

Artikel Penelitian

## Growth Response of *Mucuna bracteata* with the Application of Local Micro Organisms (LMO) of Banana Weevil

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### A B S T R A K

This research aims to determine the effect of concentration and duration immersion giving LOM banana weevil against the growth of *Mucuna bracteata*. The research was conducted in the garden of Jalan Setia Bangun Pasar III, Sei Beras Sekata, Kecamatan sunggal, Kabupaten Deli Serdang, Sumatra utara and continued in the laboratory of the Indonesian Oil Palm Research Institute (IOPRI). This research was started in April-June 2020. This study used a randomized complete block design (RCBD) factorial. The first factor was the concentration of local microorganisms (LMO) of Banana Weevil consisting of 4 levels, namely: Without treatment, 15%, 30%, 45%. The second factor. The duration of immersion consists of 4 levels, namely: No immersion time, 15 minutes, 30 minutes, 45 minutes. Observation data were analyzed using Duncan's Multiple Range Test with a significant 5%. The results showed that the LMO concentration of banana weevil was effective in increasing the growth of the number of leaves 39.77, tendril length 83.14 cm, shoot fresh weight 28.54 g, and shoot dry weight 6.03 g. The duration of soaking had a significant effect on the highest number of leaves at week 3 (9.63 pieces). The interaction application of banana weevil concentration and soaking time affected the number of root nodules (40.50 gains) and root dry weight (0.73) g of the plant *Mucuna bracteata*.

## INTRODUCTION

Clearing oil palm land causes changes in the physical, chemical and biological conditions of the soil. Soil without vegetation is directly exposed to sunlight so it experiences erosion, reducing one of the impacts of planting legume cover crops (LCC) (Widiastuti and Suharyanto, 2007).

According to (Fauzi et al., 2012) *Mucuna bracteata* is a ground cover plant that can improve the chemical properties of the soil, maintain soil physical and biological fertility, is able to suppress the growth of competing weeds, is not liked by livestock because its leaves contain high levels of phenol, is tolerant of pest and disease attacks. *Mucuna bracteata* produces high biomass and contains N, so oil palm plantations use this plant in rejuvenation areas because it produces high levels of organic matter (Siagian, 2003).

The use of *Mucuna bracteata* often experiences problems such as the availability of poor quality seeds, indicated by low growth capacity (Khasanah, 2012).

According to (Kesumaningwati, 2015) In general, bananas are grown for their fruit and leaves, other parts of the banana plant, namely the heart, stem, fruit peel and tuber, are rarely used and thrown away, so they become banana waste. Banana plants only bear fruit once in their lifetime, after that the stems and tubers are cut down and left alone (Wahyusi, 2008). Banana weevils have a high calorific value, namely 3,196.29 Cal/g (Amelia et al., 2010).

According to (Ole, 2013) banana humps contain carbohydrates (66%), water and important minerals, starch (45.4%), and protein (4.35%). Thus, banana weevils can be used as decomposing microorganisms as organic material or decomposers (Aini, 2017).

Local Microorganisms (LMO) is a fermented solution made from various resources available in nature, which contains micro and macro nutrients, has bacteria that have the potential to degrade organic matter, stimulate growth and control pests and diseases (Setiawan, 2013).

Local Microorganisms (LMO) are used as starters that help in making solid and liquid organic fertilizer (Dharma et al., 2018). Banana weevil LMO contains the growth regulator Gibberellin, Cytokinin and types of microbes namely *Azospirillum*, *Azotobacter*, *Bacillus*, *Aeromonas*, *Aspergillus*, phosphate solubilizing microbes and cellulotic microbes (Moses, 2013). Based on the description above, the author is interested in researching the effect of banana weevils as moles and soaking time on the growth of *Mucuna bracteata* seedlings.

## METHOD

### *Place and Time of Research*

The research was carried out at the experimental plot on Jalan Setia Bangun Pasar III, Sei Beras Sekata, Sunggal District, Deli Serdang Regency, North Sumatra. The gardens are located 3° 34' 23.2" North and 98° 36' 00.5" East. Continued in the Palm Oil Research Center (PPKS) laboratory, this research began in April-June 2020.

### *Tools and Materials*

The tools used in this research were a knife, barrel, bucket, stainless steel gater, 1/4 inch 1 m spirit level hose, plastic bottle, plastic rope, measuring cup, camera, sieve (8 mesh), scissors, hoe, pot, measuring tape, paranet, 3 kg white plastic, bamboo, wire, books, oven, analytical scale, manual scale, stopwatch, HVS paper, brown envelope, ruler and stationery. The materials used in the research were *Mucuna bracteata* seeds, banana stems, rice washing water, brown sugar, water, top soil, RP fertilizer and 15 x 21cm polybags.

### *Research Design*

This research used a factorial Randomized Complete Block Design (RCBD). Factor I is the concentration of local microorganisms (LMO) banana weevil (M) consisting of 4 levels, namely: without treatment (M0), 15% (M1), 30% (M2), 45 (M3). Factor II is the soaking time (P) consisting of 4 levels, namely: No soaking time (P0), 15 minutes (P1), 30 minutes (P2), 45 minutes (P3). In this study, there were 16 treatments with 2 repetitions, resulting in 32 plots. The research plot contained 6 plants, so the total number of plants was 192 plants. The data were analyzed using analysis of variance, if the treatments showed a significantly different effect then it was continued with the Duncan Multiple Range Test (DMRT) advanced means test with a significance of 5%. Data were processed with the SAS 9.3.1 program.

### *Research Procedure*

1. Preparation MOL  
10 kg of banana tubers are gated, 2 kg of brown sugar is dissolved in 10 L of rice washing water, then put all the ingredients in a barrel and stir until evenly mixed and close tightly. The top of the barrel has a hole to channel a hose into the barrel and a bottle filled with water to maintain pressure and prevent air from entering. The banana hump LMO fermentation process is carried out for 14 days, producing a spirit-like/alcohol-like aroma and a brownish/blackish color.
2. Area Preparation  
The research area was cleaned of plant remains and rubbish manually using a hoe and then the area of the research area was measured.
3. Making Shade  
Making nursery shelters in polybags is made with a length of 8 m, a width of 2.60 m, a height of 1.5 m, and a distance between repetitions of 60 cm. The shade poles are made from bamboo and the roof uses 70% paranet arranged parallel.

#### 4. Preparation of Planting Material

*Mucuna bracteata* seed plant material provided by PT. Langkat Nusantara Kepong (LNK) Bekiun Garden, sowing is done by cutting off a small portion of the tip of the seed with scissors to break the dormancy period of the *Mucuna bracteata* seeds, then the *Mucuna bracteata* seeds are soaked using 1 liter of water mixed with 1 gam of ingofol (anti-fungal) for 5 minutes then *Mucuna bracteata* seeds are sown in the seeding area until they produce 2 spear-shaped leaves (for 7 days).

#### 5. Preparation of Planting Media

The soil used is top soil and RP fertilizer, the soil is sifted using a sieve (8 mesh), the ratio of 1kg soil: 10 g RP

#### 6. Soaking

After 7 days the *Mucuna bracteata* plants were removed from the seeding site, after which the sprout roots were soaked up to the top of the roots in a solution of local microorganisms (MOL) Banana Weevil with soaking times divided into 4 levels and recommended concentrations. In polybags can be removed manually.

#### 7. Planting

*Mucuna bracteata* sprouts that have been soaked are then planted in polybags. Planting is carried out by placing *Mucuna bracteata* sprouts with one sprout per hole to a depth of  $\pm 3$  cm.

#### 8. Maintenance

Watering is done manually using gembor at intervals of 2 times a day. Weeding.

#### 9. Observation

Number of leaves, tendril length, root length, number of root nodules, fresh root weight, shoot fresh weight, root dry weight, shoot dry weight, root shoot ratio and survival percentage.

## RESULT AND DISCUSSION

### *Number of Leaves*

Based on analysis of variance, the results showed that the concentration of banana weevil (M) had a significant effect on the growth of the number of leaves of *Mucuna bracteata* plants at weeks 1, 3, 4, 5, 6, 7 and 8 after planting (Table 1). The length of soaking had a significant effect at week 3 (Table 2) and the interaction between the two had no significant effect.

Table 1. Effect of Local Microorganism Concentration (LMO) on the Number of Leaves (Strands) of *Mucuna Bracteata* Plants

Concentration	The number of leaves (strands)						
	1 WAP	3 WAP	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP
M0 (0 %)	4.69a	10.15a	13.75a	17.60a	22.55a	30.70a	39.77a
M1 (15 %)	4.38a	9.10b	12.48ab	15.58b	20.66a	28.08a	37.06a
M2 (30 %)	4.31a	8.94b	11.58bc	15.31bc	20.31a	28.02a	35.81ab
M3 (45 %)	3.75b	8.19c	10.70c	13.46c	17.92b	23.36b	30.69b

Note: Numbers followed by the same notation indicate that they are not significantly different from the 5% DMRT test. Week after plant (WAP).

Table 2. Effect of Soaking Time on The Number of Leaves (Strands) of *Mucuna Bracteata* Plants

Soaking Time	The number of leaves (strands)
	3 WAP
P0 (soak)	9.63a
P1 (15 minute)	9.08ab
P2 (30 minute)	9.10ab
P3 (45 minute)	8.56b

Note: Numbers followed by the same notation indicate that they are not significantly different from the 5% DMRT test. Week after plant (WAP)

### ***Tendrils Length***

Based on the analysis of variance, the results showed that the concentration of banana weevil (M) had a significant effect on the growth of *Mucuna bracteata* plant tendril length in the 6th week after planting (Table 3). The soaking time did not have a significant effect and the interaction between banana weevil concentration and soaking time did not have a significant effect.

### ***Header Fresh Weight***

Based on analysis of variance, the results showed that the concentration of banana weevil (M) had a significant effect on the growth of fresh weight of *Mucuna bracteata* plant crowns in the 8th week after planting (Table 4). The soaking time did not have a significant effect and the interaction between banana weevil concentration and soaking time did not have a significant effect.

### ***Header Dry Weight***

Based on the analysis of variance, the results showed that the concentration of banana weevil (M) had a significant effect on the growth of the dry weight of the *Mucuna bracteata* plant crown at the 8th week after planting, the dry weight of the shoot (Table 5). The soaking time did not have a significant effect and the interaction between banana weevil concentration and soaking time did not have a significant effect.

Table 3. Effect of Local Microorganism Concentration (LMO) on Tendril Length (CM) of *Mucuna Bracteata* Plants

Concentration	Tendril length (cm)
	6 WAP
M0 (0 %)	83.14a
M1 (15 %)	70.97ab
M2 (30 %)	57.30bc
M3 (45 %)	43.07c

Note: Numbers followed by the same notation indicate that they are not significantly different from the 5% DMRT test. Week after plant (WAP).

Table 4. Effect of Local Microorganism Concentration (LMO) on Fresh Shoot Weight (g) of *Mucuna Bracteata* Plants

Concentration	Fresh shoot weight (g)
	8 WAP
M0 (0 %)	28.54a
M1 (15 %)	23.726a
M2 (30 %)	22.66ab
M3 (45 %)	17.52b

Note: Numbers followed by the same notation indicate that they are not significantly different from the 5% DMRT test. Week after plant (WAP).

Table 5. Effect of Local Microorganism Concentration (LMO) on Shoot Dry Weight (g) of *Mucuna Bracteata* Plants

Concentration	Shoot dry weight (g)
	8 WAP
M0 (0 %)	6.03a
M1 (15 %)	5.22ab
M2 (30 %)	4.67bc
M3 (45 %)	3.91c

Note: Numbers followed by the same notation indicate that they are not significantly different from the 5% DMRT test. Week after plant (WAP).

#### *Number of Root Nodules*

Based on analysis of variance, the results showed that the concentration of banana weevil (M) had a significant effect on the growth of the number of leaves of *Mucuna bracteata* plants in the 8th week after planting. The soaking time had a significant effect at week 8 and the interaction between banana weevil concentration and soaking time had a significant effect.

#### *Root Dry Weight*

Based on the analysis of variance, the results showed that the concentration of banana weevil (M) had a significant effect on the dry weight growth of *Mucuna bracteata* plants in the 8th week after planting. The length of soaking had a real effect at week 8.

Table 6. Effect of Local Microorganism Concentration (LMO) and Soaking Time on the Number of Root Nodules (Gains) of *Mucuna Bracteata* Plants

Treatment	The number of root nodules (gains)
	8 WAP
M0P0	34.67 ab
M0P1	32.62 abc
M0P2	29.33 bcd
M0P3	28.00 bcd
M1P0	40.50 a
M1P1	27.33 bcd
M1P2	27.30 bcd
M1P3	20.17 d
M2P0	28.50 bcd
M2P1	24.83 cd
M2P2	30.33 bc

M2P3	30.00	bc
M3P0	23.42	cd
M3P1	25.08	cd
M3P2	24.17	cd
M3P3	26.08	cd

Note: Numbers followed by the same notation indicate that they are not significantly different from the 5% DMRT test. Week after plant (WAP).

Table 8. Effect of Local Microorganism Concentration (LMO) and Soaking Time on Dry Weight of *Mucuna Bracteata* Plant Roots

Treatment	Dry weight roots (g)	
	8 WAP	
M0P0	0.48	Def
M0P1	0.61	Abc
M0P2	0.73	A
M0P3	0.53	Bcde
M1P0	0.65	Ab
M1P1	0.57	Bcd
M1P2	0.62	Abc
M1P3	0.53	Bcde
M2P0	0.48	Def
M2P1	0.42	Fe
M2P2	0.58	Bcd
M2P3	0.38	F
M3P0	0.51	Cde
M3P1	0.58	Ef
M3P2	0.43	Ef
M3P3	0.44	Ef

Note: Numbers followed by the same notation indicate that they are not significantly different from the 5% DMRT test. Week after plant (WAP).

#### **Root length, Root fresh weight, Root crown ratio, Percentage of life**

Based on analysis of variance, the LMO concentration of banana weevils and the length of banana soaking did not have a significant effect on the growth of root length, fresh root weight, root crown ratio and survival percentage but the application of weevils did. However, the concentration of banana weevil (M) had a significant effect on the number of leaves, length of tendrils, fresh weight of the crown and dry weight of the crown of *Mucuna bracteata* plants in the 8th week after planting. Application without banana weevil concentration (M0) was effective in increasing the growth of the number of leaves until it reached 39.77 pieces (higher than the treatment) see table 1. The length of the tendrils at week 6 reached 83.14 cm (higher than the treatment) see table 3. The fresh weight of the crown can reach 28.54 g (higher than the treatment) see table 4. The dry weight of the crown can reach 6.03 g (higher than the treatment) see table 5.

This is thought to be due to climatic factors such as rainfall. The transport of water from the ground becomes greater, so more water is transported. The climatic factor that influences plant growth is rainfall, by knowing the weather factors the levels of photosynthesis and respiration that develop dynamically can be simulated (Setiawan, 2009). Transporting water from the soil can cause the formation of an increasing number of leaves (Winarni et al., 2004).

The soaking time had a significant effect in the 3rd week in the P0 (control) treatment, reaching 9.63, see table 2. It is suspected that the soaking process for too long causes the seeds to become saturated, thereby affecting their growth potential, in line with the statement (Schmit, 2000) explaining that there are There is a risk that the seeds will die if soaked

for too long. Germination power is also influenced by water. As is known, water is an environmental factor that influences the germination process (Sadjad, 1975).

The interaction effect of banana weevil LMO concentration and soaking time had a significant effect on the number of root nodules in the 8th week in the M1P0 treatment up to 40.50, see table 6. Providing local banana weevil microorganisms (LMO) which contain the element N can increase the number of Rhizobium bacteria. in the soil and bacteria develop well, infecting plant roots, forming nodules. According to (Novriani, 2011) stated that Rhizobium is one of the providers of N nutrients for plants if it is in symbiosis with legume plants, the amount of N greatly influences whether or not the formation of root nodules will fail.

The interaction effect of LMO concentration of banana hump and soaking time had a significant effect on root dry weight at week 8 in the M0P2 treatment up to 0.73 g, see table 7. Root dry weight is the accumulation of photosynthesis results, uptake of nutrients, water and sunlight, roots have the ability to absorb water. (Lakitan, 2000) the plant root system can be influenced by the conditions of the plant growing media. Environmental factors that influence the root system are soil moisture, soil temperature, soil fertility, soil pH, soil aeration and root interactions (Islami and Utomo, 1995). According to (Lakitan 2011) this is because the wet weight of the roots will affect the dry weight of the roots, the lower the wet weight of the roots the lower the dry weight will be.

## CONCLUSION

The effect of concentration (LMO) of banana hump has an effect on the concentration of the number of leaves (strands), tendril length (cm), fresh shoot weight (g) and shoot dry weight (g) of *Mucuna bracteata* plants. The length of soaking for local microorganisms (LMO) of banana humps affects the number of leaves (strands) of the *Mucuna bracteata* plant. Interaction between the effects of local microorganisms (LMO) on weevils bananas and soaking time affect the number of root nodules (gains) and root dry weight (g) of *Mucuna bracteata* plants.

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