meter, thermometer, hand sprayer, seedling tubs, analytical scales, manual scales, measuring cups, jerry cans, spoons, funnels, label paper, buckets, hoes, ropes, seedling trays, cutters, spectrophotometers, tissues, cotton buds, sieves, rulers, meters, callipers stationery, and mobile phone cameras. The materials used consisted of potato seed G0 Granola variety, cocopeat, cocofiber, organic fertilizer, Pearl NPK fertilizer (16:16:16), and pesticides.

The experiment was conducted using RAL with six treatments, each repeated four times. The treatments in this study were:

1. Cocofiber 100%
2. Cocopeat 100%
3. Cocopeat 20% + Cocofiber 80%
4. Cocopeat 40% + Cocofiber 60%
5. Cocopeat 60% + Cocofiber 40%
6. Cocopeat 80% + Cocofiber 20%

Before seeding, the cocopeat and cocofiber planting media were first rinsed with water to remove the tannin content. Next, the seedling tubs were filled with planting media according to the mixture specified in the treatment. The seedlings used in this study were G0 potato seedlings of Granola variety that were 110-115 days old, good quality and had buds 1-2 cm long.

Planting was done in the planting media using a distance of 20 cm x 15 cm. The tubers were planted with a depth of 3 cm, the sprout eyes facing upwards, and then covered with planting media. Seedlings that did not grow until 1 MST were replanted using seedlings that had been provided with the same treatment and age.

Watering was done regularly using a water hose. When the weeds grew a bit much, manual weeding was done. Basic fertilization with organic fertilizer (20 tons/ha), and NPK Mutiara 16:16:16 supplementary

fertilizer (250 kg/ha) were done twice at 21 and 60 days: pest and disease control using pesticides and recommended doses.

Potato plants that can be harvested are characterized by the leaves of potato plants that have changed colour from green to yellow evenly, and the plant stems have dried somewhat. Harvesting is done manually by pulling the plants by hand. Some of the post-harvest handling carried out is cleaning by washing tubers to remove soil, sorting is done by selecting tubers that have good quality or undamaged tubers, grading is done by grouping tubers in several classes of tubers and post-harvest observations are made.

3. Results and Discussion

The results showed that using a mixture of cocopeat and cocofiber as a planting medium affected the growth and production of first-generation (G1) potato tubers, as seen in Table 1.

Table 1. Plant Height, Number of Leaves, Stem Diameter, and Number of Branches of G1 Potato Seedlings in Various Compositions of Planting Media

Treatment	Plant Height (cm)	Number of Leaves (helai)	Stem Diameter (cm)	Number of Branches
Cocofiber 100%	18.34 d	7.62 d	0.56 c	0.19 c
Cocopeat 100%	38.52 a	12.53 b	0.77 b	0.41 a
Cocopeat 20% + Cocofiber 80%	24.22 c	7.75 d	0.61 c	0.25 c
Cocopeat 40% + Cocofiber 60%	33.71 b	9.87 c	0.79 ab	0.28 bc
Cocopeat 60% + Cocofiber 40%	30.54 b	10.75 c	0.75 b	0.38 ab
Cocopeat 80% + Cocofiber 20%	40.36 a	14.28 a	0.85 a	0.47 a
KK (%) =	9.18	11.13	7.32	24.33

Notes: The numbers in the same column followed by the same lowercase letters are not significantly different according to the DNMRT further test at the 5% real leve Notes: The numbers in the same column followed by the same lowercase letters are similar according to the DNMRT further test at the 5% real level.

Table 1 shows that using cocopeat and its mixture with cocofiber as a planting medium significantly affects plant height, number of leaves, stem diameter and number of branches of G1 potato seedlings. Cocopeat 80% + Cocofiber20% treatment showed the highest numbers in all parameters of plant height, number of leaves, stem diameter and number of branches, namely 40.36 cm, 14.28, 0.85 cm and 0.47, respectively. Furthermore, there was a decrease in plant height with the decreasing percentage of cocopeat content in the planting media mixture. For the observation of the number of leaves, the mix of 80% cocopeat+ 20%cocofibergave the highest number of leaves (14.28 strands), which was significantly different from the others, but 100% cocopeat gave the second highest number of leaves (12.53%) while the lowest was in the use of 100% coco fibre (7.62 strands) which was not significantly different from the mixture of 80% cocopeat+ 20% coco-fibre (7.75 strands). Furthermore, the mixture of 80% cocopeat+ 20% coco fibre also gave the largest stem diameter (0.85 cm), followed by a mixture of 40% cocopeat+ 60% coco fibre (0.79 cm) and the smallest stem diameter was found in 100% coco fibre media (0.56 cm). In the observation of the number of branches, the mixture of cocopeat80% + cocofiber20% also gave the highest number of branches (0.4688), which was not significantly different from the Cocopeat100% media (0.4062) and cocopeat60% + cocofiber40% mixture (0.3750). The least number of branches was obtained in 100% cocofiber media (0.1875).

This fact shows that using cocopeat planting media can provide suitable environmental conditions for the growth of potato seedlings. Its mixture with coco fibre in small amounts or percentages can still provide good growth conditions for potato seedlings. The results of research by Yuliana (2009) found that in addition to humus and compost, the organic wastes that can be used as a growing medium are coconut fibre powder (cocopeat) and coir fibre (coco fibre).

The advantages of cocopeat media are high water absorption, which allows it to hold moisture longer, neutral pH, and the fact that cocopeat that has been used can be processed again and used as compost (Purnomo and Soebiyanto). Coco fibre media consists of coarser and stiffer fibres; these properties provide good drainage to reduce the risk of root decay due to waterlogging. The same thing is stated by Risnawati

(2016). Applying cocopeat and coco fibre as a planting medium has several advantages. Namely, cocopeat and coco fibre can absorb water well, and the soil becomes loose, has a neutral pH, and can encourage growth in roots faster, so it is used as a nursery medium.

Table 2: Fresh Weight of Tubers/plant, Fresh Weight of Tubers/treatment, Number of Tubers of G1 Potato Seedlings in various Planting Media Compositions.

Treatment	Fresh Weight of Tubers/plant (g)	Fresh Weight of Tubers/treatment (g)	Number of Tuber	Tuber Diameter (mm)
Cocofiber 100%	9.77 c	153.50 b	1.56	21.84 b
Cocopeat 100%	23.23 a	517.75 a	2.47	32.10 a
Cocopeat 20% + Cocofiber 80%	17.55 ab	360.50 a	1.75	26.89 ab
Cocopeat 40% + Cocofiber 60%	18.09 ab	362.75 a	2.31	29.73 a
Cocopeat 60% + Cocofiber 40%	19.02 ab	408.75 a	2.09	34.21 a
Cocopeat 80% + Cocofiber 20%	13.75 bc	377.25 a	2.47	27.78 ab
KK (%) =	25.47	22.22	23.11	16.52

Notes: The numbers in the same column followed by the same lowercase letters are not significantly different according to the DNMRT further test at the 5% real leve Notes: The numbers in the same column followed by the same lowercase letters are similar according to the DNMRT further test at the 5% real level.

Table 2 shows that the treatment of 100% cocofiber and 100% cocopeat is significantly different from the fresh weight of tubers per plant, namely 9.77 g and 23.23 g and fresh weight of tubers per treatment, namely 153.5 g and 517.75 g, as well as the diameter of tubers, namely 21.84 cm and 32.10 cm. While the number of tubers was not significantly different, namely 1.56 and 2.47. This shows that 100% cocopeat treatment is better than 100% *cocofiber*, while the mixed treatment of 60% cocopeat + 40% cocofiber shows a higher value than other mixed treatments.

The treatment using cocopeat obtained a higher value than cocofiber because cocopeat has better water absorption and a finer texture so that it can maintain soil moisture (Bendahou and Ghadouani, 2017). The planting medium has a direct effect on tuber production because the process of tuber formation occurs in the planting medium. For this reason, a porous planting medium is an absolute requirement for potato production, in addition to the planting medium must also be able to provide plant needs for nutrients. As has been found by some of these researchers; Agustin, *et al*., 2014; Irawan and Kafiar, 2015; Saputra, 2016; Hamdani, *et al*., 2019, that the utilization of organic materials such as *cocopeat, cocofiber,* and rice husk charcoal is very potential to be used as an alternative planting media composite to reduce the use of top soil. The media also has a high percentage of air space and water holding capacity so that it can make plants can have sufficient water supply and can translocate nutrients.

Table 3. Percentage of tuber class of G1 potato seedlings in various compositions of planting media.

Treatment	Percentage of Tuber Class (%)		
	S	M	L
Cocofiber 100%	100	0,0	0,0
Cocopeat 100%	88,6	11,4	0,0
Cocopeat 20% + Cocofiber 80%	100	0,0	0,0
Cocopeat 40% + Cocofiber 60%	93,2	6,8	0,0
Cocopeat 60% + Cocofiber 40%	94	6,0	0,0
Cocopeat 80% + Cocofiber 20%	100	0,0	0,0

The various compositions of planting media used did not produce tubers with large sizes (L), and only some compositions produced medium sizes (M). Generally, small size tubers (S) are produced using various planting media compositions. In this case, first generation (G1) potatoes, which are intended for seed/seedling procurement, do have a small size because the number is expected, not the weight or size.

4. Conclusions

The best vegetative growth response was found in 80% cocopeat + 20% cocofiber planting media. In contrast, the best results in fresh weight, number and diameter of tubers were found in the 100% cocopeat

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