



APPLICATION OF *Ananas comosus* (L.) Merr. EXTRACT WITH LOCAL MICROORGANISM FORMULATION *Solanum lycopersicum* (L.) AND *Saccharum officinarum* Linn. BAGASSE IN ORGANOSOL SOIL MEDIUM ON THE GROWTH OF *Brassica oleracea* (L.) *Alboglabra* Group PLANTS

PENERAPAN EKSTRAK ANANAS *comosus* (L.) Merr. DENGAN FORMULASI MIKROORGANISME LOKAL *Solanum lycopersicum* (L.) DAN BAGASSE *Saccharum officinarum* Linn. DI MEDIO TANAH ORGANOSOL DALAM PERTUMBUHAN TANAMAN DARI KELOMPOK *Alboglabra Brassica oleracea* (L.)

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Abstract

Organosol soil has a very high content, but has a low soil acidity (pH) (acidic). As well as the occurrence of very slow decomposition of organic matter. The treatment with *Ananas comosus* (L.) Merr. extract, which contains bioactive compounds such as bromelain enzymes, organic acids, and simple sugars, can accelerate the decomposition of organic matter and support the activity of soil microorganisms. The Local Microorganisms (MoL) applied, such as *Solanum lycopersicum* (L.) and *Saccharum officinarum* Linn., contain various functional microbes such as *Lactobacillus* sp., *Saccharomyces* sp., and *Azotobacter* sp., which play a role in nitrogen fixation, phosphate solubilisation, and organic matter decomposition. Overall, the results of research and observations conducted on Organosol soil media treated with *Ananas comosus* (L.) Merr. extract with the addition of Local Microorganisms (MoL) *Solanum lycopersicum* (L.) and *Saccharum officinarum* Linn. has been proven to effectively improve the chemical properties and fertility of Organosol soil through its role in increasing microbial activity and accelerating the decomposition of organic matter. This indicates that innovations in the application of fruit and the role of local microorganisms have the potential to be developed as environmentally friendly technologies for sustainable soil management.

Keywords : *Ananas comosus*, *Solanum lycopersicum*, *Saccharum officinarum*, Organosol.



Abstrak

Tanah Organosol memiliki kadar kandungan yang sangat tinggi, namun memiliki kadar kemasaman tanah (pH) yang rendah (Masam). Serta terjadinya dekomposisi bahan organik yang sangat lambat. Pada perlakuan ekstrak Ananas comosus (L.) Merr. yang dimana mengandung senyawa bioaktif seperti enzim bromelin, asam organik, dan gula sederhana yang dapat mempercepat terjadinya proses dekomposisi bahan organik serta terjadinya daya dukungan terhadap aktivitas mikroorganisme tanah. Mikroorganisme Lokal (MoL) yang diaplikasikan seperti *Solanum lycopersicum* (L.) dan *Saccharum officinarum* Linn. mengandung berbagai mikroba fungsional seperti *Lactobacillus* sp., *Saccharomyces* sp., dan *Azotobacter* sp. yang berperan dalam fiksasi nitrogen, pelarutan fosfat, dan penguraian bahan organik. Secara keseluruhan pada hasil penelitian dan pengamatan yang terjadi di media tanah Organosol yang diaplikasikan Ekstrak Ananas comosus (L.) Merr. dengan tambahan Mikroorganisme Lokal (MoL) *Solanum lycopersicum* (L.) dan *Saccharum officinarum* Linn. terbukti secara efektif dapat memperbaiki sifat kimia serta dapat memperbaiki kesuburan tanah Organosol melalui peran mekanisme dalam peningkatan aktivitas mikroba dan percepatan dekomposisi bahan organik yang terjadi. Hal ini mengindikasikan bahwa inovasi dalam aplikasi buah dan peran mikroorganisme local berpotensi dikembangkan sebagai teknologi yang ramah lingkungan untuk pengelolaan tanah secara berkelanjutan.

Kata Kunci : Ananas comosus, *Solanum lycopersicum*, *Saccharum officinarum*, Organosol.

1. INTRODUCTION

Local Microorganisms (MoL) is a solution produced from the fermentation of natural materials derived from agriculture and household waste. Local microorganisms (MoL) contain various important components in their composition and are very beneficial for plants, one of which is carbohydrates, glucose and microorganisms (Palupi, 2015 in Rahyuni et al., 2023).

MoL solution contains several primary macro nutrients such as nitrogen (N), phosphorus (P), and potassium (K). Other components include micro nutrients such as Calcium (Ca), Magnesium (Mg), Iron (Fe), Manganese (Mn), and Zinc (Zn), as well as plant growth regulators (PGRs) such as Auxin, Gibberellin, and Cytokinin (Lubis, 2025; Lubis, 2026).

Salim and Sriharti (2008) also argue that Local Microorganisms (MoL) can accelerate compost maturation, which means that bacteria play a role in accelerating the maturation process of raw organic materials so that they can be accepted by the soil and plants (Rahyuni et al., 2023; Lubis, 2025).

According to Wahyuni et al. (2016), local microorganisms (MoL) from Ananas comosus (L.) Merr. fruit extract are essentially capable of improving soil fertility or enhancing soil capability. This is consistent with the research and opinion of Mandasari. (2020) in Putri (2023) that the wise use of organic waste made from vegetable or fruit residues can improve and enhance soil capability and texture. According to Salim and Srinarti (2008) in Lubis (2025), local microorganisms (MoL) can function and accelerate compost maturation, where bacteria in MoL act as decomposers that break down unavailable organic matter into available forms in the soil.

Solanum lycopersicum (L.) fruit is an excellent organic material for soil fertility. *Solanum lycopersicum* (L.) fruit waste contains bacteria or microbes that can act as decomposers or bioactivators in the composting process of organic materials. According to



Lubis (2025), the identification of local microorganisms (MoL) from *Solanum lycopersicum* (L.) waste has the potential to be a good type of MoL, as well as containing carbohydrates and glucose, which are sources of energy for microbes in the soil. In this case, the role played by Effective Microorganisms-4 (EM-4) is highly replaceable by the role of waste that is made into artificial Local Microorganisms (MoL).

Saccharum officinarum Linn. bagasse can improve the physical, chemical and biological properties of soil, especially in soils with problems such as compact or loose alluvial soils with low soil acidity levels. Bokashi or bagasse from *Saccharum officinarum* Linn. plants has nutrient levels that can be absorbed by plants, such as N, P, and K, and can contribute to soil fertility.

2. RESEARCH METHOD

This study was conducted over a period of four months, from June 2025 to September 2025. It was carried out at the Soil and Plant Laboratory at Darwan Ali University, Sampit.

This research design uses a Factorial Randomised Block Design (RAK), consisting of 6 factors, where Factor 1, Application of *Ananas comosus* (L.) Merr. extract, consists of 2 levels, namely 400 ml.polybag-1 and 800 ml.polybag-1, Factor 2 Application of Local Microorganisms (MoL) *Solanum lycopersicum* (L.) consisting of 2 levels, namely 400 ml.polybag-1, and 800 ml.polybag-1, Factor 3 Application of Local Microorganisms (MoL) *Saccharum officinarum* Linn. consisting of two levels: 400 ml.polybag-1 and 800 ml.polybag-1. Factor 4: Mixed formulation of pineapple (*Ananas comosus* (L.) Merr.) extract application and MoL *Solanum lycopersicum* (L.) consisting of 2 levels, namely 400 ml.polybag-1, and 800 ml.polybag-1, Factor 5 Mixed Formulation Application of *Ananas comosus* (L.) Merr. Extract and MoL *Saccharum officinarum* Linn. Bagasse consisted of two levels, namely 400 ml.polybag-1 and 800 ml.polybag-1. Factor 6 of the mixed formulation application of *Ananas comosus* (L.) Merr. with MoL *Solanum lycopersicum* (L.) and MoL *Saccharum officinarum* Linn. residue. It consists of two levels, namely 600 ml.polybag-1 and 900 ml.polybag-1.

Local microorganisms (MoL) were applied to Organosol soil media twice a week. Rock phosphate (RP) fertilizer was applied to all soil media once a week to promote root growth in *Brassica oleracea* (L.) *Alboglabra* Group plants.

In this research observation, Organosol soil was used, and then tested in a Soil Laboratory Test. The laboratory tests consisted of an initial Organosol soil test, which included a physical analysis of the soil, namely a soil texture analysis consisting of the percentage of sand, silt and clay, a chemical analysis of the soil, namely an analysis of the organic carbon content, total nitrogen content, P₂O₅ – total HCl 25%, K₂O – Potential Ex. HCl 25%, Cation Exchange Capacity (CEC), and Soil Acidity (pH) H₂O Soil, as well as the Final Organosol Soil Test consisting of Total N-Soil, P₂O₅ – Total HCl 25%, and K₂O – Potential Ex. HCl 25%.



3. RESULT AND DISCUSSION

a. Initial Soil Content Test – Organosol Soil

In the initial observation of soil chemistry, nutrient content testing was carried out on Organosol soil media, as shown in Table 1 below:

Table 1. Preliminary Analysis of Organosol Soil

Texture	Method of Analysis	Units	Results	Description
Sand			42,12	
Dust	Hydrometer	%	30,10	Clay
Clay			25,15	
C-Organic	Spectrophotometry	%	3,12	m
N-Total	Kjedhal	%	0,51	h
P ₂ O ₅ -Total HCl 25%	Spectrophotometry	me.100 g ⁻¹	20,15	l
K ₂ O-Potential Ex. HCl 25%	AAS	me.100 g ⁻¹	0,56	m
CEC	Volumetry	me.100 g ⁻¹	17,10	m
pH H ₂ O	Electrometry	-----	5,7	Slightly Sour

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

Laboratory analysis results show that the nutrient content of Organosol soil has an acidity level (potential of Hydrogen (pH)) of 5.7, which is considered slightly acidic.

Testing of the nutrient content of Organosol soil with testing of the organic carbon content or Organic C yielded a result of 3.12% with a moderate criterion. In testing the macro nutrient content of the soil, namely total nitrogen (N-Total) in Organosol soil, the result was 0.51% with a high criterion, total phosphorus content in the soil (P₂O₅-Total HC 25%) was 20.15 me.100 g⁻¹ with a low criterion, and the potential potassium content in the soil (K₂O-Potential Ex. HCl 25%) was 0.56 me.100 g⁻¹ with moderate criteria. The Cation Exchange Capacity (CEC) test had a value of 17.10 me.100 g⁻¹ with moderate criteria.

In initial testing of Organosol soil, it was concluded that Organosol soil has a very high organic content, so that the organic carbon (C-Organic) content in the soil greatly supports the fertility of Organosol soil. However, this does not mean that Organosol soil remains fertile, as the transfer of Organosol soil to polybag media can cause the organic matter content to undergo lysis or leaching, resulting in a decrease in carbon content and loss of fertility. This is in line with Lubis (2025) opinion in Lubis (2026) that the organic content remains without loss by adding organic matter or organic fertilizer to maintain soil fertility and health.

In the analysis of macro nutrient levels in Organosol soil, it was found that the levels of soil nitrogen, phosphorus, and potassium indicated that Organosol soil was in good condition for plant growth. This showed that organic matter was also readily available. However, when Organosol soil was transferred to polybags, nutrient levels decreased. This is in line with the opinion of Ali (2016) in Mandasari (2024) that the cause of nutrient availability is the role of microorganisms in extracting energy from the decomposition of organic matter, which is



produced in biochemical reactions, such as the conversion of carbohydrates into CO₂ and H₂O, so that the nutrients in the soil can be fulfilled by plant growth.

b. Final Soil Content Test

1) N-Total Content of Soil – Organosol Soil

In the final soil chemistry observation, testing of Total Soil Nitrogen (N-Total) levels in Organosol soil was conducted, as shown in Table 2 below:

Table 2. Final Soil Analysis Results – N-Total Content of Soil

N-Total Content of Soil (%)			
Treatment	Unit	Level	Analysis Results
<i>Ananas comosus</i> (L.) Merr.	ml.polybag ⁻¹	400	0,53 h
		800	0,55 h
<i>Solanum lycopersicum</i> (L.)	ml.polybag ⁻¹	400	0,54 h
		800	0,56 h
<i>Saccharum officinarum</i> Linn.	ml.polybag ⁻¹	400	0,55 h
		800	0.56 h
<i>Ananas comosus</i> (L.) Merr. + <i>Solanum lycopersicum</i> (L.)	ml.polybag ⁻¹	400	0,56 h
		800	0,58 h
<i>Ananas comosus</i> (L.) Merr. + <i>Saccharum officinarum</i> Linn.	ml.polybag ⁻¹	400	0,57 h
		800	0,58 h
<i>Ananas comosus</i> (L.) Merr. + <i>Saccharum officinarum</i> Linn. + <i>Solanum lycopersicum</i> (L.)	ml.polybag ⁻¹	600	0,58 h
		900	0,59 h

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



The results of the research observations in Table 2 show that the total nitrogen content (N-Total) in Organosol soil with the application of *Ananas comosus* (L.) Merr. extract formulated with local microorganisms (MoL) *Solanum lycopersicum* (L.) and *Saccharum officinarum* Linn. bagasse was highest at a dose of 900 ml.polybag⁻¹, amounting to 0.59%. However, this was also the same as the level of 800 ml.polybag⁻¹ in the treatment of *Ananas comosus* (L.) Merr. extract and *Saccharum officinarum* Linn. bagasse at 0.58% and the treatment of *Ananas comosus* (L.) Merr. extract and MoL *Solanum lycopersicum* (L.) at a dose of 800 ml.polybag⁻¹ at 0.58%.

An increase in total soil nitrogen (N-Total) occurs due to the role of microorganisms in producing ammonia (NH₃) and nitrogen (N₂). A decrease in total soil nitrogen (N-Total) occurs because nitrogen reacts with water to form nitrate (NO₃⁻) and hydrogen (H⁺) levels. This is in line with the opinion of Hartatik *et al.* (2015) that the presence of nitrate (NO₃⁻) compounds, which are mobile in nature, allows local microorganisms (MoL) from *Ananas comosus* (L.) Merr. extract, formulated with MoL *Solanum lycopersicum* (L.) and *Saccharum officinarum* Linn. bagasse contains protein levels of 4.41% and 4.12%, respectively, thereby increasing the overall nitrogen requirement of the soil due to the application of organic materials into the soil. According to Wahyuni *et al.* (2016), the application of *Solanum lycopersicum* (L.) fruit and *Saccharum officinarum* Linn. pulp contains 4.12% protein and 1.00 protein per 100 g.

2) P₂O₅-Total HCl 25% Content of Soil – Organosol Soil

In the final soil chemistry observation, testing was conducted on the Total Phosphorus content of the soil (P₂O₅-Total HCl 25%) in Organosol soil, as shown in Table 3 below:

Table 3. Final Soil Analysis Results – P₂O₅-Total HCl 25% Content of Soil

P ₂ O ₅ - Total HCl 25% (me.100 g ⁻¹)			
Treatment	Unit	Level	Analysis Results
<i>Ananas comosus</i> (L.) Merr.	ml.polybag ⁻¹	400	22,89 m
		800	26,18 m
<i>Solanum lycopersicum</i> (L.)	ml.polybag ⁻¹	400	25,16 m
		800	29,90 m
<i>Saccharum officinarum</i> Linn.	ml.polybag ⁻¹	400	25,49 m
		800	28,78 m
<i>Ananas comosus</i> (L.) Merr. + <i>Solanum lycopersicum</i> (L.)	ml.polybag ⁻¹	400	29,88 m
		800	32,12 m
<i>Ananas comosus</i> (L.) Merr. + <i>Saccharum officinarum</i> Linn.	ml.polybag ⁻¹	400	29,74 m
		800	31,19 m
<i>Ananas comosus</i> (L.) Merr. + <i>Saccharum officinarum</i> Linn. + <i>Solanum lycopersicum</i> (L.)	ml.polybag ⁻¹	600	29,87 m
		900	32,49 m



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

The results of the research observations in Table 3 show that the total phosphorus content of the soil (P_2O_5 -Total HCl 25%) in Organosol soil with the application of *Ananas comosus* (L.) Merr. extract formulated with local microorganisms (MoL) *Solanum lycopersicum* (L.) and *Saccharum officinarum* Linn. bagasse was highest at a dose of 900 ml.polybag⁻¹, amounting to 32.49 me.100 g⁻¹. However, this was also the same as the level of 800 ml.polybag⁻¹ in the treatment of *Ananas comosus* (L.) Merr. and *Saccharum officinarum* Linn. bagasse treatment at 31.19 me.100 g⁻¹ and the *Ananas comosus* (L.) Merr. extract and MoL *Solanum lycopersicum* (L.) treatment at a dose of 800 ml.polybag⁻¹ at 32.12 me.100 g⁻¹.

In this case, MoL (Local Microorganisms) added to the composting process of *Saccharum officinarum* Linn. bagasse and *Ananas comosus* (L.) Merr. extract can increase the content of organic compounds such as N, P, K, and Micro (Ca, Mg, S). This also highlights the role of RP (Rock Phosphate) fertilizer, which can increase P (Phosphorus) nutrients in the soil. According to Rahyuni *et al.* (2023), the process of adding total phosphorus nutrients involves the fixation of P with Ca and Mg to form Ca-P and Mg-P.

According to Fitriani (2016) and Pramuja (2023), the treatment of local microorganisms (MoL) from *Solanum lycopersicum* (L.) and *Saccharum officinarum* Linn. formulated with *Solanum lycopersicum* (L.) and *Saccharum officinarum* Linn. bagasse is due to the optimal role of MoL (Local Microorganisms) application from *Solanum lycopersicum* (L.) fruit, which contains 10 mg.100 g⁻¹ of phosphorus (P) nutrients, thereby increasing the phosphorus (P) nutrient content in the soil.

3) K₂O-Potential Ex. HCl 25% Content of Soil – Organosol Soil

In the final soil chemistry observation, testing of the Soil Potassium Potential (K₂O-Potential Ex. HCl 25%) was carried out on Organosol soil, as shown in Table 4 below:

Table 4. Final Soil Analysis Results – K₂O-Potential Ex. HCl 25% Content of Soil

K ₂ O - Potential Ex. HCl 25% (me.100 g ⁻¹)			
Treatment	Unit	Level	Analysis Results
<i>Ananas comosus</i> (L.) Merr.	ml.polybag ⁻¹	400	0,58 m
		800	0,59 m
<i>Solanum lycopersicum</i> (L.)	ml.polybag ⁻¹	400	0,59 m
		800	0,59 m
<i>Saccharum officinarum</i> Linn.	ml.polybag ⁻¹	400	1,00 h
		800	1,03 h
<i>Ananas comosus</i> (L.) Merr. + <i>Solanum lycopersicum</i> (L.)	ml.polybag ⁻¹	400	1,02 h
		800	1,04 h
<i>Ananas comosus</i> (L.) Merr. + <i>Saccharum officinarum</i> Linn.	ml.polybag ⁻¹	400	1,02 h
		800	1,04 h
<i>Ananas comosus</i> (L.) Merr. + <i>Saccharum officinarum</i> Linn. + <i>Solanum lycopersicum</i> (L.)	ml.polybag ⁻¹	600	1,07 h



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

From the observations in Table 4, it can be seen that the highest soil potassium content was found in the application of *Ananas comosus* (L.) Merr. extract formulated with local microorganisms (MoL) *Saccharum officinarum* Linn. and *Solanum lycopersicum* Linn. pulp with a dose of 900 mlpolybag⁻¹, resulting in a potassium content of 1.07 me.100 g⁻¹ of soil at a high level, but this was not significantly different from the dose of 600 mlpolybag⁻¹, which also resulted in a potassium content of 1.07 me.100 g⁻¹ of soil at a high level. This indicates that the application of *Ananas comosus* (L.) Merr. extract increases the potassium content in the soil and supports the beneficial bacteria of local microorganisms (MoL) *Solanum lycopersicum* (L.) and *Saccharum officinarum* Linn. The positive role played by local microorganisms is significant in the soil because during the composting process, potassium (K) nutrients are released into complex bonds. This occurs due to the assistance provided by local microorganisms and the role of bioactivators.

According to Lubis (2025), potassium utilised by microbes in the composting process or local microorganism (MoL) process is used as a catalyst, so that the presence of these bacteria can help increase potassium (K) content. This is confirmed by Ismayana *et al.* (2015) in Rahyuni *et al.* (2023) that beneficial bacteria and fungi that are useful for soil fertility can be bound by microorganisms and stored by soil microbes.

4. CONCLUSION

In conclusion, the results of the analysis show that the application of *Ananas comosus* (L.) Merr. extract formulated with Local Microorganisms (MoL) *Solanum lycopersicum* (L.) and *Saccharum officinarum* Linn. bagasse has a significant effect on increasing nutrient levels in Organosol soil as a growth medium for *Brassica oleracea* (L.) *Alboglabra* Group plants. The application of *Ananas comosus* (L.) Merr. extract formulated with *Solanum lycopersicum* (L.) and *Saccharum officinarum* Linn. bagasse can improve the growth and fertility of *Brassica oleracea* (L.) *Alboglabra* Group plants because the nutrient content of the plants becomes available in the Organosol soil.

In this recommendation, for further research, use Ultisol or Inceptisol soil media with application rates in accordance with previous research to determine the nutrient carrying capacity of the soil.

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