Influence Of Azolla Composition (*Azolla, Sp*) On The Growth Of Oil Family Bitches (*Elaeis Quenensis Jacq*) In Pre Nursery

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ABSTRACT

This research was carried out in Jaya Setia Village, Pasar Muara Bungo District. This research was carried out from February 20 2014 to May 20 2014. The aim of this research was to determine the effect of administering a dose of Azolla compost and to determine the correct dose of Azolla compost for the growth of oil palm seedlings. The design used in this research was a Completely Randomized Design (CRD) with 5 treatments and 4 replications, the treatments were as follows: A0 (No treatment), A1 (Azolla Compost 125 g/polybag), A2 (Azolla Compost 250 g/ polybag), A3 (Azolla Compost 375 g/polybag) and A4 (Azolla Compost 500 g/polybag). The variables observed were plant height (cm), total leaf area (cm2), stem diameter (cm), increase in the number of fronds (stem), and root volume (ml). The research results showed that administering a dose of Azolla compost of 3.75 g/polybag had a real effect on plant height, total leaf area, increase in the number of fronds and root volume but had no real effect on stem diameter. Providing a dose of Azolla compost at a dose of 375 g/polybag is the best dose for the growth of oil palm seedlings.

Keywords: Azolla Compost, Growth and Palm Plants.

INTRODUCTION

For Indonesia, palm oil is the country's leading commodity. The plant whose main products consist of palm oil (CPO) and palm kernel oil (KPO) has a high economic value and is one of the largest contributors to foreign exchange compared to other commodities. Until now, oil palm has also been produced in the form of plantations and palm oil processing plants to become oil and its derivative products (Fauzi et al., 2012).

Table 1**.** Development of Oil Palm Area in 2012 - 2013 Based on Provisional Figures (ASEM)

No	District	Land Area (Ha)
1	Batanghari	45.194
2	Bungo	65.861
3	Kerinci	104.654
4	Merangin	48.582
5	Muarojambi	69.298
6	Sarolangun	43.504
7	Tanjungjabung Barat	88.203
8	Tanjungjabung Timur	42.123
9	Tebo	79.163
TOTAL		586,582 Ha

Source : Direktorat 2013 Jendaral Perkebunan Provinsi Jambi

Based on the table above, oil palm is a superior product in Jambi Province, oil palm plantations are the second largest plantation area after rubber plantations in 2013 Jambi province has an oil palm plantation area of 586,582 ha, which is the largest producer of agricultural production, namely 1,874,475 tons (Jambi Forest and Plantation Office, 2013).

Nursery is one of the determining factors for the success of oil palm cultivation. Oil palm nurseries are known as "double 2 stage" nurseries. The initial nursery is conducted for 3 months and requires shade. The initial nursery aims to obtain plants with uniform growth when transferred to the main nursery (Lubis and Widanarko, 2011).

Plant growth and development are inseparable from the availability of nutrients in the form of fertilizers, be it organic fertilizers or inorganic fertilizers. Fertilizer application in the nursery is one of the steps for plant growth and development that can ultimately increase production (Sutanto et al., 2002).

To encourage plant growth, additional nutrients are needed, basic fertilizers that are applied through the soil. One of the organic fertilizers used in this study is azolla compost.

The growth and development of oil palm seedlings in the pre nursery is influenced by the availability of nutrients in the soil. The unavailability of nutrients for plants will cause plant growth to be disrupted and reduce the growth achieved. Nitrogen is a nutrient required in the formation and vegetative growth of plants such as leaves, stems and roots. Therefore, oil palm seedlings respond very well to nutrients N, P, and K in oil palm nurseries, organic materials that contain high enough nitrogen elements such as compost or organic fertilizers are needed (Lubis and Widanarko, 2011).

N-containing fertilizers can be either inorganic or organic. Excessive use of inorganic fertilizers will cause damage to the physical properties of the soil. According to Nugroho et.al (1999) the continuous use of inorganic fertilizers without being balanced with the provision can damage the physical properties of the soil. The use of compost from organic materials can improve the physical properties of damaged soil, for example from Azolla sp. This plant is a type of fern that lives in the aquatic environment which is often referred to as a nuisance plant (water weed) and has a wide distribution, easy to cultivate and can grow quickly.

Azolla has an ability that is not possessed by other aquatic plants, namely tethering nitrogen (N) from the air. This N cannot be directly absorbed by plants. The N content in Azolla is very high for the size of organic matter, it can reach 4 - 5% of its dry weight. Other organic materials are generally only < 2% (Batan, 2010).

According to Rochdianto (2010) The use of azolla as fertilizer, when calculated from its dry weight in the form of compost (dry azolla) contains elements of Nitrogen (N) 3 - 5 percent, Phosphor (P) 0.5 - 0.9 percent and Potassium (K) 2 - 4.5 percent. While the micronutrients are Calcium (Ca) 0.4 - 1 percent, Magnesium (Mg) 0.5 - 0.6 percent, Ferum (Fe) 0.06 - 0.26 percent and Mangaan (Mn) 0.11 - 0.16 percent. Based on the chemical composition, when used for fertilizer to maintain soil fertility, each hectare of area requires 20 tons of azolla in fresh form, or 6-7 tons in the form of compost (15 percent moisture content) or about 1 ton in a dry state.

Azolla is a water-living herb that plays an important role in fixing free nitrogen from the air. In addition to acting as organic matter, growing azolla will convert ammonia into amino acids which will be used by plants in photosynthesis (Sebanyang, 1996). Rao in Sutanto (2002) added that Azolla sp has a C/N ratio between 12-18 so that within 1 week the biomass of Azolla sp has been completely decomposed. Immersion of Azolla sp into the soil is highly recommended in order to accelerate the decomposition process and the release of nutrients can be earlier, so that the role of Azolla sp as organic fertilizer gets better results. Experimental results in the field show that the use of Azolla sp as organic compost can save production costs by as much as 50%.

Based on research by Untung, et al (2003), that the application of Azolla compost and TSP at a dose of Azolla 250 g/polybag and TSP 4 g/polybag can increase plant height

growth (cm), total leaf area (cm2), crown wet weight (g) and root wet weight (g) in cocoa seedlings in polybags.

Based on the description above, the author is interested in conducting research with the title "The Effect of Azolla Compost (Azolla Sp) on the Growth of Oil Palm Seedlings (Elaeis quenensis jacq) in Pre Nursery".

METHODS

This research has been conducted in Jaya Setia sub-district of Muara Bungo Market, with an altitude of + 80 m above sea level, soil type Ultisol (PMK) pH 5.8 and rainfall of 190 mm/month. The research was conducted for 3 months from February 20, 2014 to May 20, 2014.

Trial Design

The design in this study was to use a Randomized Group Design (RAL) consisting of 1 factor, namely: Dosage of azolla compost:

A0 : 0 g/polybag
A1 : 125 g/polybag
A2 : 250 g/polybag
A3 : 375 g/polybag
A4 : 500 g/polybag

Each treatment was repeated 4 times resulting in 5 x 4 = 20 experimental units. Each experimental unit measured 0.6 x 0.6 m, with a spacing of 30 x 30 cm, each experimental unit consisted of 3 plants, and 2 plants were taken as samples. The total number of 20 x 3 = 60 plants and 2 x 20 = 40 plants were taken as samples.

Research Implementation

Preparation of Azolla Compost

Azolla plants were collected as much as 35 kg and then cut into pieces using a machete approximately 3 - 5 cm long, then after being cut into pieces, composting was carried out using EM4 as much as ¼ liter, composting lasted for two weeks.

Land Clearing

The land is cleared of weeds and grasses by removing them with a hoe. The soil where the polybags are placed is trenched around to prevent waterlogging**.**

Preparation of Plant Media

The small polybags used should be black in color. The polybags are 14 cm long, 8 cm wide, and 0.14 cm thick. In addition, the planting medium used was a mixture of topsoil and Azolla compost according to the application time and treatment dose.

Prenursery

The prenursery is where oil palm sprouts are planted and maintained until they are three months old. The criteria for superior seeds are: Seeds have a germination power of more than 80%, seeds must be from the first offspring (F1).

Application of azolla compost

The application of azolla compost is carried out in accordance with the dose of azolla compost given in accordance with each treatment. By stirring until evenly distributed with the soil.

Shade

Shade or protection is made from palm leaves. The height of the poles is two meters (front and back are the same) and the distance between the poles is three meters. Shade is maintained until the sprouts have 2-3 leaves. After that, the shade is gradually reduced from the east to allow more morning sunlight to enter the bed. Shade reduction is done gradually and should not be too late as it can inhibit plant growth. Conversely, if the reduction is too fast, it will cause plant stress. Shade reduction is done after the seedlings are 6 weeks old.

Maintenance

Watering is done regularly every day, in the morning from 06.00-10.30 and in the afternoon starting at 15.00. The volume of water sprinkled is about 0.25-0.5 liters per seedling. Weeding is done by pulling out the grass that grows in the baby bag by hand. Weeding should be done once every two weeks. The grass was collected between the beds to dry in the sun.

Pest attacks at the time of the study were red ants, for control researchers used Furadan 3 G by sprinkling it around the plant. For diseases during the research in the nursery there were no symptoms of disease attack.

Variables Observed

Plant Height Increase (cm)

Measurement of plant height began after the plants grew, namely the age of 1 month after seedling. with an interval of 2 weeks until the end of the study. Measurement starts from the root neck to the growing point, so that the measurement does not change, it is given agar about 5 cm from the ground surface.

Total Leaf Area (cm2)

Measurement was done once at the end of the study, the unit used was cm2. The calculated leaf area was taken randomly by counting from two leaf samples, then averaged the results multiplied by the total number of leaves. To calculate the leaf area using the formula: P x L x 0.75, Rutger Francis and Faliner, 1969 in Ichwan, 1988).

P : Length

L : Width

0,75 : Constant

Stem diameter (cm)

The diameter of the stem is measured at a height of 5 cm above the ground or at the root collar which is done 1 x, namely at the end of the study using a push rod.

Number of midribs (Stem)

By counting the number of midribs including young midribs, starting from the second week until the end of the study at weekly intervals.

Root volume (ml)

Calculation of root volume was carried out at the end of the study, the root volume was calculated taking part of the plant roots by cutting starting from the root neck. The whole part of the root is then washed from clean root dirt and put into a measuring cup that has been determined by the volume of water. the excess volume of water after taking the roots of the plant is called the palm root volume.

Data Analysis

To determine the effect of treatment, statistical tests were carried out using variance analysis (anova) if the effect was significant then continued with the Duncan New Multiple Range Test (DNMRT) at the 5% level (Steel and Torrie, 1994).

DISCUSSION

Plant Height Increase (cm)

To see the dynamics of plant height growth in each Azolla compost treatment, it can be presented in the form of Figure 1**.**

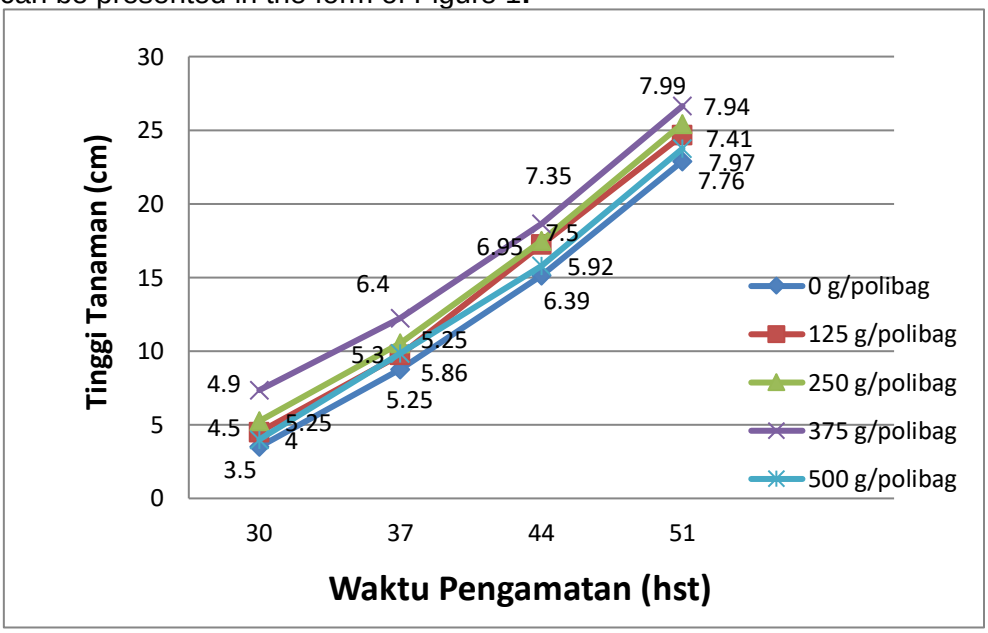

Figure 1. Dynamics of plant height growth at 30 days -51 days with various doses of Azolla compost.

From the graph above, it is clear that the dosing of Azolla compost every week increases the average plant height. In the provision of Azolla compost A3 (375 g / polybag) there was an increase in the average height of plants every 1 week which was quite good. It is suspected that giving a dose of Azolla compost can provide macro nutrients, especially nitrogen nutrients needed for plant growth and development so that high growth gives a real response.

According to Agromedia (2008), during the growth period young plants need proper nutrition to support their vegetative growth, both stems, branches and leaves. At that time the plant is forming its body so that the plant becomes a healthy and strong plant. Therefore, plants need protein to build their bodies. Considering that protein is taken from the element nitrogen, plants also need a lot of nitrogen during their vegetative period. This is reinforced by Agustina, (2004) components of various compounds in the plant body, namely amino acids, amides, proteins, chlorophyll and alkaloids 40-45% protoplasm is composed of compounds containing nitrogen nutrients.

The results of the analysis of variance showed that the provision of various doses of azolla compost had a significant effect on plant height (Appendix 5). The average plant height of oil palm seedlings on the provision of various doses of azolla compost can be seen in Table 3.

Table 3 Mean plant height at various doses of azolla compost.

Perlakuan	Rata-rata (cm)
A0 : 0 g/polybag	22,90 b
A1 : 125 g/polybag	24,66 ab
A2 : 250 g/polybag	25,44 ab
A3 : 375 g/polybag	26,64 a
A4 : 500 g/polybag	23,75 b

KK = 6,51 %

Notes: Numbers followed by different lowercase letters in the same column indicate significantly different treatments according to the DNMRT test at the 5% level (P < 0.05).

Table 3 shows that there is a significant difference between the doses of Azolla compost 0 g/polibag is not significantly different from 125 g/polibag, 250 g/polibag and 500 g/polibag but 0 g/polibag is different from 375 g/polibag. The highest increase in plant height was shown by giving a dose of Azolla compost at a dose of 375 g/polibag g/polibag, which amounted to 26.64 cm. This is because the dose of 375 g/polybag is able to provide nitrogen nutrients that are needed by plants for plant height growth of oil palm seedlings. The provision of a dose of 500 g/polybag tends to decrease, it is suspected that the provision of Azolla compost at this dose cannot be maximally utilized because plants have a saturation limit in the absorption of nutrients. The lowest plant growth was shown by giving a dose of 0 g/polybag compost, which amounted to 22.90 cm, this is because there is no contribution of nutrients provided from azolla compost to meet the needs of oil palm seedlings so that it cannot provide maximum results on the increase in plant height of oil palm seedlings.

According to Suwahyono, (2011) nitrogen is not only one of the essential components of protein, but also a part of DNA and is very important for plant growth and production. Nitrogen deficiency can generally cause stunted/dead plants. Rosita et al, 2007 in Mailina et al (2013), stated that plant growth increases with increasing plant age. The increase in plant growth is thought to be due to the addition of nutrients from organic matter.

According to Agromedia (2000) nitrogen spurs plant growth in general, is a constituent of chlorophyll, amino acids, fats and enzymes. Nitrogen is the basic material needed to form amino acids and proteins that will be utilized for plant metabolic processes and will ultimately affect the growth of organs such as stems, leaves and roots better.

Total leaf area (cm2)

The results of the analysis of variance showed that the provision of various doses of azolla compost had a significant effect on total leaf area (Appendix 6). The average total leaf area of oil palm seedlings on various doses of azolla compost can be seen in Table 4.

Table 4 Mean total leaf area at various doses of azolla compost.

Treatment	Average (cm^2)
A0 : 0 g/polybag	307,46 c
A1 : 125 g/polybag	373,79 c
A2 : 250 g/polybag	771,48 b
A3 : 375 g/polybag	1599,52 a
A4 : 500 g/polybag	422,89 c
KK = 20,65 %	

Notes: Numbers followed by different lowercase letters in the same column indicate significantly different treatments according to the DNMRT test at the 5% level (P < 0.05).

Table 4 shows that the application of Azolla compost at a dose of 0 g/polybag is not different from 125 g/polybag and 500 g/polybag but different from 250 g/polybag and 375 g/polybag. The best treatment for leaf area is 375 g/polybag. Application of azolla compost 0 g/polybag was not different from 500 g/polybag. This is because at this dose Azolla compost is able to provide nitrogen nutrients that are needed by plants for leaf growth. Giving compost at a dose of 500 g/polybag is not significantly different from the dose of 0 g/polybag and 125 g/polybag. This is because plants cannot absorb nutrients optimally, so

that at a dose of 500 g/polybag there tends to be a decrease because plants have a saturation limit in the absorption of nutrients, while at a dose of 125 g/polybag it is because the availability of nutrients is not sufficient to meet the vegetative growth of oil palm seedlings, especially in increasing total leaf area. Lack of essential nutrients from the amount needed by plants causes disruption of metabolic processes resulting in inhibition of cell division and development which can inhibit the rate of vegetative growth such as plant height and number of leaves and total leaf area.

According to AgroMedia (2008) the N element in the soil is more than the other elements, so the growth of plants is more directed to the magnitude of the rate of vegetative growth, such as stems, branches and leaves where the leaf surface becomes larger and spurs the photosynthesis process of plants Lakitan (1995) added that if the nutrient content in the soil is sufficiently available (fertile) then the ILD (Leaf Area Index) of a plant will be higher, where most of the assimilate is allocated to the formation of leaves which results in increased leaf area.

According to Suwahyono, (2011) states that plants that do not get additional nitrogen elements will grow stunted and the leaves formed are smaller, thinner and yellow, while plants that get additional nitrogen elements will form more and wider leaves. According to Nyakpa et al. (1988), the process of leaf formation is inseparable from the role of nutrients such as nitrogen and phosphate contained in the growing medium and available to plants.

Stem Diameter (cm)

The results of the analysis of variance showed that the provision of various doses of azolla compost had no significant effect on stem diameter (Appendix 7). The average stem diameter of oil palm seedlings on the provision of various doses of azolla compost can be seen in Table 5.

Table 5 Mean stem diameter at various doses of azolla compost

Treatment	\ Average (cm)
A0 : 0 g/polybag	3,93
A1 : 125 g/polybag	3,95
A2 : 250 g/polybag	4,28
A3 : 375 g/polybag	4,75
A4 : 500 g/polybag	4,13
KK = 10,09 %	

Note: treatment has no significant effect on stem diameter
(P > 0.05).

Based on Table 5, the provision of Azolla compost at a dose of 0 g/polybag, 125 g/polybag, 375 g/polybag and 500 g/polybag had no significant effect on stem diameter. This is probably because the oil palm seedlings used have a slow growth rate of stem circumference, and the absorption of P and K nutrients is not maximized so that the growth and development of the stem does not show a real response.

According to Suriatna (1988) states that the elements N, P and K are very instrumental in accelerating the rate and growth in plants where nitrogen is a constituent of many compounds while Posphor functions to accelerate root development, increase resistance to pests and diseases, play a role in the process of respiration, cell division and plant metabolism so as to encourage the rate of plant growth, including stem circumference.

According to Novizan in Kustino et al (2012) the nutrient nitrogen (N) is needed in every plant growth. Especially in the vegetative stage, such as the formation of buds, stems and leaves. Furthermore, according to (Wiryanta, 2005 in Triana, 2006) in addition to plant growth, potassium functions to strengthen the woody parts of the plant, improving plant

quality. Lack of potassium element causes the leaves to turn yellow and turn brown. If left unchecked, the leaves will fall off.

Number of Fronds (stem)

The results of the analysis of variance showed that the provision of various doses of azolla compost had a significant effect on the increase in the number of fronds (Appendix 8). The average number of fronds of oil palm seedlings on the provision of various doses of azolla compost can be seen in Table 6.

Table 6 Average number of midribs increase at various doses of azolla compost.

Perlakuan	Rata-rata (batang)
A0 : 0 g/polybag	1,75 b
A1 : 125 g/polybag	1,88 b
A2 : 250 g/polybag	2,06 b
A3 : 375 g/polybag	2,88 a
A4 : 500 g/polybag	2,19 b
KK = 15,74 %	

Notes: Numbers followed by different lowercase letters in the same column indicate significantly different treatments according to the DNMRT test at the 5% level ($P < 0.05$).

Table 6 shows that the provision of Azolla compost doses there is a significant difference between the provision of Azolla compost doses of 375 g / polibag with the provision of compost at doses of 0 g / polibag, 125 g / polibag, 250 g / polibag and 500 g / polibag. While giving a dose of Azolla 0 g / polibag is not different from giving compost azolla 125 g / polibag, 250 g / polibag and 500 g / polibag. The highest increase in the number of fronds was shown by the provision of Azolla compost at a dose of 375 g/polybag, which amounted to 2.88 stems. This is because at a dose of 375 g/polybag, Azolla compost is able to provide nitrogen nutrients that are needed by plants for the growth of the number of fronds.

According to Pahan (2008), the number of fronds is strongly influenced by the availability of nitrogen and phosphorus nutrients in the soil. If nitrogen nutrients are sufficient in the soil, plants can produce an optimal number of midribs. This is in accordance with the opinion of Agromedia (2008) which states that organic compost fertilizer can prevent the blockage of phosphate nutrients and increase the availability of useful nutrients. Organic compost contains humus acids that help free the elements that are blocked so that they are easily absorbed by plants.

The use of azolla compost more often will increase biological activity, improve the physical and chemical conditions of the soil, so that it becomes better and further azolla compost as a provider of nutrients and minerals contained in the lower soil more efficiently Suhartina and Adi Sarwanto, 1996 in Kustino, (2012).

Root Volume (ml)

The results of the analysis of variance showed that the provision of various doses of azolla compost had a significant effect on root volume (Appendix 8). The average root volume of oil palm seedlings on various doses of azolla compost can be seen in Table 7.

Table 7 Mean root volume at various doses of azolla compost

Perlakuan	Rata-rata (ml)
A0 : 0 g/polybag	6,75 b
A1 : 125 g/polybag	10,13 b
A2 : 250 g/polybag	10,88 b
A3 : 375 g/polybag	16,63 a

A4 : 500 g/polybag	16,50 a
KK = 21,81 %	

Notes: Numbers followed by different lowercase letters in the same column indicate significantly different treatments according to the DNMRT test at the 5% level ($P < 0.05$).

Table 7 shows that the dosing of Azolla compost had a significant effect on the volume of roots in oil palm seedlings. The dose of 3.75 g/polybag was not different from the dose of 500 g/polybag Azolla compost but significantly different from the doses of 0 g/polybag, 125 g/polybag and 250 g/polybag Azolla compost. It is suspected that the dosing of Azolla compost can provide P nutrients, available P nutrients in the soil can increase root growth and by giving Azolla compost to the soil can improve the physical and chemical properties of the soil so that the growth and development of roots run normally.

According to Agromedia (2008) explains that the application of compost fertilizer into the soil is able to improve and maintain the soil structure remains loose so that the growth and development of plant roots becomes better. The availability of nutrients in a balanced amount for plant growth, causes the process of division, enlargement and elongation of cells to take place quickly which results in several plant organs growing rapidly. Suriatna, (1988) in Meliana et al (2013) states that the elements N, P and K are very instrumental in accelerating the rate and growth in plants where nitrogen is a constituent of many compounds while Posphor serves to accelerate root development,

Root volume is an important factor in plant growth that reflects the ability to absorb nutrients and metabolism that occurs in plants. (Lakitan, 1993, in Hidayat et al 2013) stated that most of the elements needed by plants are absorbed from the soil solution through the roots, except carbon and oxygen which are absorbed from the air through the leaves. The root system of the plant can be influenced by soil conditions or plant growth media.

CONCLUSION AND SUGGESTION

Conclusion

Conclusions as follows:

1. Giving various doses of azolla compost has a significant effect on plant height (cm), total leaf area (cm2), increase in the number of fronds and root volume (ml) but has no significant effect on stem diameter (cm).
2. Giving various doses of azolla compost with the A3 dose of 375 g/polybag is the best dose for vegetative growth of oil palm seedlings in polybags.

Suggestion

To increase the growth of oil palm seedlings in polybags, it is recommended to use azolla compost at a dose of 375 g/polybag and further research needs to be carried out on the provision of azolla compost on various types of planting media and on different plants.

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