



GC-MS Chemical profiling, antimicrobial, antioxidant and antidiabetic activities of the volatile oil from

Lannea acida (A. Rich) leaves

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Introduction

- For decades, Medicinal plants have been used in developing countries because it has comparatively fewer complications
- Essential oils generated from plants are considered green technology and are the most significant secondary metabolites of medicinal plants
- Diabetes-related conditions have been ranked among the top ten diseases that result in a high death rate globally
- Diabetes mellitus (DM) is a metabolic disorder marked by an elevated rise in glucose level (hyperglycemia) which promotes excessive generation of reactive oxygen species (ROS)
- The leading cause of mortality in diabetics has been linked to oxidative stress and antioxidants have been considered as treatments
- Lannea acid* (*Anacardiaceae*) **Fig. 1** locally known as “bembe” is a multipurpose tree indigenous to Guinea, Mali, Gambia, Niger, Nigeria, Central African Republic and Burkina Faso.
- Ethnomedical uses: used in the treatment of anemia, cancer, malaria, gynecological and pregnancy disorders

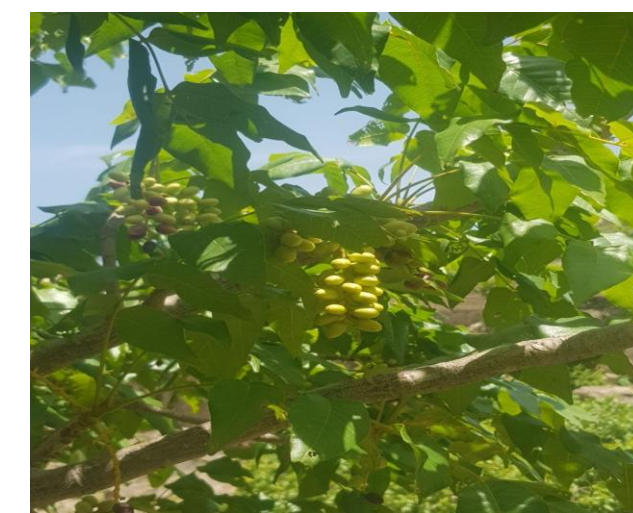
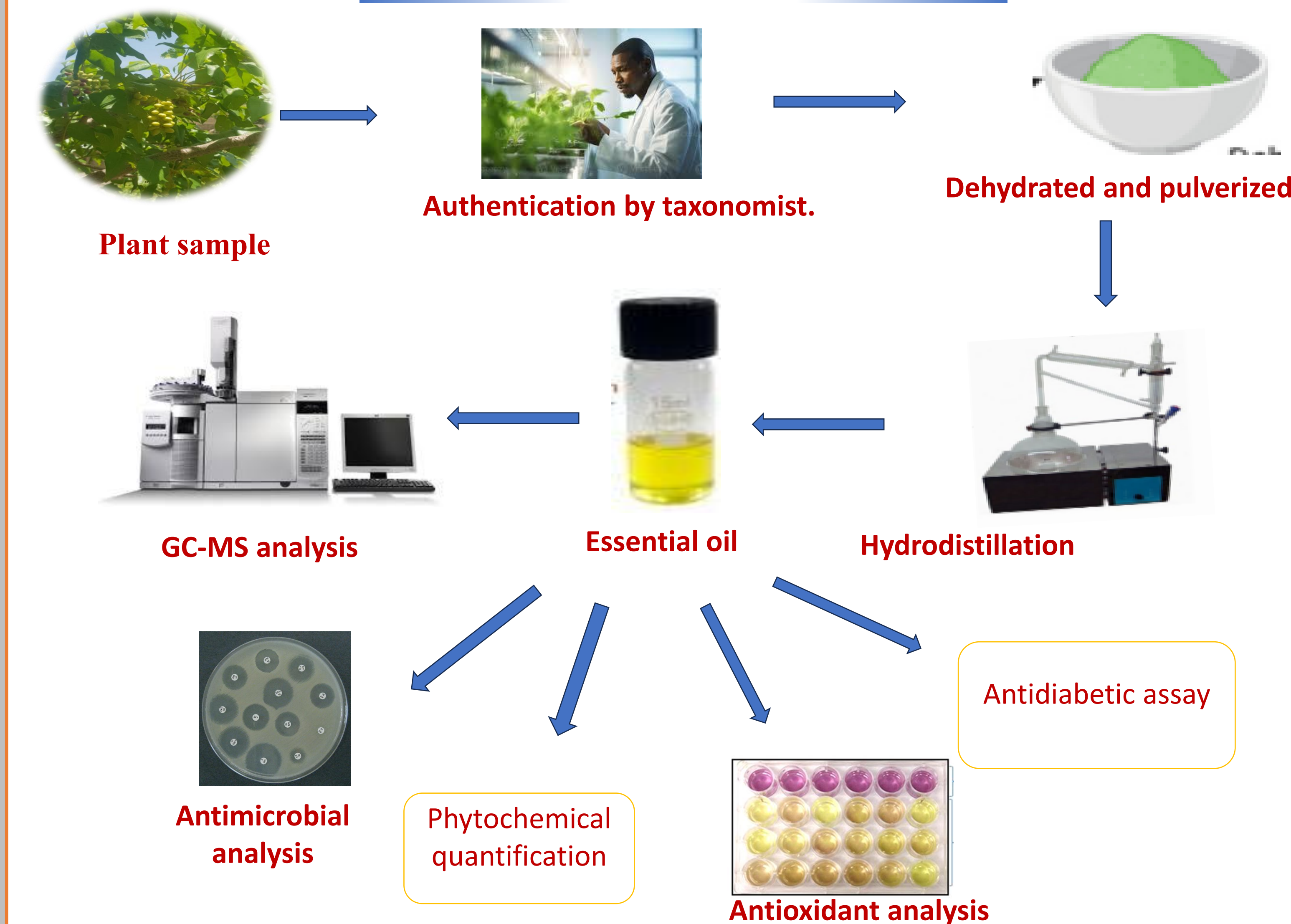


Fig 1. *L. acida* leaves

Aim

- This study aims at investigating the chemical constituents, antimicrobial, antioxidant and antidiabetic activities from the essential oil of *Lannea acida* leaves

Methodology



Results

Table 1: Major constituents in *L. acida* essential oil

S/N	RT	Constituents	Relative Abundance %
1	12.59	alpha-Pinene	11.56
2	15.69	Myrcene	15.19
3	16.91	delta-3-Carene	18.04
4	48.65	Guaia-1(10),11-diene	8.74
5	53.88	Spathulenol	3.33
6	54.17	Caryophyllene oxide	2.03

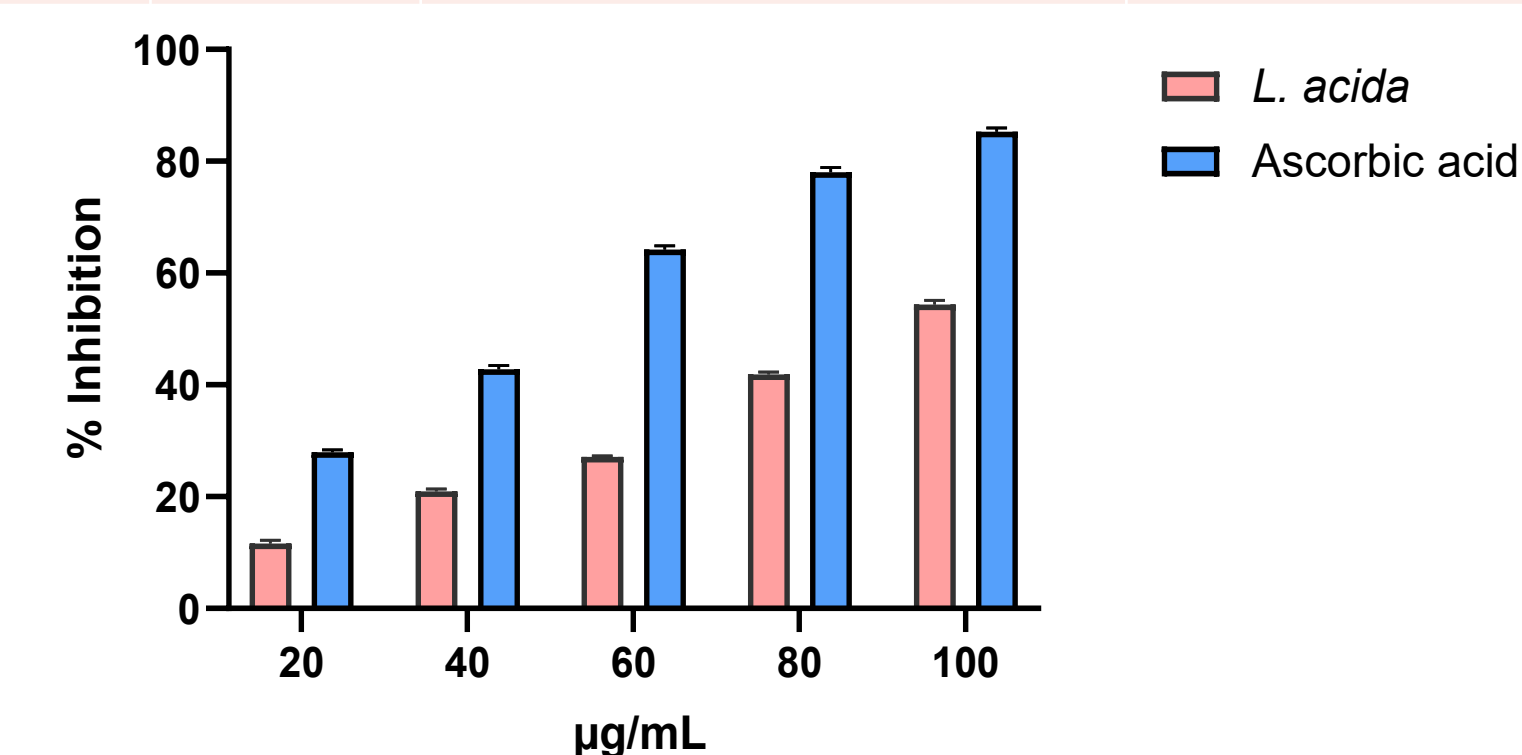


Fig 2: DDPH radical scavenging activity of *L. acida* EO.

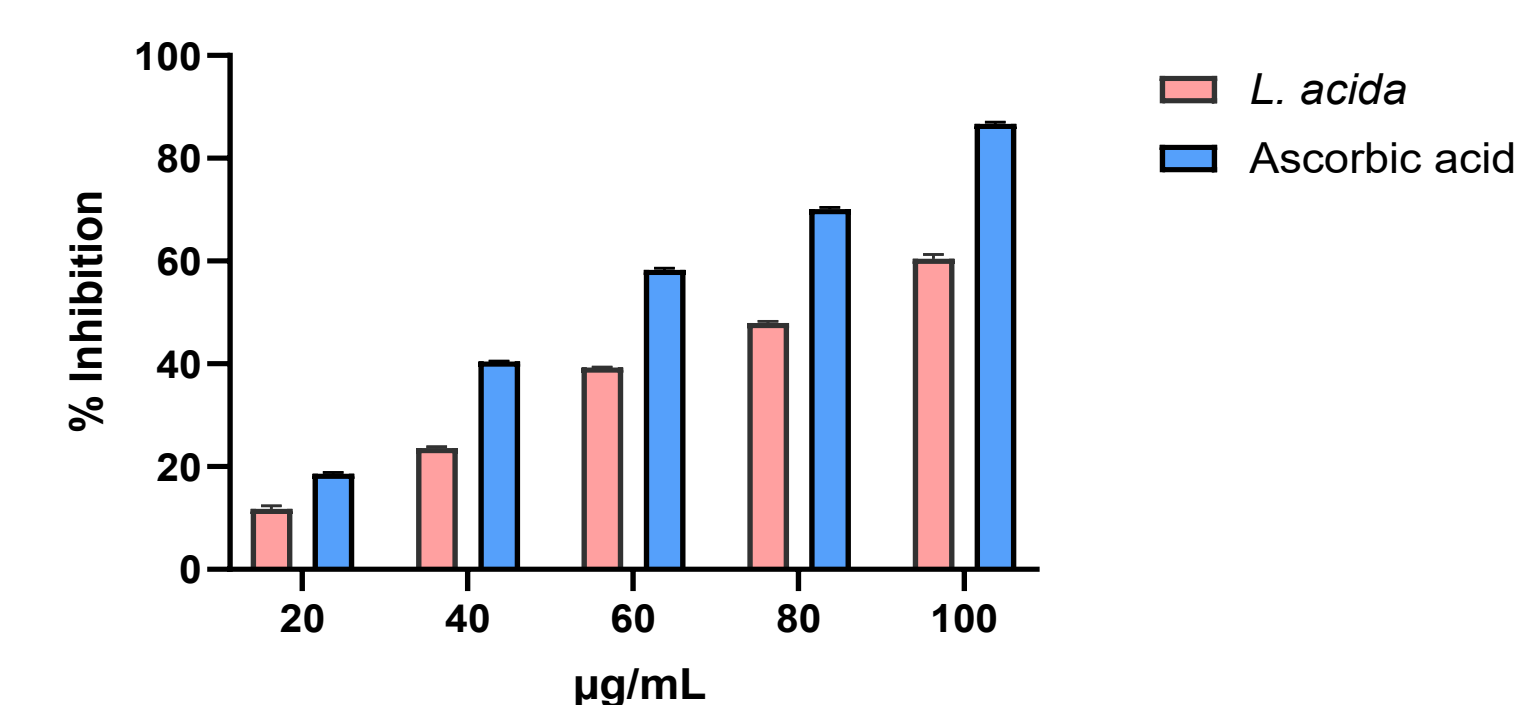


Fig 5: Lipid peroxidation radical scavenging activity of *L. acida* EO.

Table 5: *In vitro* antioxidant assay

Assays	IC ₅₀ µg/mL	
	<i>L. acida</i>	Ascorbic acid
DDPH	95.36 ± 0.03	47.12 ± 0.01
NO	85.87 ± 0.02	62.04 ± 0.04
H ₂ O ₂	101.15 ± 0.03	52.09 ± 0.03
Lipid peroxidation	81.99 ± 0.05	54.17 ± 0.03

Table 2: Quantitative phytochemical assay

Phytochemicals	<i>L. acida</i> EO
Total phenol (mg/GAE/100g)	5.18 ± 0.05
Total flavonoid (mg/QE/100g)	6.41 ± 0.08
Total antioxidant capacity (mg/AAE/100g)	26.90 ± 0.04

Table 3: *in vitro* antidiabetic assay

Assay/sample	IC ₅₀ µg/mL	
	α-amylase	α-Glucosidase
<i>L. acida</i>	97.61 ± 0.04	95.08 ± 0.02
Acarbose	57.027 ± 0.05	57.61 ± 0.03

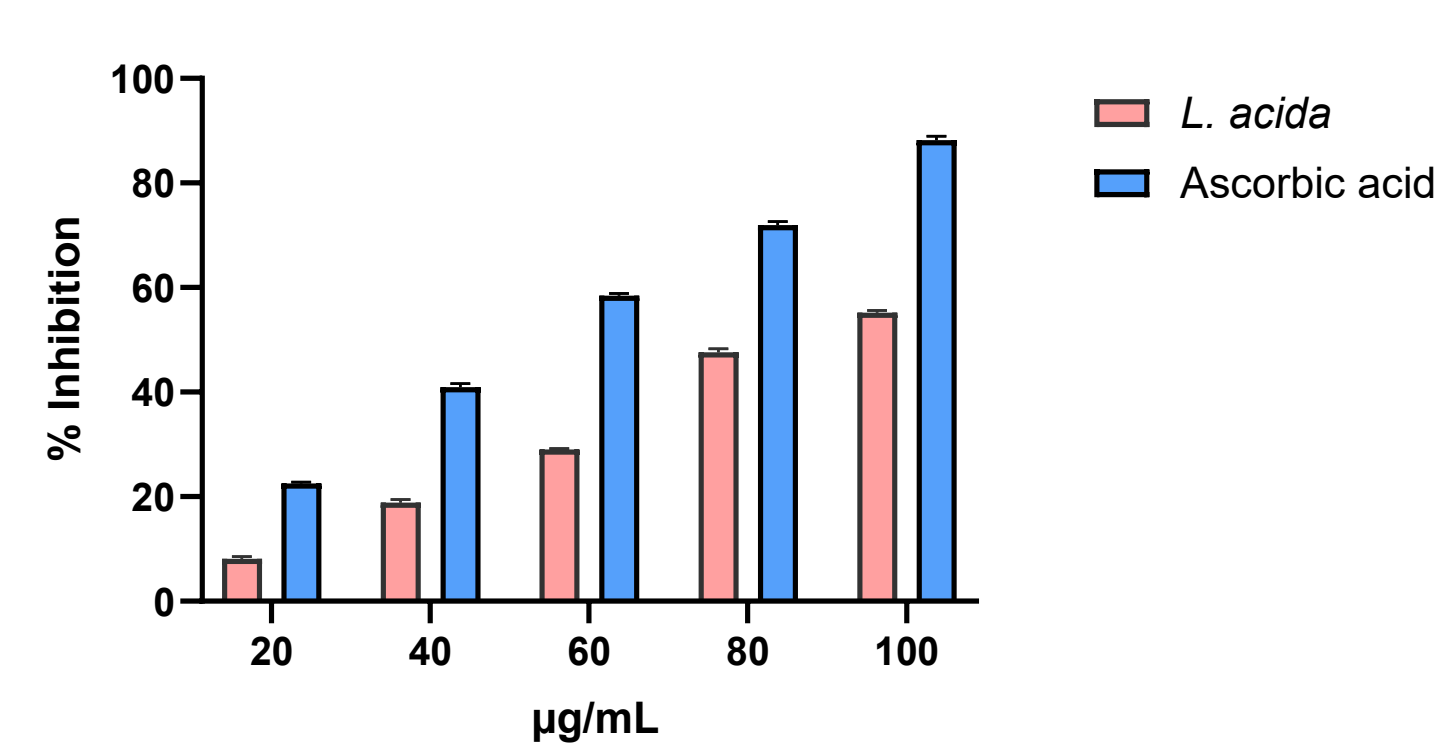


Fig 3: NO radical scavenging activity of *L. acida* EO.

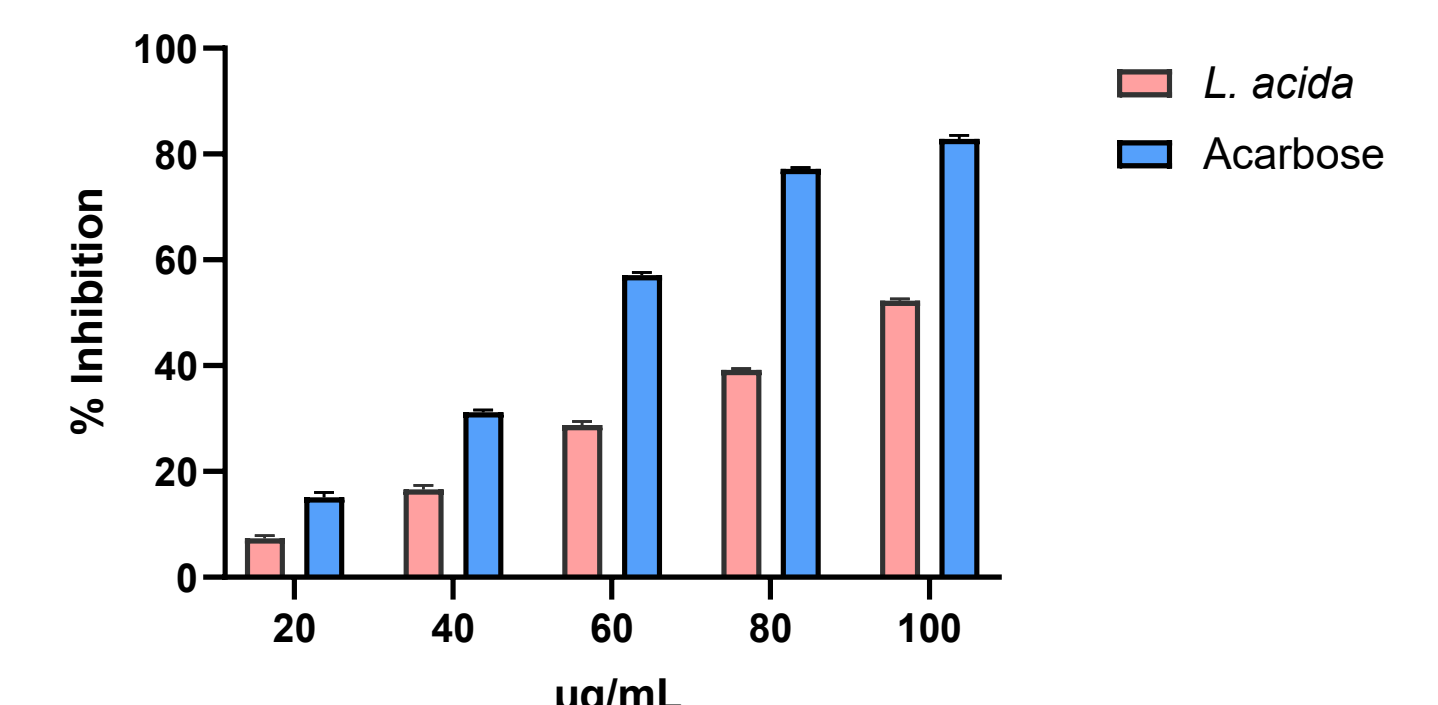


Fig 6: Inhibitory potency of *L. acida* EO against α-amylase activity.

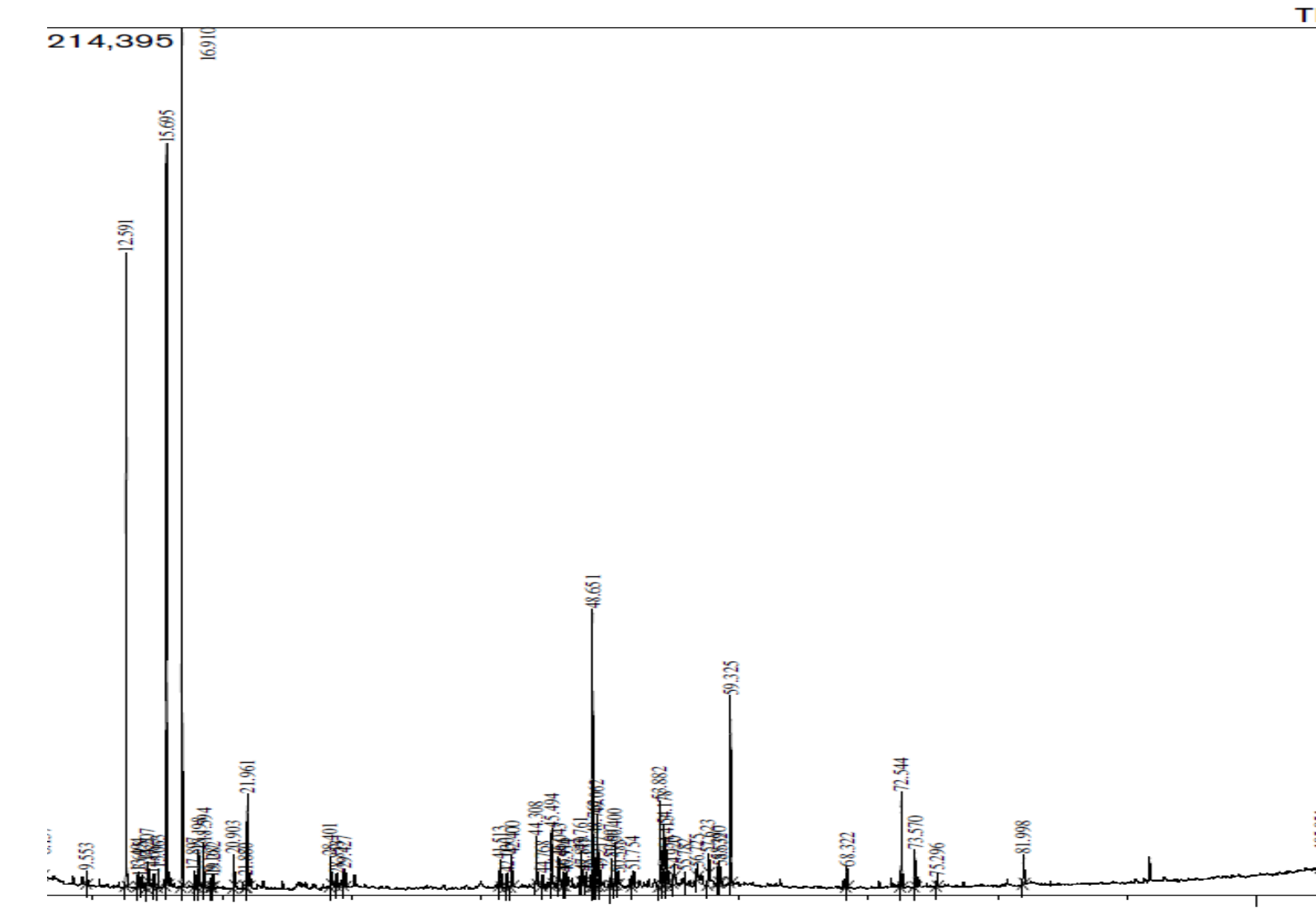


Fig 8: Chromatogram of *L. acida* EO

Table 4: antimicrobial assay

Micro organisms	MIC	MBC
<i>S. aureus</i>	62.5	1000
<i>B. Subtilis</i>	250	1000
<i>S. Fecalis</i>	125	500
<i>P. vulagris</i>	125	500
<i>S. Typhi</i>	125	1000
<i>E. Coli</i>	62.5	500
<i>P. Aeruginosa</i>	62.5	500

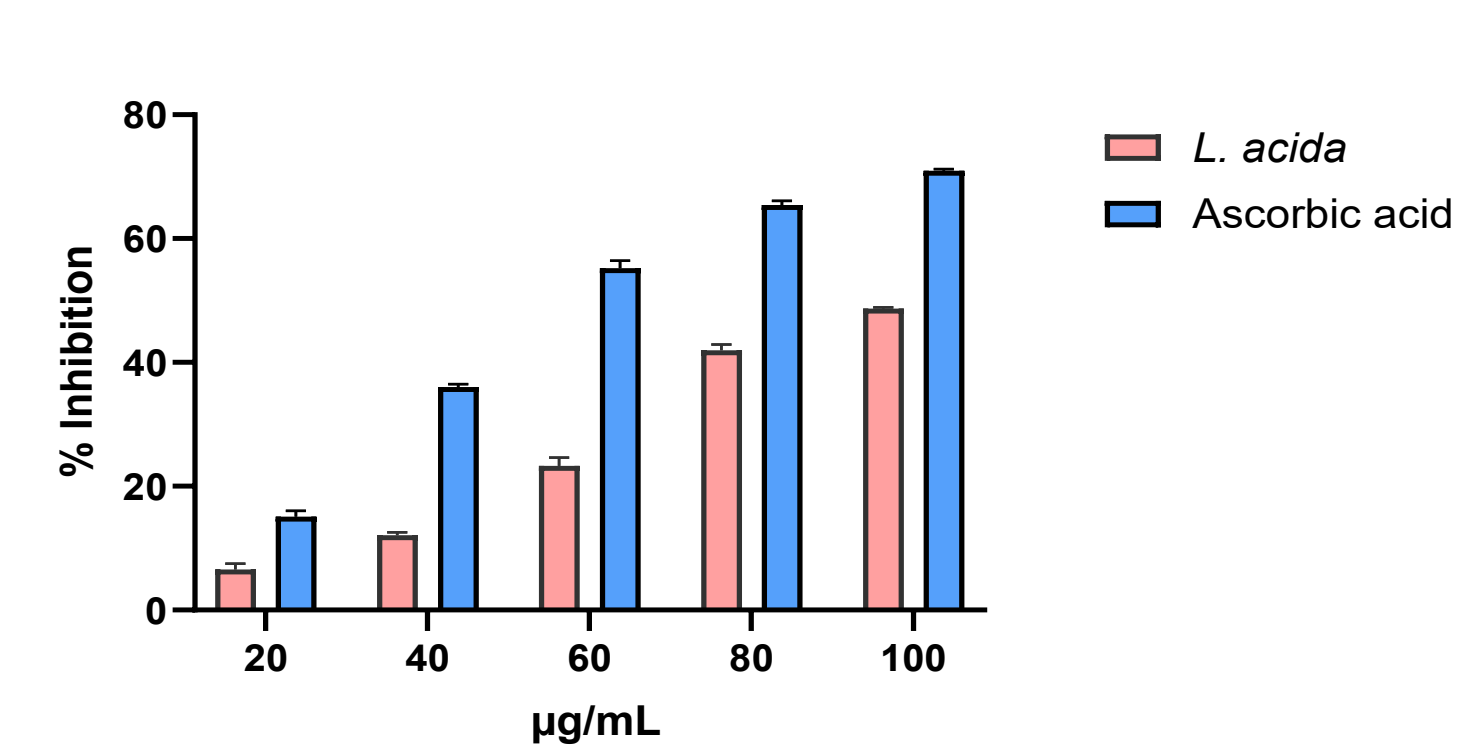


Fig 4: H₂O₂ radical scavenging activity of *L. acida* EO.

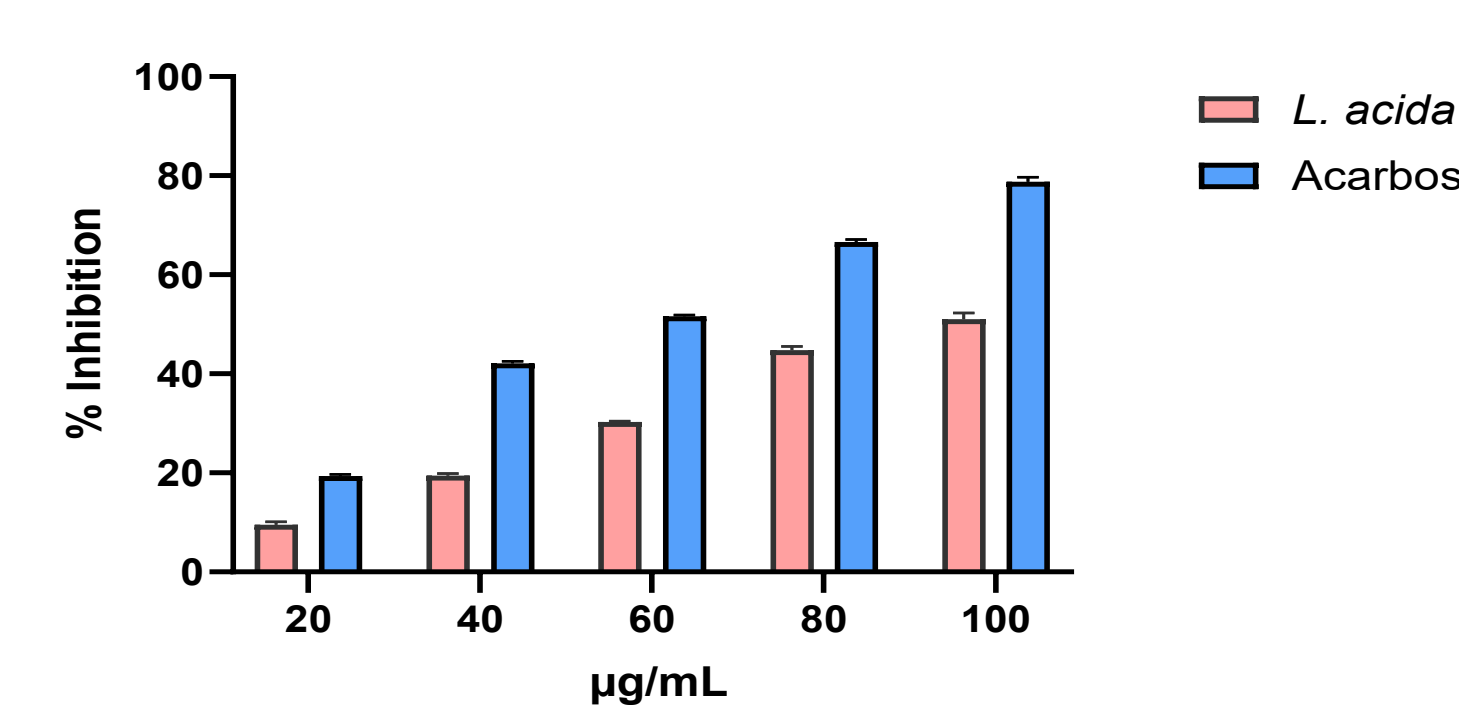


Fig 7: Inhibitory potency of *L. acida* EO against α-glucosidase activity.

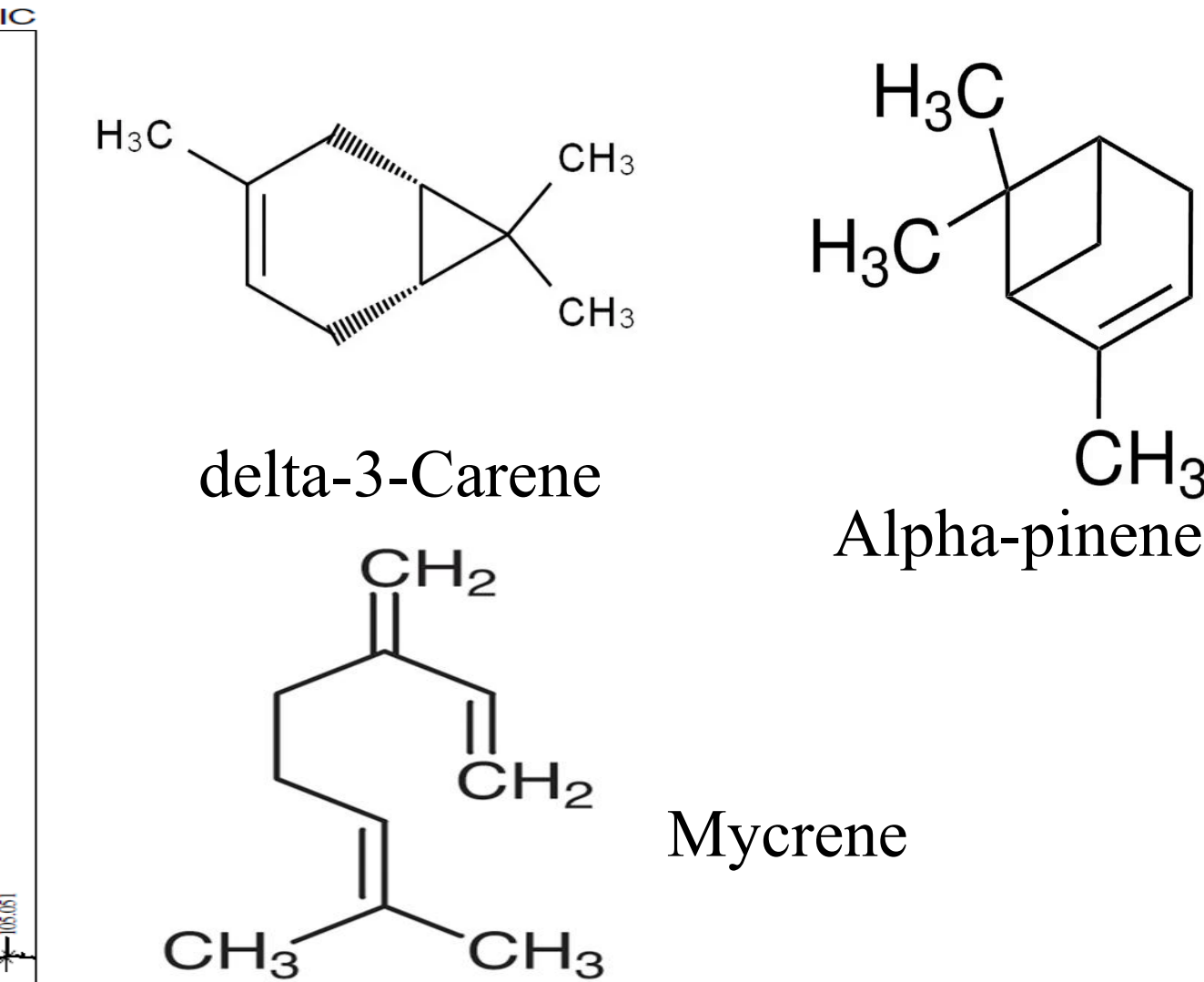


Fig 9: Structural image of some major constituents

Discussion

- The hydrodistillation of the leaves of *L. acida* yielded a pale yellow colouration with a yield of 0.42 % v/w.
- The results of the scavenging ability of essential oil against the selected tested radicals revealed a dose-dependent inhibition
- The essential oil reflected the greatest scavenging ability against lipid peroxidation activities (IC₅₀: 81.99 µg/mL) as compared to all other tested radicals.
- The essential oil exhibited a strong inhibition against α-glucosidase (IC₅₀: 95.08 µg/mL) and mild inhibition against α-amylase (IC₅₀: 97.61 µg/mL).
- The biological activities (antimicrobial, antioxidant and antidiabetic) exhibited by the essential oil maybe attributed to the presence of identified bioactive constituents alongside the phenolic, flavonoids and TAC contents.
- The essential oil displayed significant inhibitory activity against a panel of selected pathogens with MIC ranging from 62.5 µg/mL to 250 µg/mL
- GC-MS analysis of the oil revealed a total of 58 chemical components with delta-3-Carene (18.04%), myrcene (15.19%), alpha-pinene (11.56%), guaia-1-(10),11-diene (8.74%), Spathulenol (3.33%) and beta-Selinene (2.33) identified as the predominant constituents.

Conclusion

- The study concludes that *L. acida* leaves comprise of active phytochemicals with antioxidant capability as well as antidiabetic potential, which indicates the ability of the plant in managing diabetes and other oxidative stress-related disorder
- Also, the oil shows good antimicrobial activity.
- This study validates the traditional usage of *L. acida* and also as an alternative or complementary therapy
- This research study contribute to the SDG 3 (Good health and well being).

Future work

- This study only investigate the *in vitro* biological activities of *L. acida* essential oil. Further studies need to be carried out to isolate the chemical constituents as well as a designed clinical trial to provide *in vivo* evidence

References

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