



Toxicity and Safety Evaluation of Glycolipid Biosurfactant Produced by Yeast Strains Isolated from Fruit Pastes

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Abstract	Article History
This study was undertaken to evaluate the toxicity and safety of glycolipid biosurfactant produced by yeast strains isolated from fruit pastes. Yeast strains were isolated from ripe pineapple (<i>Ananas comosus</i>) and unripe plantain (<i>Musa paradisiaca</i>) pastes using enrichment technique and screening for their biosurfactant potentials using emulsification and oil displacement tests. The yeast strains were characterized and identified using classical microbiological techniques. The crude biosurfactants produced were characterized biochemically and their toxicity status evaluated using phytotoxicity test. The result revealed that a total of 10 strains of yeast were isolated from the fruit pastes. The yeast strain PA4 had the highest emulsification activity of 37.50 % while yeast strain PA1 had the lowest emulsification activity of 23.52 %, respectively. Also, PA3 had the highest dispersive index of 24.64 mm, while PL3 had the lowest dispersive index of 8.54 mm, respectively. The yeast strains were classically identified as <i>Trichosporon</i> sp. and <i>Candida</i> sp. They were found to be glycopospholipid in nature as well as non – toxic to <i>Zea mays</i> seeds at low concentrations. The study has helped to synthesize a low cost and ecofriendly glycopospholipid biosurfactant which consolidates the ecological acceptability of biosurfactant. Keywords: Bioeconomy, Biosafety, Biototoxicity, Ecological acceptability, Glycolipid biosurfactant	Received: 27 Dec 2025 Accepted: 24 Jan 2026 Published: 01 Feb 2026 Scan QR code to view*  License: CC BY 4.0*  Open Access article.
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1. Introduction

Glycolipids, a type of biosurfactants, compose the greatest market share of biosurfactants (Hayes *et al.*, 2019). Glycolipid biosurfactants are low-molecular-weight amphiphiles that consist of a hydrophilic polysaccharide headgroup and one or many hydrophobic fatty acid tails (Jahan *et al.*, 2020). Glycolipid biosurfactants have potential applications in the pharmaceutical, agricultural, and environmental sectors (Hayes *et al.*, 2019). A set of factors affects the type, amount, and properties of the biosurfactants produced: the used substrate (water-soluble/insoluble carbon source, nitrogen source, carbon-to-nitrogen ratio, carbon-to-phosphorus ratio, and metal ion concentration)

and the fermentation conditions (pH, temperature, aeration, agitation, oxygen availability, and incubation time), as well as the selected microorganism, downstream processing of the biosurfactants, and application of genetic engineering of the producing organism (De *et al.*, 2015 and Jahan *et al.*, 2020). The same factors also affect the cost and environmental impact of the biosurfactant production. If biosurfactants are produced from raw cooking oils, then the substrate contributes up to 89% of the total production cost (Ashby *et al.*, 2013) and 47% of the total life cycle environmental impact (Baccile *et al.*, 2016).

For bioproducts to gain their market share, the quality and price must be comparable to their synthetic analogs (Mukherjee *et al.*, 2006 and Nitschke *et al.*, 2005; Enemchukwu *et al.*, 2026a; 2026b). Biosurfactants can replace synthetic surfactants only if the cost of the raw material and the process is reduced to the minimum (Sobrinho *et al.*, 2008). Exploring alternative substrates for biosurfactant production can serve as an effective cost-cutting strategy. The use of low-cost substrate or cheap waste material may decrease the total biosurfactant production costs by 10% to 30% (Zenati *et al.*, 2018). Biosurfactant production based on industrial byproducts and waste effluents presents a huge potential for its application at the industrial scale in a more economic and environmentally friendly process, boosting the necessary transition towards a circular economy (Jiménez-Peñalver *et al.*, 2019). Meanwhile, the changes oils and fats undergo during frying or other thermal treatments may adversely impact the amount and properties of the biosurfactant produced or change the overall microbial metabolisms of the oils and fats when used as a carbon source in fermentation (Kim *et al.*, 2021).

Toxicity is defined as the capacity of a substance to have a harmful effect on a living organism. This depends on the concentration and properties of the chemical product to which the organism is exposed as well as the exposure time (Santos *et al.*, 2016). The absence of toxicity is of fundamental importance for applications in the environmental realm. Ecotoxicity bioassays are analytical methods that allow characterizing the toxicity of chemical substances. The exposure of living microorganisms employed as bioindicators to these substances constitutes a valuable environmental analysis tool (Sobrinho *et al.*, 2013). The use of *Zea mays* L. and several others biomonitors for environmental toxicity monitoring and evaluation has been reported by several investigators (Uba and Chukwura, 2016; Uba, 2019a; 2019b; 2019c; Uba *et al.* 2019b; 2019c; 2019d; Alisa *et al.*, 2020; Anukam *et al.*, 2020a; 2020b; Da Silva Santos *et al.* 2020; Ejurefa *et al.*, 2020a; 2020b; Uba *et al.*, 2020a; 2020b; 2020c; 2020d; 2020e; 2020h; Uba *et al.*, 2021a; 2021b; Ifediegwu *et al.* 2023a; Uba and Obiefuna, 2023; Nnaka *et al.* 2024; Ubani *et al.*, 2024; 2025). There are limited studies on the ecological acceptability of biosurfactants produced. This study is unique as it reports the production of biosurfactants from completely safe sources and low cost substrates. Therefore, the study was undertaken to evaluate the toxicity and safety of glycolipid biosurfactant produced by yeast strains isolated from fruit pastes.

2. Materials and Methods

2.1 Sample Collection

Ripe Queen pineapple (*Ananas comosus*) and Plantain (*Musa paradisiaca*) fruits were purchased from

Ekeagbagba Market, Uli town in Ihiala Local Government Area (LGA) Anambra State Nigeria. The fruits were carried in a sterile plastic container, identified by a botanist in Biological Sciences, Chukwuemeka Odumegwu Ojukwu University and transported to the Microbiology Laboratory of Chukwuemeka Odumegwu Ojukwu University Uli Campus for further analyses.

2.2 Sample Preparation

The fruits were washed with sterile water containing disinfectant, drained, peeled and sliced into smaller pieces. The juices were aseptically extracted using an electric juice blender, filtered with muslin cloth and the filtrates were collected in a sterile plastic container as described by Anichebe *et al.* (2019); Okoye *et al.* (2020a); (2020b); (2020c) and Uba *et al.* (2020e).

2.3 Preparation and Sterilization of Media and Glassware

All glass wares used was sterilized in an autoclave at 121 °C at 15 psi for 15 min. Yeast Extract Dextrose Peptone (YEDP) broth was used for enrichment and isolation while Potato Dextrose Agar (PDA) was used for the inoculation and identification of the yeast isolates. Yeast Extract Dextrose Peptone (YEDP) broth was prepared with 40 g of peptone water, 10 g of yeast extract and 20 g of dextrose sugar (sucrose) in 1 L of distilled water. The mixtures were mixed vigorously and then sterilized by autoclaving at 121 °C, 15 psi for 15 min. It was allowed to cool before inoculation. Fifty (50) mg/L of tetracycline and 0.05 mg/L of gentamycin were added to inhibit bacterial growth. Also, Potato Dextrose Agar (PDA) medium was used for the isolation of the yeast. This was prepared according to manufacturer's instructions by dispensing 39 g of agar into 1000 mL of distilled water. The mixture was mixed vigorously and then sterilized by autoclaving at 121 °C, 15 psi for 15 min. It was allowed to cool to 45 °C and dispensed into Petri dishes for solidification and dried in a hot air oven before inoculation. Fifty (50) mg/L of tetracycline and 0.05 mg/L of gentamycin were added to the PDA media to inhibit bacterial growth (Dibua *et al.*, 2020; Chukwura *et al.*, 2025).

2.4 Isolation and Maintenance of the Pure Yeast Culture

For the isolation of hydrocarbon - degrading yeasts, 2 % (v/v) of waste engine oil was added into a 250 mL conical flask containing 100 mL of YEDP broth with one hundred (100) millilitres of the fermenting extracts of plantain and pineapple, respectively were incubated for two weeks at 30 °C to enhance microbial growth. An aliquot of 0.5 mL of the YEDP broth containing the plantain and pineapple substrates juices were inoculated onto Potato Dextrose Agar (PDA) media in duplicates using a glass spreader. The plates were incubated at 30 °C for 72 hr. The colonies that appeared on the plates

were further sub - cultured and incubated for another 48 hr at 30 °C in order to obtain pure cultures. The selected yeast isolates were obtained and the pure cultures of the isolates were stored in 10 % glycerol at 4°C in Bjou bottles (Nwaguma *et al.*, 2016; Uba, 2018a; 2018b; Uba *et al.*, 2018a; 2018b; 2018c).

2.5 Substrate

Three types of industrial waste were used as substrates to produce the biosurfactant. Cassava liquor was obtained from a local cassava processing firm at Aluora Uli, Ihiala Local Government Area (LGA) Anambra State Nigeria. Corn steep liquor was acquired from local pap dealer at Mgbeki Uli and vegetable waste frying oil was obtained from a cake fryer at Ubahudara Uli, both Ihiala L.G.A. Anambra State, Nigeria.

2.6 Static Growth Condition

The biosurfactant production conditions that was used in this work was adopted with slight modification from the method of Da Silva Lira *et al.* (2020). The inoculum of yeast was prepared by transferring cells grown on a slant with 50 mL of yeast mold broth (YMB). The seed culture was incubated for 24 hr at 28 °C and agitated at 200 rpm. The yeast was cultivated in a submerged culture with shaking in a rotary shaker. A low-cost basal production medium formulated with distilled water supplemented with 5 % waste vegetable oil, 5 % cassava liquor and 5 % corn steep liquor were used for production of the biosurfactant. The medium was sterilized by autoclaving at 121 °C for 20 min. The final pH of the medium was adjusted to 7.0. The inoculum (5 % v/v) was added to the cool medium at the amount of 10^8 cells/mL. Cultivation was carried out in Erlenmeyer flasks at 30 °C with shaking at 180 rpm for 120 hr. After the incubation period, the production media were subjected to centrifugation with stirring at 4,000 rpm for 20 minutes for the obtainment of the cell - free broth. Aliquots were withdrawn after fermentation and screened for extracellular biosurfactant production. All experiments were conducted in triplicate (Uba *et al.* 2017; Dokubo *et al.*, 2022a; 2022b; Dokubo and Uba, 2023; Ekwenze *et al.* 2025; Okafor *et al.* 2023; Ele *et al.* 2024a; Ifediegwu *et al.* 2024a; Uba and Okonkwo, 2025; Uba *et al.*, 2025).

2.6.1 Emulsification index

The emulsifying capacity was evaluated by emulsification index (E_{24}) as described by Kalyani *et al.* (2014), Uba *et al.* (2018d), Anidu *et al.* (2023) and Uba and Anidu (2023). For this assay, 2 mL of waste engine oil was dispensed into a test tube which comprised of 2 mL biosurfactant solution. The test tube was maintained for 24 hr after being vigorously vortexed at 4000 rpm for 2 min and the emulsion height, oil and aqueous zones were measured. The emulsion index (E_{24}) was determined as the percentage of height of the emulsified layer (mm) divided by the total height of the liquid

column (mm). The percentage of emulsification index was calculated using the following equation:

$$E_{24} = \frac{\text{Height of emulsion formed} \times 100}{\text{Total height of solution}}$$

2.6.2 Oil displacement assay

The dispersion ability of the crude biosurfactant on waste engine oil was analysed using oil displacement assay as described by Uba *et al.* (2018d), Anidu *et al.* (2023) and Uba and Anidu (2023). An empty Petri dish was filled with 25mL of distilled water and 0.1 mL waste engine oil was added on the water surface. Then, on the waste engine oil surface, 0.01 mL of culture filtrate was dropped and with the presence of surfactant, the waste oil was displaced and gave a diameter of clear zone. Furthermore, distilled water was used as negative control where no displacement and clear zone was observed whereas SDS was used as positive control. The dispersion index is given by:

$$D = \pi r^2$$

Where r is radius of the clear zone and $\pi = 3.143$

2.7 Characterization and Identification of the Most Biosurfactant – Producing Yeast Isolate

2.7.1 Macroscopic and microscopic identification

The best selected biosurfactant – producing yeast isolate with maximum surfactant activities were examined macroscopically on PDA agar plates for colony elevation, pigmentation, colony size, nature and shape. Microscopically, water mount was employed and sterile distilled water was placed on a glass slide with a bacteriological loop. A light emulsion of the yeast in this drop of water was made, covered with a cover slip and examined under X40 objective lens for cellular characteristics, ascospore formation and vegetative reproduction. Biochemical features examined included carbohydrates fermentation test (glucose, galactose, sucrose, maltose, fructose, lactose, xylose, arabinose), germ tube, pellicle formation and urease test (Nwaguma *et al.* 2016; Uba *et al.* 2019a; Dokubo *et al.*, 2024).

2.8 Preliminary Identification Test

2.8.1 Phenol: H₂SO₄ test

This test was used to detect the glycolipid containing biosurfactant. To 1 mL of crude supernatants, 1 mL of 5 % phenol was added and thereafter, 2 - 5 mL of concentrated H₂SO₄ was added drop by drop to the mixture until orange colour is developed. The development of orange colour indicates the presence of glycolipids containing biosurfactant (Kalyani *et al.* 2014; Anidu *et al.*, 2023).

2.8.2 Biuret test

This test was used to detect for the lipopeptide containing bio-surfactant. Two millilitres of crude supernatants was heated at 70 °C and then mixed with 1 mL of 1 M NaOH solution. Drops of 1 % CuSO₄ was added slowly until violet or pink ring is observed, which indicates the

presence of lipopeptides containing biosurfactant (Kalyani *et al.* 2014; Anidu *et al.*, 2023).

2.8.3 Phosphate test

This test was used to detect the phospholipid containing bio-surfactant. About ten drops of 6 M HNO₃ was added to 2 mL of crude supernatant and was heated at 70 °C. After cooling, 5 % (w/v) ammonium molybdate was added to the mixture drop by drop, slowly until the formation of yellow colour, and then the yellow precipitates. This indicates the presence of phospholipids containing biosurfactant (Kalyani *et al.* 2014; Anidu *et al.*, 2023).

2.8.4 N-Cetyl-N, N, N - trimethyl - ammonium-bromide (CTAB)/methylene blue test

This test was used to detect the rhamnolipid containing bio-surfactant. Blue agar plates composing of mineral salts-agar-medium, supplemented with 2 % carbon sources, N-Cetyl - N, N, N trimethyl - ammonium-bromide (CTAB) 0.5 mg/mL and methylene blue 0.2 mg/mL was used to detect the extracellular glycolipids production. The presence of dark blue colour zones

indicate the rhamnolipid bio-surfactant production (Kalyani *et al.* 2014; Anidu *et al.*, 2023).

2.9 Biosurfactant Toxicity Testing

2.9.1 Phytotoxicity test

The phytotoxicity of the biosurfactant was evaluated in a static assay involving seed germination and root growth of *Zea mays* (Maize) based on the methods of Rufino *et al.* (2013) and Da Silva Lira *et al.* (2020). The test solutions were prepared in distilled water with crude biosurfactant concentrations of 6.25%, 12.5%, 25%, 50% and 100%, respectively. Seed surfaces were sterilized using 70% ethanol for 5 min and rinsed with distilled water. Sterile filter paper in the plastic Petri dish was wetted with 5 mL of the samples before adding a total of 10 seeds into the Petri dish. The seeds were incubated at 25 °C for five days under light and the mean number of germinated seeds were counted on day 5. For the negative control, distilled water was used, whereas SDS was used as a positive control. Experiments were performed in triplicate. The seed germination, root growth (≥ 5 mm) and the germination index (≥ 80 %) was calculated using the following formulas below:

$$1. \text{ Relative seed germination (\%)} = \frac{\text{No. of seeds germinated in extract} \times 100}{\text{No. of seeds germinated in control}}$$

$$2. \text{ Relative root length (\%)} = \frac{\text{Mean root length in extract} \times 100}{\text{Mean root length in control}}$$

$$3. \text{ Germination index (\%)} = \frac{\text{Percentage of seeds germinated} \times \text{Percentage of root length}}{100}$$

2.10 Statistical Analysis

Data was presented in mean and standard deviation as well as analyzed using GraphPad Prism Version 8.0.2. Two-way analysis of variance (ANOVA) followed by Dunnett comparison of means of the different biodegradation and bioremediation set ups at 95 % confidence level. Threshold values < 0.05 were considered statistically significant (Ezeamama *et al.* 2020a; 2025b; Ifediegwu *et al.* 2023b; 2024b; 2024c; Ofunwa *et al.* 2024; Okoye *et al.*, 2020d; Njoku *et al.*, 2019a; 2019b; Nkamigbo *et al.* 2020a; 2020b; Uba *et al.*, 2019e; Uba *et al.*, 2020f; 2020g; Okafor *et al.* 2021a; 2021b; Alfred *et al.*, 2023; Alfred *et al.* 2025).

3. Results

The result of the emulsification and oil displacement of the biosurfactant producing yeast isolate is presented in Table 1. From the result, yeast strain PA4 had the highest emulsification activity of 37.50 % while yeast strain PA1 had the lowest emulsification activity of 23.52 %, respectively. Also, PA3 had the highest dispersive index of 24.64 mm, while PL3 had the lowest dispersive index of 8.54 mm, respectively.

Table 1: Emulsification and oil displacement activity of the biosurfactant producing yeast isolate

Isolate code	Emulsifying activity (E ₂₄) (%)	Dispersive index (mm)
PA1	23.52 ± 0.009	16.62
PA2	33.33	10.18
PA3	26.66	24.64 ± 0.016
PA4	37.50	15.90
PA5	33.33	22.06
PL1	25.00	19.64
PL2	25.00	15.90
PL3	26.66	8.54
PL4	26.31	19.64
PL5	33.33	14.52

The result of the macroscopic feature of the selected biosurfactant producing yeast isolates is presented in Table 2. From the result, the two most potent yeast isolates PA3 and PA4 were irregular in shape, large in colony size, undulate and entire in margin, flat in elevation, smooth in texture and creamy in pigmentation, respectively.

The result of the microscopic and biochemical feature of the best selected biosurfactant producing yeast isolate is

presented in Table 3. From the result, both isolates PA3 and PA4 were rod in cell characteristics, positive to Gram stain, ascospore formation, vegetative reproduction, lactophenol stain, pellicle formation, urease, galactose, glucose, fructose, arabinose tests and negative to xylose, maltose, lactose, sucrose tests, respectively. They are physiologically identified as *Trichosporon* sp. and *Candida* sp.

Table 2: Macroscopic feature of the selected biosurfactant producing yeast isolate

Parameter	Isolate code	
	PA3	PA4
Shape	Irregular	Irregular
Colony size	Large	Large
Margin	Undulate	Entire
Elevation	Flat	Flat
Texture	Smooth	Smooth
Pigmentation	Creamy	Creamy

Table 3: Microscopic and biochemical feature of the best selected biosurfactant producing yeast isolate

Parameters	PA3	PA4
Cell characteristics	Rod	Rod
Gram stain	+	+
Ascospore formation	+	+
Vegetative reproduction	+	+
Lactophenol stain	+	+
Pellicle formation	+	+
Urease test	+	+
Galactose	+	+
Glucose	+	+
Xylose	-	-
Maltose	-	-
Fructose	+	+
Arabinose	+	-
Lactose	-	-
Sucrose	-	-
Identity	<i>Trichosporon</i> sp.	<i>Candida</i> sp.

The result of the biochemical profile of the crude biosurfactant produced by the yeast isolates is presented in Table 4. From the result, isolate PA3 and PA4 were positive to phenol and

phosphate tests but negative to Biuret and CTAB tests, respectively.

Table 4: Biochemical profile of the crude biosurfactant produced by the yeast isolate

Test	Isolate code	
	PA3	PA4
Phenol	+	+
Biuret	-	-
Phosphate	+	+
CTAB	-	-

Note: CTAB = Cetyl trimethyl ammonium-bromide; + = positive result; - = negative result

The result of the germination profile of *Zea mays* seeds exposed to different concentration of biosurfactant by the yeast isolates is presented in Table 5. From the result,

yeast isolate PA3 had the highest percentage seed germination, percentage relative root length and germination index values of 100.0, 112.7 and 93.8 % as

well as the lowest percentage seed germination, percentage relative root length and percentage germination index values of 58.3, 35.4 and 17.7 %, respectively. Yeast isolate PA4 had the highest percentage seed germination, percentage relative root

length and germination index values of 133.3, 84.9 and 113.1 % and as well as the lowest percentage seed germination, percentage relative root length and germination index values of 75.0, 41.4, and 37.9 %, respectively.

Table 5: Germination profile of *Zea mays* seeds exposed to different concentration of biosurfactant by the yeast isolate

Concentration (%)	Seed germination (%)	Relative root length (%)	Germination index (%)
	PA3	PA4	PA3 PA4
6.25	83.3	91.6	112.7 79.5
12.5	83.3	133.3	85.9 84.9
25	58.3	75.0	68.2 68.2
50	100	83.0	49.8 55.0
100	50.0	91.6	35.4 41.4
			17.7 37.9

N.B: % = Percentage

4. Discussion

In this study, a total of 10 strains of yeasts were isolated from ripe pineapple (*Ananas comosus*) and unripe plantain (*Musa paradisiaca*) pastes. All these yeast strains were initially screened for extracellular biosurfactant production grown in Yeast Extract Dextrose Peptone medium containing waste engine oil as sole source of carbon. Out of these 10, only 2 strains (PA3 and PA4) showed higher positive results for emulsification test. As per the results observed for these two strains, the emulsified layer for PA4 showed maximum emulsification area of 37.50 % indicating a good biosurfactant production. These results were presented in the Table 1. Again, these 10 isolates were tested for biosurfactant production using oil displacement test and the drop displaced layer for PA3 showed maximum displaced area with a diameter of 24.64 mm. Therefore, these strains (PA3 and PA4) were used for physical and chemical characterization of the bio-surfactant. The use of these techniques was similar to the report of Ghayyomi *et al.* (2012) who used the combination of oil displacement test, emulsification index and surface tension test to select biosurfactant producers. Ghayyomi *et al.* (2012) suggested that a single method is not suitable to identify biosurfactants producers, and he recommended the combination of methods.

The results in Tables 2 and 3 revealed that these yeast strains were classically identified as *Trichosporon* sp. and *Candida* sp. Similar observations were documented by Sobrinho *et al.* (2013), Chaprão *et al.* (2015), Santos *et al.* (2017) and Ohalet *et al.* (2024) who isolated these yeast strains capable of producing biosurfactants from different sources.

Glycolipids, lipopeptides and phospholipids are three types of bio-surfactants. In order to identify the type of biosurfactant, Phenol-H₂SO₄ test (glycolipids), Biuret test (lipopeptides), CTAB test (Rhamnolipid) and

phosphate test (phosphate lipids) were performed with cell-free supernatant of PA3 and PA4 yeast strains. Phenol-H₂SO₄ test was conducted as per the method described by Kulyani *et al.* (2014) in which PA3 and PA4 isolates had shown orange colour when phenol and concentrated sulphuric acid were added. Biuret reagent would turn to violet or pink ring due to the reaction of peptide bond proteins. However, negative results were obtained in this study, i.e. colour did not change to violet. For CTAB test, there was no deep blue halo zone in the CTAB plates and for phosphate test also, yellow colour precipitate was observed in this study. These results were shown in Table 4 and similar observation was obtained by Nwaguma *et al.* (2016) who reported the presence of phospholipid biosurfactant by *Klebsiella pneumoniae* IVN51 isolated from hydrocarbon –polluted soil in Ogoniland, Nigeria.

The toxicity of the biosurfactant from the yeast strains PA3 and PA4 was tested in a short bioassay. Bioassays involving plants play an important role in predicting the effect of chemical products in an ecosystem. The germination index which combines measures of relative seed germination and relative root growth, was used to evaluate the toxicity of the biosurfactant to the seeds of *Zea mays* (maize). A germination index of 80 % was used as an indicator of the absence of phytotoxicity (Da Silva Lira *et al.*, 2020). The results in Table 5 revealed that the solutions of glycophospholipid biosurfactant at low concentrations tested had no inhibitory effect on seed germination or root growth, indicating low toxicity of the biosurfactant. Moreover, leaf growth and the growth of secondary roots occurred under all concentration conditions tested. The result was in agreement with study carried out by Da Silva Lira *et al.* (2020) who reported that their isolated glycolipid biosurfactant from the yeast *Candida Guilliermondii* was not toxic to *Artemia salina*, or the vegetable seeds tested at different concentrations of the biosurfactant.

5. Conclusion

This study revealed that ripe pineapple (*Ananas comosus*) and unripe plantain (*Musa paradisiaca*) pastes harbored a lot of surfactant producers especially *Trichosporon* sp. and *Candida* sp., which were the top biosurfactant producers. Biochemical tests confirm the biosurfactant is a glycopospholipid. The phytotoxicity profile revealed non - toxicity to the germination and growth of *Zea mays* L which suggested its potentials for environmental and industrial applications. Future study should focus on exploration of more non - toxic source of biosurfactant producing yeast strains. Future study should focus on pilot or industrial scale production of biosurfactant with attendant cost implications and explore PCR based primer molecular techniques for detecting different biosurfactant producers.

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