

Antibacterial Activity of Ethyl Acetate Extracts of Metabolites Produced by Endophytic Bacteria Isolated from *Moringa oleifera* Leaves against Antibiotic Resistant Bacteria

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INTRODUCTION

- The emergence of multidrug-resistant isolates has become a significant challenge and poses a threat to the effective treatment.
- This have necessitated the urgent needs for new and effective antimicrobial agents.
- Endophytes are microorganisms colonizing healthy plants tissue without causing any noticeable injury to the host.
- They are reported as reservoir of various classes of broad spectrum bioactive compounds.

METHODS

- Endophytic bacteria were isolated and identified from healthy leaves of *M. oleifera*.
- The endophytic bacteria were screened for antibacterial against MRSA and MDR *E. coli*.
- Ethyl acetate extracts of metabolites produced by endophytic bacteria with activities were evaluated for antibacterial activity against MRSA and MDR *E. coli* using agar well diffusion assay with DMSO as control.
- Minimum Inhibitory Concentration and Minimum Bactericidal Concentration of the ethyl acetate extracts were determined.

RESULTS AND DISCUSSION

- Eleven endophytic bacteria were isolated from healthy leaves of *Moringa oleifera*.
- Four of the endophytes exhibited antibacterial activities against the test isolates.

Table 1: Antibacterial activity of endophytic bacteria against MRSA and MDR *E. coli*

Isolates Code	Antibacterial activity against	
	MRSA	MDR <i>E. coli</i>
<i>Bacillus</i> sp. E3	-	-
<i>Bacillus</i> sp. E5	+	-
<i>Bacillus</i> sp. E7	-	-
<i>Bacillus</i> sp. E8	+	-
<i>Micrococcus</i> sp. E9	-	-
<i>Bacillus</i> sp. E10	+	+
<i>Bacillus</i> sp. E11	-	-
<i>Micrococcus</i> sp. E12	-	-
<i>Bacillus</i> sp. E13	-	-
<i>Bacillus</i> sp. E14	+	+
<i>Bacillus</i> sp. E15	+	-

- Isolation of endophytic bacteria from healthy leaves of *Moringa oleifera* indicates a symbiotic association between the plant and the endophytic bacteria.
- Ethyl acetate extracts of metabolites produced by endophytic bacteria showed a wide range of antibacterial activity with inhibitory zone ranging from 11.0 to 27.0 mm for MRSA and 13.0 to 30.0 mm for MDR *E. coli* with MIC values between 50 mg/mL and 100 mg/mL.

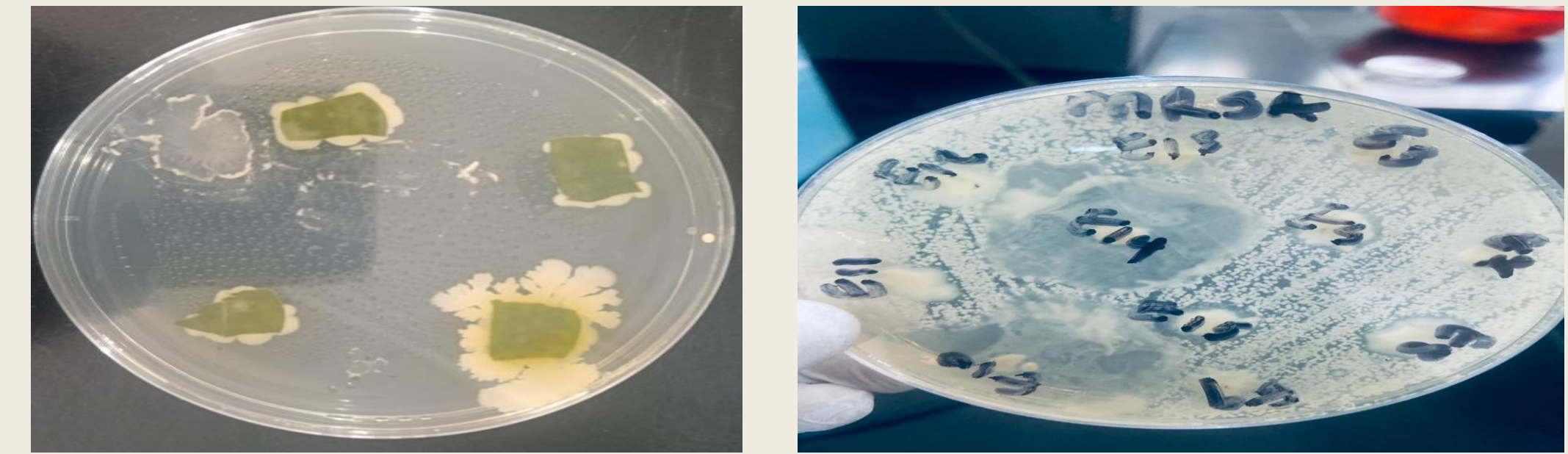


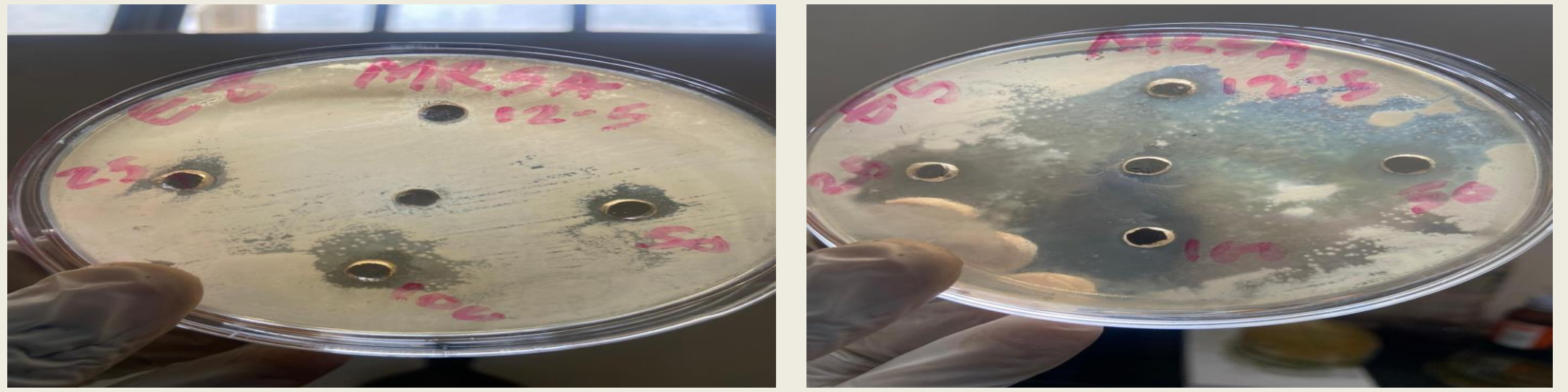
Table 2: Antibacterial activity of ethyl acetate extract of endophytic bacteria against MRSA

Isolates code	Diameter of zone of inhibition(mm)				
Conc. (mg/mL)	100	50	25	12.5	Control
<i>Bacillus</i> sp. E5	27	17	14	11	0
<i>Bacillus</i> sp. E8	18	10	7	0	0
<i>Bacillus</i> sp. E10	15	10	6	0	0
<i>Bacillus</i> sp. E14	15	12	10	8	0
<i>Bacillus</i> sp. E15	0	0	0	0	0

Table 3: Antibacterial activity of ethyl Acetate extract of endophytic bacteria at against MDR *E. coli*

Isolates code		Diameter of zone of inhibition(mm)			
Conc. (mg/mL)	100	50	25	12.5	Control
<i>Bacillus</i> sp. E5	30	20	9	7	0
<i>Bacillus</i> sp. E14	13	0	0	0	0

- Antibacterial activity observed against MRSA and MDR *E. coli* might be due to their ability to produce bioactive metabolites.
- The differences in the size of inhibition zone observed might be due to the difference in activity of bioactive metabolites produced by the endophytic bacteria.
- Variation was observed in the MIC for both MRSA and MDR *E. coli* with the range of 12.5 to 100 mg/mL for respectively. Growth was observed at all the MBC which indicate the endophytic bacteria might have produce bioactive metabolites that can only inhibit the growth of the test bacteria at these concentrations.



CONCLUSION

- Ethyl acetate extracts of metabolites produced by endophytic bacteria isolated from leaves of *Moringa oleifera* exhibited antibacterial activity against antibiotic resistant isolates and can serve as source of novel therapeutic agents.

References

Hashem, A. H., et al. (2023). Bacterial Endophytes From *Moringa Oleifera* Leaves As A Promising Source For Bioactive Compounds. *Separations*, 10(7), 395.

Enerijiof, K.E and Isola, O.B. (2019). Preliminary Phytochemical Screening and In VitroAntibacterial Activities of Aqueous and Ethanol Extracts of *Ageratum Conyzoides*L. Leaf, Stem, Flower and Root on some Bacterial Isolates Associated with diarrhoea. *Niger J Pure Applied Sciences*, volume.32(2): 3480–3489.

Maroof A., et al. (2012). Isolation Of Microbial Endophytes From Some Ethnomedicinal Plants Of Jammu And Kashmir. *Journal of Natural Product and Plant Resources*;2(2).

Duhan, P. et al. (2020) Isolation, Identification, And Characterization Of Endophytic Bacteria From Medicinal Plant *Tinosporacordifolia*. *South African J. Botany*, 134, 43–49