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Research Article

Effectiveness of Local Microorganisms from *Glysine max* Dregs in Formulation with Coconut Milk and Degan Coconut Water as a Test for the Effect of Ultisol Soil Fertility

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Abstract
The application of a mixture of Coconut Milk and Degan Coconut Water formulated with Glysine max Dregs can improve the fertility and health of Ultisol soils which are nutrient deficient or nutrient poor in Ultisol soils. The use of the three ingredients has important potential as the effectiveness of soil fertility, and the impact on soil health. Glysine max dregs contains rich nutrients, namely nitrogen (N), phosphorus (P), and potassium (K), while coconut milk contains important nutrients and growth hormones that can refer to both plant growth, while Degan coconut water also contains rich nutrients, and also contains cytokinin hormones which play an important role in stimulating cell division and plant root growth. The conclusion is that Glysine max dregs, coconut milk and Degan coconut water can potentially increase the fertility of Ultisol soil and can create liquid organic fertilizer as an environmentally friendly and effective fertilizer in applying to soil and plants.

Keywords: Glysine max, Ultisol, Coconut Milk, Degan Coconut Water, Dregs.

1. Introduction

Ultisol is one of the dominating soil types in Indonesia. The dominance of Ultisol soil has largely led to its own achievements, namely the achievement of agricultural and plantation productivity. In general, Ultisol soil has not been handled properly, therefore, in increasing the productivity of yellow red podzolic soil or commonly referred to as Ultisol, it is necessary to add organic matter to the soil (Lubis, 2020; Yosephine et al., 2022).

Ultisol soils have a soil acidity (pH) of 4.5 - 5.5 and are very nutrient poor, which in this condition, is called acid dryland. According to Fitriatin et al. (2014) that Ultisol soils are characterised by: low organic content, low macro-nutrients and have very low availability of phosphorus (P). According to Syahputra et al. (2015), Cation Exchange Capacity (CEC), Base Saturation (KB), and Organic Carbon (C-Organic) are included in the low criteria, while the Aluminium content (Al Saturation) is high criteria, P fixation is high and the content of iron (Fe) and Manganese (Mn) is close to the limit of poisoning plants.

One way to improve Ultisol soil fertility is by providing organic matter (Sujana & Putra, 2015). In soil fertility, organic matter affects cation exchange capacity, soil acidity (pH), and soil nutrients. According to research by Ifa et al. (2020) that, the content contained in coconut water is N 0.28%, P 0.17%, and K 0.05%. Meanwhile, according to Riskiyanto's research (2023), coconut milk consists of N 0.33%, P 0.28%, and K 0.11%.

The content of Local Microorganisms (MoL) from Glysine max has many benefits, one of which is the content of protein, fat, calcium, phosphorus, nitrogen, and potassium. Where the percentage of nutrient content is 27.09% protein, 7.3% fat, 0.5% calcium, 1.219% phosphorus, 0.110% nitrogen, 0.361% potassium. According to Tua et al. (2014), the advantage of using Glysine max dregs as fertilizer is that it has a fairly high protein content of around 43.8%, fat 0.9%, crude fibre 6%, calcium 0.32%, phosphorus 0.76%, magnesium 32.3 mg.Kg-1, and other ingredients. In the research results of Rahmina et al. (2017), that the composition of the elemental content of nitrogen (N) is 0.110%, phosphorus (P) 1.219% and potassium (K) 0.361%.

To overcome this, organic materials in the form of organic fertilizer from local microorganisms (MoL) from Glysine max and coconut milk and Degan coconut water are formulated together and applied to the level of Ultisol soil fertility.

2. Methods

In this study, the research was conducted at the Research Practice Garden - Soil and Plants, Soil Laboratory, University of Sumatera Utara, Medan. This research was conducted for 3 months from August 2024 to November 2024. The soil used is Top Soil with Ultisol Soil type taken at the Aek Pancur Palm Oil Nursery, Tanjung Morawa, North Sumatra.

In this study using a Factorial Randomised Group Design (RAK) where Factor 1 is the MoL Glysine max + Coconut Milk Formulation with 2 levels of treatment, namely Level 1 is G1 100 ml.polybag-1 + C1 100 ml.polybag-1 with code (G1C1), Level 2 is G1 100 ml.polybag-1 + C2 200 ml. polybag-1 with code (G1C2), Factor 2 is MoL Glysine max Formulation + Degan Coconut Water with 2 Treatment Levels, namely Level 1 is G1 100 ml.polybag-1 + D1 100 ml.polybag-1 with code (G1D1), Level 2 is G1 100 ml. polybag-1 + D2 200 ml.polybag-1 with the code (G1D2), Factor 3 is the MoL Formulation of Glysine max + Coconut Milk + Degan Coconut Water with 2 levels of treatment, namely Level 1 is G1 100 ml. polybag-1 + C1 100 ml.polybag-1 + D1 100 ml.polybag-1 with code (G1C1D1), Level 2 is G1 100 ml.polybag-1 + C2 200 ml.polybag-1 + D2 200 ml.polybag-1 with code (G1C2D2), Factor 4 is Coconut Milk + Degan Coconut Water Formulation with 2 treatment levels, namely Level 1 is C1 100 ml. polybag-1 + D1 100 ml.polybag-1, Level 2 is C2 200 ml.polybag-1 + D2 200 ml.polybag-1, Factor 5 is the application of Local Microorganisms (MoL) Glysine max with 2 treatment levels, namely Level 1 is G1 100 ml.polybag-1, Level 2 is G2 200 ml.polybag-1.

The application of liquid organic was done in a rotation of 2 times.month-1 with application in week 1 and week 3, and the application of RP (Rock Phosphate) fertilizer was done in a rotation of 1 time.2 weeks-1 at a dose of 10 g.polybag-1. Soil analysis and experiments were conducted at the Soil Laboratory, Indonesian Oil Palm Research Institute (IOPRI or PPKS) Medan, and the Soil, Plant, Fertilizer and Water Laboratory at the Institute for Agricultural Technology (IAT or BPTP) Johor, Medan, North Sumatra.

Research observations and research indicators from the beginning and end of the study can be seen, at the beginning of the study are soil physical properties, namely Soil Texture (%), soil chemical properties consisting of Soil C-Organic (%), N-Total (%), P2O5-avl (P-Bray-I) (ppm P), Potential K2O Ex. HCl 25% (me.100 g-1), Cation Exchange Capacity (CEC) (me.100 g-1), Soil Acidity Potential of Hydrogen (pH) H2O, Al-dd (me.100 g-1), Al Saturation (%), Ca-dd (me.100 g-1), K-dd (me.100 g-1), Mg-dd (me.100 g-1), Na-dd (me.100 g-1), MnO Ex. HCl 25% (%), at the end of the study consisted of soil chemical properties namely Soil C-Organic (%), N-Total (%), P2O5-avl (P-Bray-I) (ppm P), Potential K2O Ex. HCl 25% (me.100 g-1), Cation Exchange Capacity (CEC) (me.100 g-1), Soil Acidity (pH) H2O.

3. Results and Discussion

3.1. Results of Analysis of Physical and Chemical Properties of Ultisol Soil

a. Initial Soil Analysis – Ultisol Soil

To determine the characteristics of planting media on Ultisol Soil, an initial analysis of the quality and fertility of Ultisol soil was conducted. The following Table 1 lists the results of the initial soil analysis on Ultisol soil, as follows:

Table 1. Preliminary Soil Analysis Results – Ultisol Soil

Texture	Method of Analysis	Units	Results	Description
Sand	Hydrometer	%	18,10	*Dusty Clay*
Dust			41,20	
Clay			59,11	
Analysis	**Method of Analysis**	**Units**	**Results**	**Description**
C-Organic	Spectrofotometry	%	1,78	l
N-Total	Kjedhal	%	0,33	m
P_2O_5 (P-Bray I)	Spectrofotometry	ppm P	4,98	vl
K_2O - Potential Ex. HCl 25%	AAS/Asam Acetat 1 N	me.100 g^{-1}	0,29	vl
CEC	Volumetry/NaCl 10%	me.100 g^{-1}	13,78	l
pH H_2O	Elektrometry	-----	4,6	*Sour*
Al Saturation	Titrymetry	%	0	nm
Al-dd		me.100 g^{-1}	0	nm
Ca-dd	AAS/Asam Acetat 1 N	me.100 g^{-1}	4,39	l
Mg-dd			0,77	l
K-dd			0,27	l
MnO Ex. HCl 25%	Spectrofotometry	%	0,31	h

Description: Criteria for Planting Media, h = High, l = Low, m = Medium, sl = Slightly Low, vl = Very Low, vh = Very High, n = Neutral, nm = Not Measurable

The results of the initial soil analysis on Ultisol Soil showed that the texture of Ultisol soil is Dusty Clay, where the Sand fraction is 18.10%, the dust fraction is 41.20%, and the clay fraction is 59.11%. It can be concluded that the texture of the Ultisol soil is known to contain more clay fraction, so that higher clay content allows the roots of plants that grow to be inhibited in their development, so it is necessary to add organic matter. According to Nazir et al. (2017) that, soil acidity is closely related to the pattern of nutrient availability in the soil, so that most nutrients result will rarely dissolve and become inhibited for plants and have a high level of acidity. According to Riskiyanto (2023) in his research, that the application of organic matter needs to be done on soils that have clay or clayey loam soil texture, and sandy in order to keep the soil texture healthy and can be a growing medium for plants, while according to Yosephine et al. (2022) that, it is known that the addition of organic matter to Ultisol soil will make the weakening and structure of Ultisol soil more crumbly, so that plant roots can penetrate and search for water and mineral nutrients in the soil.

In the observation of soil chemical analysis, it is known that the soil C-Organic content in Ultisol Soil is classified as low with a result of 1.78%, soil nitrogen (N) content is classified as medium with a content of 0.33%, P2O5 content (P-Bray I) with a result of 4.98 ppm P with very low criteria, K2O-Potential Ex. HCl 25% with a result of 0.29 me.100 g-1 with very low criteria, soil Cation Exchange Capacity (CEC) content with a result of 13.78 me.100 g-1 with low criteria, and soil acidity (pH) is classified as acid with a result of 4.6. In the analysis of soil acidity (pH) that, soil acidity that can and plants can grow is with pH 5.5 - 7.0, because microorganisms such as bacteria and fungi can breed well in the soil and play a role in breaking down organic matter in the soil (Neina, 2019).

The lack of nitrogen (N) in the soil makes plant growth stunted, and a minimum of 0.31% is available that can be absorbed by plants, the low phosphorus content in the soil is influenced by the presence of acidic pH, unavailable organic matter and dense soil texture, and the low potassium content in Ultisol soil because the potassium content is easily lost washed or carried away by water so that the efficiency of potassium fertilization is quite low.

This states that there is a need to increase and improve the nutrients in Ultisol soil related to the fertility and health of Ultisol soil for plant growth. in increasing and providing organic matter into Ultisol soil can be in the form of solid or liquid organic matter, this can make an increase in nutrients in Ultisol soil. Organic matter plays a very important role in improving soil fertility in maintaining the physical, chemical and biological properties of the soil and increasing fertility to make it more fertile and crumbly for plants. According to Hasibuan (2015), the application and application of organic matter directly into the soil can increase soil organic carbon, soil acidity value (pH), soil N-Total content and reduce soil C/N ratio.

In the observation of ion exchange nutrients that aluminium (Al) levels with unreadable results, (Calcium) Ca-dd levels with results of 4.39 me.100 g-1 is classified as low, (Potassium) K-dd levels with results of 0.27 me.100 g-1 is classified as low and Mg-dd levels with results of 0.77 me.100 g-1 is classified as low. This is because the availability of nutrients is closely related to the presence of nutrient ions, in some nutrients that are in small amounts and lower amounts of K and Mg, the nutrient levels are more difficult to absorb by plants (Hasibuan & Nasution, 2023).

3.2. Soil Analysis Results – C-Organic Testing (%)

To determine the characteristics of planting media on Ultisol soil, the final analysis of the quality and fertility of Ultisol soil that has been applied is carried out. The following Table 2 lists the results of the final soil analysis on Ultisol soil, as follows:

Table 2. Final Analysis Results of Ultisol Soil – C-Organic (%)

Liquid Organic Treatment	Dosage Rate	C-Organic
	ml.polybag^{-1}	%
MoL *Glysine max* Dregs + Coconut Milk	100 + 100	4,69 h
	100 + 200	4,77 h
MoL *Glysine max* Dregs + Degan Coconut Water	100 + 100	4,70 h
	100 + 200	4,75 h
MoL *Glysine Max* Dregs + Coconut Milk + Degan Coconut Water	100 + 100 + 100	5,89 h
	100 + 200 + 200	6,12 vh
Coconut Milk + Degan Coconut Water	100 + 100	5,12 h
	200 + 200	5,89 h
MoL *Glysine Max* Dregs	100	4,33 h
	200	4,57 h

Description: Criteria for Planting Media, h = High, l = Low, m = Medium, sl = Slightly Low, vl = Very Low, vh = Very High, n = Neutral, nm = Not Measurable

In Table 2, the analysis of soil organic carbon (C-Organic) showed that the higher organic content was the level with the formulation of Local Microorganisms (MoL) Glysine max Dregs 100 ml.polybag-1 + Coconut Milk 200 ml.polybag-1 + Degan Coconut Water 200 ml.polybag-1 with a result of 6.12%. The result was different from the application of the formulation of Local Microorganisms (MoL) Glysine max dregs 100 ml.polybag-1 + Coconut Milk 100 ml.polybag-1 + Degan Coconut Water 100 ml.polybag-1 with a result of 5.89%. With higher levels of liquid organic application, the soil quality will be better too. This is because C-Organic content determines the quality of Ultisol soil, where the higher the C-Organic content, the better the soil quality. According to Siregar (2017) in Hanafiah (2019) that organic matter determines soil fertility, where the presence of organic matter, the C-Organic content in the soil will be better and the soil will be better.

3.3. Soil Analysis Results – N-Total Testing (%)

To determine the characteristics of planting media on Ultisol soil, the final analysis of the quality and fertility of Ultisol soil that has been applied is carried out. The following Table 3 lists the results of the final soil analysis on Ultisol soil, as follows:

Table 3. Final Analysis Results of Ultisol Soil – N-Total (%)

Liquid Organic Treatment	Dosage Rate	N-Total
	ml.polybag^{-1}	%
MoL *Glysine max* Dregs + Coconut Milk	100 + 100	0,57 h
	100 + 200	0,58 h
MoL *Glysine max* Dregs + Degan Coconut Water	100 + 100	0,58 h
	100 + 200	0,59 h
MoL *Glysine Max* Dregs + Coconut Milk + Degan Coconut Water	100 + 100 + 100	0,79 h
	100 + 200 + 200	0,78 h
Coconut Milk + Degan Coconut Water	100 + 100	0,58 h
	200 + 200	0,59 h
MoL *Glysine Max* Dregs	100	0,51 h
	200	0,54 h

Description: Criteria for Planting Media, h = High, l = Low, m = Medium, sl = Slightly Low, vl = Very Low, vh = Very High, n = Neutral, nm = Not Measurable

In Table 3, it is explained that the content of Total Soil Nitrogen (N-Total) in Ultisol soil is the highest result in the formulation of Local Microorganisms (MoL) Dregs of Glysine max 100 ml.polybag-1 + Coconut Milk 100 ml.polybag-1 + Degan Coconut Water 100 ml. polybag-1 with a result of 0.79% while at higher doses in the formulation of Local Microorganisms (MoL) Glysine max dregs 100 ml.polybag-1 + Coconut Milk 200 ml.polybag-1 + Degan Coconut Water 200 ml.polybag-1 with a result of 0.78%.

The total nitrogen content of the soil has been fulfilled at a normal dose rather than more or slightly below. Because most of the nitrogen content in the soil will make plant growth not good in its growth and development, both in the roots, and leaves that quickly fall off easily. This is conveyed by Lubis (2025) that, with a high N-Total content, the absorption of nutrients by plant roots will be better. According to Yosephine et al. (2022) that, low nitrogen content in the soil will inhibit plant growth and development, because nitrogen levels have the main function of synthesising chlorophyll and amino acids.

Total soil nitrogen content in the application of Coconut Milk + Degan Coconut Water Glysine max dregs with a high dose gets a result of 0.54%. This states that liquid organic applied either mixed formulation or single is able to increase the total soil nitrogen content in Ultisol Soil.

3.4. Soil Analysis Results – P2O5 (P-Bray I) Testing (ppm P)

To determine the characteristics of planting media on Ultisol soil, the final analysis of the quality and fertility of Ultisol soil that has been applied is carried out. The following Table 4 lists the results of the final soil analysis on Ultisol soil, as follows:

Table 4. Final Analysis Results of Ultisol Soil – P2O5 (P-Bray I) (ppm P)

Liquid Organic Treatment	Dosage Rate ml.polybag^{-1}	P_2O_5 (P-Bray I) ppm P
MoL *Glysine max* Dregs + Coconut Milk	100 + 100	8,67 m
	100 + 200	8,69 m
MoL *Glysine max* Dregs + Degan Coconut Water	100 + 100	8,91 m
	100 + 200	8,92 m
MoL *Glysine Max* Dregs + Coconut Milk + Degan Coconut Water	100 + 100 + 100	10,45 m
	100 + 200 + 200	11,78 h
Coconut Milk + Degan Coconut Water	100 + 100	9,69 m
	200 + 200	9,88 m
MoL *Glysine Max* Dregs	100	8,54 m
	200	8,66 m

Description: Criteria for Planting Media, h = High, l = Low, m = Medium, sl = Slightly Low, vl = Very Low, vh = Very High, n = Neutral, nm = Not Measurable

In the observation of soil analysis, it is known in Table 4 that the higher soil Phosphor levels with a result of 11.78 ppm P in the application of the formulation of Local Microorganisms (MoL) of Glysine max dregs 100 ml.polybag-1 + Coconut Milk 200 ml.polybag-1 + Degan Coconut Water 200 ml.polybag-1. Basically, the application of organic materials in the form of liquid into Ultisol soil can increase the fertility of Ultisol soil and add Phosphorus nutrients that are lacking in Ultisol soil.

The element of phosphorus (P) plays a role in stimulating plant root growth. the importance of phosphorus (P) nutrients in the application of organic materials in the form of liquid or solid into Ultisol soil is due to the very low levels of phosphorus in Ultisol soil.

The content of phosphorus also has problems in its availability in the soil, namely one of the problems in the level of soil acidity (pH), the availability of soil organic matter, and soil texture which

greatly determines soil quality. According to Hadi et al. (2014) that, excessive availability of phosphorus in the soil is also not good, because it will be a problem. The availability of little phosphorus is also a problem because it will affect the plants, so in this case increasing the P content must first be done by applying the right organic material and applying P fertilizer so that its availability is sufficient.

3.5. Soil Analysis Results – K2O-Potential Ex. HCl 25% Testing (me.100 g-1)

To determine the characteristics of planting media on Ultisol soil, the final analysis of the quality and fertility of Ultisol soil that has been applied is carried out. The following Table 5 lists the results of the final soil analysis on Ultisol soil, as follows:

Table 5. Final Analysis Results of Ultisol Soil – K2O-Potential Ex. HCl 25% (me.100 g-1)

Liquid Organic Treatment	Dosage Rate	K_2O-Potential Ex. HCl 25%
	ml.polybag^{-1}	me.100 g^{-1}
MoL *Glysine max* Dregs + Coconut Milk	100 + 100	0,67 m
	100 + 200	0,79 m
MoL *Glysine max* Dregs + Degan Coconut Water	100 + 100	1,12 h
	100 + 200	1,21 h
MoL *Glysine Max* Dregs + Coconut Milk + Degan Coconut Water	100 + 100 + 100	1,33 h
	100 + 200 + 200	1,49 h
Coconut Milk + Degan Coconut Water	100 + 100	1,12 h
	200 + 200	1,27 h
MoL *Glysine Max* Dregs	100	0,51 m
	200	0,59 m

Description: Criteria for Planting Media, h = High, l = Low, m = Medium, sl = Slightly Low, vl = Very Low, vh = Very High, n = Neutral, nm = Not Measurable

Potassium analysis results can be seen in Table 5 where, the highest potassium nutrient levels in the application of the formulation of Local Microorganisms (MoL) Glysine max dregs 100 ml.polybag-1 + Coconut Milk 200 ml.polybag-1 + Degan Coconut Water 200 ml.polybag-1 with the results of 1.49 me.100 g-1. The influence of the element potassium (K) is very important for soil fertility and plants, which in the soil can be influenced by soil parent material. Potassium (K) nutrient has a mobile nature in the soil which means it moves so that it is easily lost and washed away by water. So that the K content in the soil is easily lost. So that potassium (K) levels are more applied to organic or inorganic fertilizers to maintain the stability of potassium nutrients in the soil, while in plants it strengthens plant growth so that plants do not fall easily.

According to Lubis (2023) stated that, the effect of potassium (K) concentration on soil that has low fertility is very influential, so it is necessary to add organic matter to the soil. Potassium concentration in organic matter is sufficient to add potassium (K) nutrients that are deficient in the soil.

3.6. Soil Analysis Results – Cation Exchange Capacity Testing (me.100 g-1)

To determine the characteristics of planting media on Ultisol soil, the final analysis of the quality and fertility of Ultisol soil that has been applied is carried out. The following Table 6 lists the results of the final soil analysis on Ultisol soil, as follows:

Table 6. Final Analysis Results of Ultisol Soil – Cation Exchange Capacity (me.100 g-1)

Liquid Organic Treatment	Dosage Rate	Cation Exchange Capacity
	ml.polybag^{-1}	me.100 g^{-1}
MoL *Glysine max* Dregs + Coconut Milk	100 + 100	18,92 m
	100 + 200	24,10 m
MoL *Glysine max* Dregs + Degan Coconut Water	100 + 100	24,87 m
	100 + 200	25,16 h
MoL *Glysine Max* Dregs + Coconut Milk + Degan Coconut Water	100 + 100 + 100	25,88 h
	100 + 200 + 200	27,69 h
Coconut Milk + Degan Coconut Water	100 + 100	17,33 m
	200 + 200	17,90 m
MoL *Glysine Max* Dregs	100	17,15 m
	200	17,19 m

Description: Criteria for Planting Media, h = High, l = Low, m = Medium, sl = Slightly Low, vl = Very Low, vh = Very High, n = Neutral, nm = Not Measurable

In the results of laboratory analysis that, can be seen in Table 6, where the Cation Exchange Capacity (CEC) which has the largest value is in the test formulation of Local Microorganisms (MoL) of Glysine max Dregs 100 ml.polybag-1 + Coconut Milk 200 ml.polybag-1 + Degan Coconut Water 200 ml.polybag-1 with a result of 27.69 me.100 g-1 in high criteria. These results are not much different from the application of the formulation of Local Microorganisms (MoL) of Glysine max dregs 100 ml.polybag-1 + Coconut Milk 100 ml.polybag-1 + Degan Coconut Water 100 ml.polybag-1 with a result of 25.88 me.100 g-1 in high criteria and also in the formulation of Local Microorganisms (MoL) of Glysine max Dregs 100 ml.polybag-1 + Degan Coconut Water 100 ml.polybag-1 with a result of 25.16 me.100 g-1 with high criteria.

So, with these results, it is stated that the CEC content in the soil has been fulfilled due to the application of liquid organic matter given. According to Fahlei et al. (2017) that, applied organic matter can increase soil fertility, both physically, chemically and biologically, so that the application of formulated liquid organic matter of Glysine max dregs can increase macro, micro nutrients and soil cation exchange capacity.

3.7. Soil Analysis Results – Soil Acidity (pH) Testing

To determine the characteristics of planting media on Ultisol soil, the final analysis of the quality and fertility of Ultisol soil that has been applied is carried out. The following Table 7 lists the results of the final soil analysis on Ultisol soil, as follows:

Table 7. Final Analysis Results of Ultisol Soil – Soil Acidity

Liquid Organic Treatment	Dosage Rate	potential of Hydrogen (pH)
	ml.polybag^{-1}	-----
MoL *Glysine max* Dregs + Coconut Milk	100 + 100	5,6
	100 + 200	5,8
MoL *Glysine max* Dregs + Degan Coconut Water	100 + 100	5,8
	100 + 200	5,9
MoL *Glysine Max* Dregs + Coconut Milk + Degan Coconut Water	100 + 100 + 100	6,2
	100 + 200 + 200	6,5
Coconut Milk + Degan Coconut Water	100 + 100	5,9
	200 + 200	5,9
MoL *Glysine Max* Dregs	100	5,6
	200	5,6

In the results of the soil acidity (pH) analysis test on Ultisol soil applied with liquid organic matter, the highest level of soil acidity increase was in the formulation of Local Microorganisms (MoL) Dregs of Glysine max 100 ml.polybag-1 + Coconut Milk 200 ml.polybag-1 + Degan Coconut Water 200 ml. polybag-1 with a soil acidity result of 6.5 but not much different from the formulation of Local Microorganisms (MoL) of Glysine max Dregs 100 ml.polybag-1 + Coconut Milk 100 ml.polybag-1 + Degan Coconut Water 100 ml.polybag-1 with a soil acidity result of 6.2.

pH (potential of Hydrogen) or soil acidity is one of the factors that can determine soil fertility which determines the solubility of nutrients in the soil. According to Dhaliwal et al. (2019), the availability of nutrients both in macro and micro nutrients in the soil is strongly influenced by soil pH. The opinion of Mao et al. (2017) states that soils that have high soil acidity (>7.0) can cause P fixation thus reducing the availability of nutrients for plants.

4. Conclusion

In this study, it was found that the application of Local Microorganisms (MoL) consisting of Glycine max dregs (100 ml polybag^{-1}), coconut milk (200 ml polybag^{-1}), and young coconut water (200 ml polybag^{-1}) is effective in meeting the nutrient requirements of Ultisol soil. This combination provides an optimal nutrient balance for plant growth. However, when applied in lower or higher quantities than the recommended dosage, it results in nutrient imbalance, either deficiency or excess. In the case of over-application, nutrients are not effectively absorbed by plants and may instead be leached out through irrigation, leading to environmental waste and inefficiency.

Future researchers are encouraged to explore the long-term effects of MoL application on soil microbial activity and structure, as well as its impact on different plant species. Additionally, studies could investigate the effectiveness of varying application intervals and combinations with other organic amendments to optimize nutrient uptake and minimize nutrient leaching. Testing the formulation on other soil types beyond Ultisol would also help in understanding its broader applicability.

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