GROWTH RESPONSES OF SACHA INCHI BEAN SEEDS (Plukenetia volubilis L) ON VARIOUS ORGANIC MATERIAL SOURCES

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Abstract: Sacha inchi is a creeping perennial herb plant that belongs to the Euphorbiaceae family. Sacha inchi, or Plukenetia volubilis is a perennial plant with large, oil-filled seeds. sacha inchi plants began to be widely cultivated. However, in practice it is still planted directly in the field, without going through the nursery first, so the quality of the plants produced varies greatly. Seeding is a process that determines the quality of the plants to be cultivated. Planting media is the media used to grow plants, where roots or roots will grow and develop. A good planting medium must meet requirements such as not containing pest and disease seeds, free of weeds, able to hold water. This study aims to see the effect of the mixture and to get the best mixture of organic matter that supports the growth of Sacha inchi seedlings. This research was conducted from June to August 2022. The research method used was a Randomized Block Design (RAK) with 5 treatments consisting of: Top soil : sand (A), Top soil : sand : burnt husks (B), Top soil : sand : goat manure (C), top soil : sand : bamboo leaves (D), top soil : sand : leftover crickets (E). Data analysis with F test and further test with BNT test level of 5%. Giving organic matter shows better growth than without giving organic matter. Mixture of top soil, sand, and crickets growing media showed optimal growth in number of leaves, number of perfectly opened leaves, widest leaf width, longest leaf length, plant height, fresh weight of plants, and fresh weight of roots.

Keywords: Sacha Inchi Beans, Growing Media, Organic Materials

1. Introduction

Sacha inchi is a creeping perennial herb plant that belongs to the Euphorbiaceae family. According to[1], members of this family are widely distributed and have complex habitats. Sacha inchi or also known as Plukenetia volubilis is a perennial plant with large, oil-filled seeds. The plant is monoecious; the leaves are triangular to ovate in shape with a truncated to heart-shaped base, palmate venation and ciliary glands, usually with a small knob between them. The racemose inflorescence is axillary or terminal with one to two pistillate flowers at the base with many small inconspicuous flowers, the male flower rosette above. The winged ovary has four carpels; during fruit ripening, the ovary develops from green and fleshy to brown, woody and fissured. The seeds are lenticular, about 1.8 × 0.8 × 1.6 cm, and the testa is hard brown.

The potential of sacha inchi as a plant that has many benefits is one of the attractions for Indonesian people to cultivate it. Sacha inchi plants began to be planted in Indonesia in mid-2018 and began to be widely cultivated in 2019 until now. Sacha inchi has a star-shaped fruit, which has antioxidant properties and produces a nut with approximately 22-30% protein, 45-50% fat, 35.2- 50.8% omega-3, 33.4–41.0% omega -6, and 10.7% omega-9 [2]. According to [3], sacha inchi has many nutrients that are very beneficial for the body because they contain 45.2% Omega3, 36.8% Omega6, 9.6% Omega9, and 7.7% saturated fat. Due to the many benefits of this plant, sacha inchi began to be cultivated commercially in Southeast Asia, especially in Thailand, Vietnam, Malaysia and Indonesia.
In Indonesia, sacha inchi has begun to be widely cultivated. However, in practice it is still planted directly in the field, without going through the nursery first, so the quality of the plants produced varies greatly. Seeding is a process that determines the quality of the plants to be cultivated. Utilization of organic matter as a mixture of planting media in nurseries is one of the efforts to obtain good quality seeds. Apart from that, the factors that affect plant growth are internal factors and external factors. Internal factors are factors that are found in the seeds,

seedlings or plants themselves. External factors are factors that are outside of seeds, seedlings or plants, one that influences growth is the planting medium.

Planting media is the media used to grow plants, where roots or roots will grow and develop [4]. A good planting medium must meet requirements such as not containing pest and disease seeds, free of weeds, able to hold water. Apart from that, it is also able to remove or drain excess water, crumbs and porous so that roots can grow and develop through the planting medium easily and the degree of acidity (pH) is between 6-6.5. Another opinion conveyed by [5] is that materials for planting media can be made from a single material or a combination of several materials, as long as they continue to function as a good growing medium. According to [6] the requirements for a good nursery stage planting medium are light, inexpensive, easy to obtain, porous (loose) and fertile (rich in nutrients).

The source of organic material as a combination of planting media can come from manure. Manure is fertilizer that comes from livestock pens, either in the form of solid manure (feces) mixed with food scraps and urine (urine), such as cows, goats, chickens and crickets. Manure does not only contain macro nutrients such as nitrogen (N), phosphate (P), and potassium (K), but manure also contains micro elements such as calcium (Ca), magnesium (Mg), and manganese (Mn) which are needed plants [7].

So far no research has been conducted on the nursery of the sacha inchi bean plant, to be able to provide good sacha inchi production. However, it is not yet known how the effect of mixed media with the addition of organic matter on the growth of sacha inchi seedlings. This study aims to see the effect of the mixture and to get the best mixture of organic matter that supports the growth of good Sacha inchi seedlings.

2. MATERIALS AND METHODS

Time and place

This research was carried out from June to August 2022. The research location was Cikasimi Housing, Tigo Koto Dibaruah Village, and North Payakumbuh District. Starting from land preparation, giving treatment, to observation.

Materials and tools

The materials used in this practice were Sacha Inchi bean seeds, polybags, topsoil, sand, roasted husks, goat manure, bamboo leaves, and organic matter left over from crickets. Paranet and bamboo stakes. The tools used are stationery, cutting scissors, trowels, and a shovel, mixing the planting medium

Experimental design

The design used in this study was a non-factorial Randomized Block Design (RBD) with a level of 5 treatments, and was repeated 3 times. Treatment details consisting of:

A. Top soil : sand
B. Top soil: sand: roasted husks
C. Top soil : sand : goat manure
D. Top soil : sand : bamboo leaves
E. Top soil: sand: leftover crickets
The data obtained from the observations will be processed with the F test. If there is a difference, then proceed with the 5% LSD test.

Implementation

Preparation of planting media and planting material

The first activity was preparing a mixed planting medium for planting media that was treated A, B, C, D, and E. Each planting media mixture was put in a polybag until it filled the polybag, then watered until it was saturated and left for 5 days so that the media was homogeneous. Seed preparation Sacha inchi bean seeds that have been

prepared are soaked in hot water for about 12 hours then sown in a moist container until radicles appear, after 5 days of age in the nursery, the seeds are transferred to polybags that already contain planting media. Nursery is done to determine the uniformity of growth for the seeds to be planted.

Maintenance

The maintenance carried out in this study was watering, weeding, and pest and disease control.

Research observations

Observations were made at the age of the plant 30 days after planting (HST). The parameters observed consisted of: analysis of top soil nutrients, media analysis after mixing, number of leaves (strands), number of perfectly open leaves (strands), width of the widest leaf (cm), Longest leaf length (cm), plant height (cm), plant fresh weight (grams) and root fresh weight (grams).

3. RESULTS AND DISCUSSION

Media Nutrient Analysis

Top Soil Media Analysis

The results of the analysis of the topsoil nutrient content used are presented in table 1 below:

Table 1. Analysis of topsoil nutrient content

No	Analysis	value	criteria
1	Kadar air %	60	
2	pH	6,2	Slight acidic
3	Nitrogen (N) %	0,38	medium
4	Phosphor (P) ppm	6,2	Very low
5	potassium (K) me/100 g	0,5	medium
6	Calcium (Ca) me/100 g	1,33	Very low

Place of analysis: Environmental Engineering Laboratory, UNAND

From the results of the soil media analysis it can be seen that in general the soil nutrient content is good because it already has a pH value of 6.2 although it is still in the slightly acidic criteria, based on the nitrogen content with a value of 0.38% and potassium with a value of 0.5 me/100 g obtained quite good results, which are in the medium criteria. Nutrient content that is still in the low category can be met by providing organic matter. According to [8] the use of organic matter mixed with the soil and the ratio of organic matter in the planting medium has a significant role in improving the physical, chemical and biological properties of the soil which will affect plant growth.

Meanwhile, the advantage of sand media is that it is easy to use and can add to the aeration and drainage system of the planting medium. Because it has large capacity pores (macro pores), the sand gets wet easily and dries quickly by the evaporation process. The cohesion and consistency (resistance to process (separation) of sand) is very small so it is easily eroded by water

Analysis of Nutrient Content of Organic Materials

Table 2. Results of analysis of nutrient content in each source of organic matter

SOURCE OF ORGANIC MATTER	Nutrient Content Analysis							
	Water level (%)	pH	Nitrogen (N) (%)	Karbon (C) (%)	Phosphor (P) (%)	potassium (K) (%)	Calcium (Ca) (%)	Iron (Fe) (ppm)

Burnt Husk	8	6,8	0,3	31	15	31	0,69	180
Goat Manure	28,4	6,2	1,7	14,8	0,65	6,52	1,64	0,02
Bamboo leaf	24,44	6,8	0,82	11,07	0,08	0,18	0,05	421,5
Crickets residue	31,99	6,5	0,47	22,91	0,13	0,67	1,23	35,5

Place of analysis: Environmental Engineering Laboratory, UNAND

Based on the results of nutrient analysis of each organic material added as a treatment material, it appears that all organic matter has varying nutrient content. This of course will affect the availability of nutrients that can be absorbed by the planted seeds.

Bamboo leaves contain high levels of P and K macro nutrients so they have the potential to be good compost raw materials for the growth of cultivated plants [9] . Goat manure contains organic matter which can provide nutrients for plants through the decomposition process.), this process occurs gradually by releasing simple organic matter for plant growth, goat manure contains little water so it is easy to decompose [10] . The results of the research by [11] stated that the addition of rice husk charcoal to the growing media had a significant effect on the height growth of Jabon seedlings. The addition of husk charcoal can increase the height growth of Jabon seedlings by 18.31% - 28.36%.

Plant observation

Plant growth is influenced by internal and external factors. Internal factors are innate factors contained in the seed. While external factors are external factors that will support and provide support to plants. [12] stated that environmental factors play an important role in the process of plant growth, and the growing media is one of the environmental factors that need to be considered. Furthermore, it is also stated that a good planting medium is usually used a mixture of sand, soil, and manure. The use of sand is very good for improving the physical properties of soil, especially clay.

Table 3. The results of the follow-up test of the average observation of sacha inchi plant seeds with various mixtures of planting media

Planting media	Number of Leaves (sheet)	Number of Perfectly Opened Leaves (sheet)	Widest Leaf Width (cm)	Longest Leaf Length (cm)	Plant Height (cm)	Plant Fresh Weight (gram)	Fresh Root Weight (gram)
A	5,67 a	4,00 a	9,03 a	12,65 a	31,67 a	8,85 a	1,91 a
B	6,67 bc	5,33 c	8,70 a	15,20 b	36,43 b	12,92 b	4,09 c
C	6,00 ab	4,00 a	10,90 c	14,63 b	47,67 c	12,94 b	2,67 b
D	7,00 cd	4,67 b	8,90 a	14,93 b	54,00 d	12,32 b	3,21 b
E	7,67 d	5,00 bc	9,77 b	13,50 a	69,00 e	16,69 c	4,56 c

Note: Numbers followed by the same letters are not significantly different at the BNT level of 5%

The BNT test results showed that treatments B, D, and E were significantly different in the number of leaves. With the best average value in treatment E (topsoil + sand + remaining crickets). In the number of fully opened leaves, treatments A and C showed no significant difference while C, D, and E were significantly different with the best average values being in treatment B (topsoil + sand + roasted husks). For leaf width, treatments A, B, D were not significantly different, and treatments C and E were significantly different. While the observation of leaf length was not significantly different in treatments A and E, and significantly different in treatments B, C, and D with the

highest average value being in treatment B (topsoil + sand + roasted husks). In observing plant height, fresh weight of plants, and fresh weight of plant roots, it can be seen that treatment E (topsoil + sand + remaining crickets) gave the highest value with a value of 69 cm for plant height, 16.69 g for fresh weight, and 4.56 g for root weight.

Figure 1. Plant growth for each treatment

Figure 2. Root growth of each treatment

The results of this growth observation when connected with the analysis of the nutrient content of added organic matter (presented in table 3) then the nutrient analysis of goat manure measured to have the best nutrient content, but in fact, it did not support the growth of Sacha Inchi seedlings. Based on the texture of the organic matter used, cricket residue fertilizer has the finest texture and has the highest water content, making it easier to decompose and be absorbed by plants. [13] , reported that the length of the decomposition process in manure was affected by the texture of the fertilizer itself. The texture which is shaped like granules and is dense is rather difficult to break physically so it is slow to decompose and the available nutrients cannot be absorbed by plants, causing a long time for plant growth.

The mixture of planting media has been shown to have a significant effect on plant growth. Plants grown in growing media with cricket residues showed the best seedling height along with the number of leaves and plant fresh weight. This is in line with the results of the analysis of the remaining nutrient content of crickets which is higher compared to other organic materials used. [14]. Plant height is the most easily observed growth measure. The increase in plant height is a result of plant metabolism in the form of an increase in cell size and growth in both cell size and length. The increase in plant height is also the result of active meristem tissue activity dividing so that the number of cells increases. Meanwhile, according to [15] Leaves are plant organs that synthesize food for plant needs as well as food reserves. So the observation of the leaves is needed as an indicator of plant growth and can also be used as supporting data in explaining the growth process. Leaves have chlorophyll which plays a role in photosynthesis. If there are more places to grow for photosynthesis, production will also increase

CONCLUSION

This research resulted in several conclusions as follows:

1. Giving organic matter shows better growth compared to without giving organic matter
2. A mixture of top soil, sand, and cricket residues showed optimal growth in Number of Leaves, Number of Perfectly Opened Leaves, Widest Leaf Width, Longest Leaf Length, Plant Height, Fresh Weight of Plants, Fresh Weight of Roots.

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