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EFFECTIVENESS OF LOCAL MICROORGANISMS FROM *MUSA PARADISIACA* DREGS FORMULATION WITH COCONUT MILK AND DEGAN COCONUT WATER AS A TEST FOR THE EFFECT OF INCEPTISOL SOIL FERTILITY

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Abstract. *The application of a mixture of Coconut Milk and Degan Coconut Water formulated with Musa paradisiaca Dregs can improve the fertility and health of Inceptisol soils which are nutrient deficient or nutrient poor in Inceptisol soils. The use of the three ingredients has important potential as the effectiveness of soil fertility, and the impact on soil health. Musa paradisiaca 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 Musa paradisiaca dregs, coconut milk and Degan coconut water can potentially increase the fertility of Inceptisol soil and can create liquid organic fertilizer as an environmentally friendly and effective fertilizer in applying to soil and plants.*

Keywords: *Musa paradisiaca, Inceptisol, Coconut Milk, Degan Coconut Water, Dregs.*

Abstrak. Penerapan campuran Santan Kelapa dan Air Kelapa Degan yang diformulasikan dengan ampas *Musa paradisiaca* dapat meningkatkan kesuburan dan kesehatan tanah Inceptisol yang kekurangan nutrisi atau miskin nutrisi. Penggunaan ketiga bahan ini memiliki potensi penting dalam meningkatkan kesuburan tanah dan

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dampaknya terhadap kesehatan tanah. Ampas *Musa paradisiaca* mengandung nutrisi yang kaya, yaitu nitrogen (N), fosfor (P), dan kalium (K), sementara santan kelapa mengandung nutrisi penting dan hormon pertumbuhan yang dapat mendukung pertumbuhan tanaman, sedangkan air kelapa Degan juga mengandung nutrisi yang kaya, serta mengandung hormon sitokinin yang berperan penting dalam merangsang pembelahan sel dan pertumbuhan akar tanaman. Kesimpulannya, ampas *Musa paradisiaca*, santan kelapa, dan air kelapa Degan berpotensi meningkatkan kesuburan tanah Inceptisol dan dapat dijadikan pupuk organik cair sebagai pupuk ramah lingkungan dan efektif dalam aplikasi pada tanah dan tanaman.

Kata Kunci: *Musa paradisiaca*, Inceptisol, Santan Kelapa, Air Kelapa Degan, Ampas.

INTRODUCTION

Soil is a medium for plant growth and also supports plant growth and production. Fertile and healthy soil is an indicator of soil that has sufficient nutrients (Mpapa, 2016 in A'yun *et al*., 2022). Inceptisol soils can also be classified as soils with enormous potential that can support agricultural production in Indonesia. Inceptisol soils also have nutrient levels ranging from low to high, as well as easily leached surface layers and highly unstable soil aggregates. According to Lubis (2025), Inceptisol soil has a moderately slow permeability rate, low organic matter content, low to moderate soil acidity (pH) levels, and a fairly high clay content in the Inceptisol soil fraction. Inceptisol is one of the dominating soil types in Indonesia. The dominance of Inceptisol soil has largely led to its own achievements, namely the achievement of agricultural and plantation productivity. In general, Inceptisol soil has not been handled properly, therefore, in increasing the productivity of yellow red podzolic soil or commonly referred to as Inceptisol, it is necessary to add organic matter to the soil (Lubis, 2020; Yosephine *et al*., 2022).

Inceptisol 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*. (2016) that Inceptisol soils are characterised by: low organic content, low macro-nutrients and have very low availability of phosphorus (P). According to Mulyani *et al*. (2015) that, 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 Inceptisoll 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%. According to the results of research by Dhani *et al*. (2014) in Maftuh *et al*. (2025), the range of organic carbon (C-Organic) levels, cation exchange capacity (CEC) and base saturation in Inceptisol soils means that soil fertility levels are very important to consider, as the ability of the soil to provide nutrients is often constrained in agricultural yields. Another constraint, besides nutrient levels in Inceptisol soil, is the complexity of absorption, which is dominated by Mg and Ca ions, resulting in relatively low potassium (K) ion content. This makes it imperative to improve the physical and chemical properties of Inceptisol soil so that it can be utilised to increase agricultural production in Indonesia (Dhaliwal *et al*., 2019; Lubis, 2025).

The content of Local Microorganisms (MoL) from *Musa paradisiaca* 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*. (2016), the advantage of using *Musa paradisiaca* 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 *Musa paradisiaca* and coconut milk and Degan coconut water are formulated together and applied to the level of Inceptisol soil fertility. The results of research by Sagay *et al*. (2020) in Sunanda *et al*. (2019) and Jasanuddes (2019) show that the nutrient content of Inceptisol soil can be increased by applying 450 $g.plant^{-1}$ of kapok banana peel compost plant showed a significant effect in improving the physical and chemical properties of

Inceptisol soil, increasing the water content to 24.77% and increasing the pH of Inceptisol soil to slightly acidic with a value of 5.68.

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 June 2025 to August 2025. The soil used is Top Soil with Inceptisol Soil type taken at the Aek Pancur Palm Oil Nursery, Tanjung Morawa, North Sumatra. In this study using a Factorial Randomised Group Design (RGD) where Factor 1 is the MoL *Musa paradisiaca* + Coconut Milk Formulation with 2 levels of treatment, namely Level 1 is G_1 100 ml.polybag^{-1} + C_1 100 ml.polybag^{-1} with code (G_1C_1), Level 2 is G_1 100 ml.polybag^{-1} + C_2 200 ml. polybag^{-1} with code (G_1C_2), Factor 2 is MoL *Musa paradisiaca* Formulation + Degan Coconut Water with 2 Treatment Levels, namely Level 1 is G_1 100 ml.polybag^{-1} + D_1 100 ml.polybag^{-1} with code (G_1D_1), Level 2 is G_1 100 ml. polybag^{-1} + D_2 200 ml.polybag^{-1} with the code (G_1D_2), Factor 3 is the MoL Formulation of *Musa paradisiaca* + Coconut Milk + Degan Coconut Water with 2 levels of treatment, namely Level 1 is G_1 100 ml. polybag^{-1} + C_1 100 ml.polybag^{-1} + D_1 100 ml.polybag^{-1} with code ($G_1C_1D_1$), Level 2 is G_1 100 ml.polybag^{-1} + C_2 200 ml.polybag^{-1} + D_2 200 ml.polybag^{-1} with code ($G_1C_2D_2$), Factor 4 is Coconut Milk + Degan Coconut Water Formulation with 2 treatment levels, namely Level 1 is C_1 100 ml. polybag^{-1} + D_1 100 ml.polybag^{-1}, Level 2 is C_2 200 ml.polybag^{-1} + D_2 200 ml.polybag^{-1}, Factor 5 is the application of Local Microorganisms (MoL) *Musa paradisiaca* with 2 treatment levels, namely Level 1 is G_1 100 ml.polybag^{-1}, Level 2 is G_2 200 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 (%), P_2O_5-avl (P-Bray-I) (ppm P), Potential K_2O Ex. HCl 25% (me.100 g^{-1}), Cation Exchange Capacity (CEC) (me.100 g^{-1}), Soil Acidity *Potential of Hydrogen* (pH) H_2O, 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 (%), P_2O_5-avl (P-Bray-I) (ppm P), Potential K_2O Ex. HCl 25% (me.100 g^{-1}), Cation Exchange Capacity (CEC) (me.100

RESULTS AND DISCUSSION

Results of Analysis of Physical and Chemical Properties of Inceptisol Soil

1. Initial Soil Analysis – Inceptisol Soil

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

Table 1. Preliminary Soil Analysis Results – Inceptisol Soil

Texture	**Method of Analysis**	**Units**	**Results**	**Description**
Sand Dust Clay	Hydrometer	%	18,10 41,20 59,11	*Dusty Clay*
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 Inceptisol Soil showed that the texture of Inceptisol 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 Inceptisol 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 Inceptisol soil will make the weakening and structure of Inceptisol 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, Inceptisol 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%, P_2O_5 content (P-Bray I) with a result of 4.98 ppm P with very low criteria, K_2O-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 (Novizan *et al*., 2018; Hadad *et al*., 2018). 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 Inceptisol 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 Inceptisol soil related to the fertility and health of Inceptisol soil for plant growth. in increasing and providing organic matter into Inceptisol soil can be in the form of solid or liquid organic matter, this can make an increase in nutrients in Inceptisol 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 (Leiwakabessy *et al*., 2002; Hasibuan, 2023 in Lubis, 2023).

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

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

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

Liquid Organic Treatment	Dosage Rate ml.polybag^{-1}	C-Organic %
MoL *Musa paradisiaca* Dregs + Coconut Milk	100 + 100	4,69 h
	100 + 200	4,77 h
MoL *Musa paradisiaca* Dregs + Degan Coconut Water	100 + 100	4,70 h
	100 + 200	4,75 h
MoL *Musa paradisiaca* 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 *Musa paradisiaca* 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) *Musa paradisiaca* 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) *Musa paradisiaca* 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 Inceptisol 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. Soil Analysis Results – N-Total Testing (%)

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

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

Liquid Organic Treatment	Dosage Rate ml.polybag^{-1}	N-Total %
MoL *Musa paradisiaca* Dregs + Coconut Milk	100 + 100	0,57 h
	100 + 200	0,58 h
MoL *Musa paradisiaca* Dregs + Degan Coconut Water	100 + 100	0,58 h
	100 + 200	0,59 h
MoL *Musa paradisiaca* 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 *Musa paradisiaca* 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 Inceptisol soil is the highest result in the formulation of Local Microorganisms (MoL) Dregs of *Musa paradisiaca* 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) *Musa paradisiaca* 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 (2020) 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 + *Musa paradisiaca* 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 Inceptisol Soil. The results of the analysis of the N-Total Soil Inceptisol test showed better results and good nutrient status for plant growth and usability.

4. Soil Analysis Results – P_2O_5 (P-Bray I) Testing (ppm P)

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

Table 4. Final Analysis Results of Inceptisol Soil – P_2O_5 (P-Bray I) (ppm P)

Liquid Organic Treatment	Dosage Rate	P_2O_5 (P-Bray I)
	ml.polybag^{-1}	ppm P
MoL *Musa paradisiaca* Dregs + Coconut Milk	100 + 100	8,67 m
	100 + 200	8,69 m
MoL *Musa paradisiaca* Dregs + Degan Coconut Water	100 + 100	8,91 m
	100 + 200	8,92 m
MoL *Musa paradisiaca* 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 *Musa paradisiaca* 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 *Musa paradisiaca* 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 Inceptisol soil can increase the fertility of Inceptisol soil and add Phosphorus nutrients that are lacking in Inceptisol 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 Inceptisol soil is due to the very low levels of phosphorus in Inceptisol 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*. (2016) 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.

5. Soil Analysis Results – K_2O-Potential Ex. HCl 25% Testing (me.100 g^{-1})

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

Table 5. Final Analysis Results of Inceptisol Soil – K_2O-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 *Musa paradisiaca* Dregs + Coconut Milk	100 + 100	0,67 m
	100 + 200	0,79 m
MoL *Musa paradisiaca* Dregs + Degan Coconut Water	100 + 100	1,12 h
	100 + 200	1,21 h
MoL *Musa paradisiaca* 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 *Musa paradisiaca* 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) *Musa paradisiaca* 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 (2025) in Widiowati *et al*. (2017) 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. According to Paying & Lempang (2018) in Hasibuan & Nasution (2023), the K_2O (potassium) content will increase when there is mixing between the materials, so that the addition of potassium nutrients will also increase.

6. Soil Analysis Results – Cation Exchange Capacity Testing (me.100 g^{-1})

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

Table 6. Final Analysis Results of Inceptisol Soil – Cation Exchange Capacity (me.100 g^{-1})

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

Description: Criteria for Planting Media, h = High, l = Low, m = Medium, sl = Slightly Low, l = 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 *Musa paradisiaca* 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 *Musa*

paradisiaca 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 *Musa paradisiaca* Dregs 100 ml.polybag^{-1} + Degan Coconut Water 100 ml.polybag^{-1} with a result of the 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 *Musa paradisiaca* dregs can increase macro, micro nutrients and soil cation exchange capacity.

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

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

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

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

In the results of the soil acidity (pH) analysis test on Inceptisol soil applied with liquid organic matter, the highest level of soil acidity increase was in the formulation of Local Microorganisms (MoL) Dregs of *Musa paradisiaca* 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 *Musa paradisiaca* 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 Soemarno (2017), the availability of nutrients both in macro and micro nutrients in the soil is strongly influenced by soil pH. The opinion of Soomro *et al*. (2016) states that soils that have high soil acidity (>7.0) can cause P fixation thus reducing the availability of nutrients for plants.

CONCLUSION

In this treatment, it was found that the application of Local Microorganisms (MoL) from *Musa paradisiaca* Dregs had a significant effect, and the application of coconut milk and coconut water also had a significant effect on the fertility of Inceptisol soil. In conclusion, this study found that the application of Local Microorganisms (MoL) from *Musa paradisiaca* Dregs at 100 ml.polybag^{-1}, combined with Coconut Milk at 200 ml.polybag^{-1} and Degan Coconut Water 200 ml.polybag^{-1}, can meet the nutritional requirements of Inceptisol soil and provide adequate nutrition in Inceptisol soil. It is known that Inceptisol soil has very low nutrient levels to meet standard soil health criteria. However, at application rates lower than or higher than the specified dose, the soil will experience nutrient excess, so that nutrients are not absorbed by plants but are washed away by irrigation water. In soil acidity (pH) observations, it was found that the soil acidity level had reached neutral at 6.5 in Inceptisol soil.

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