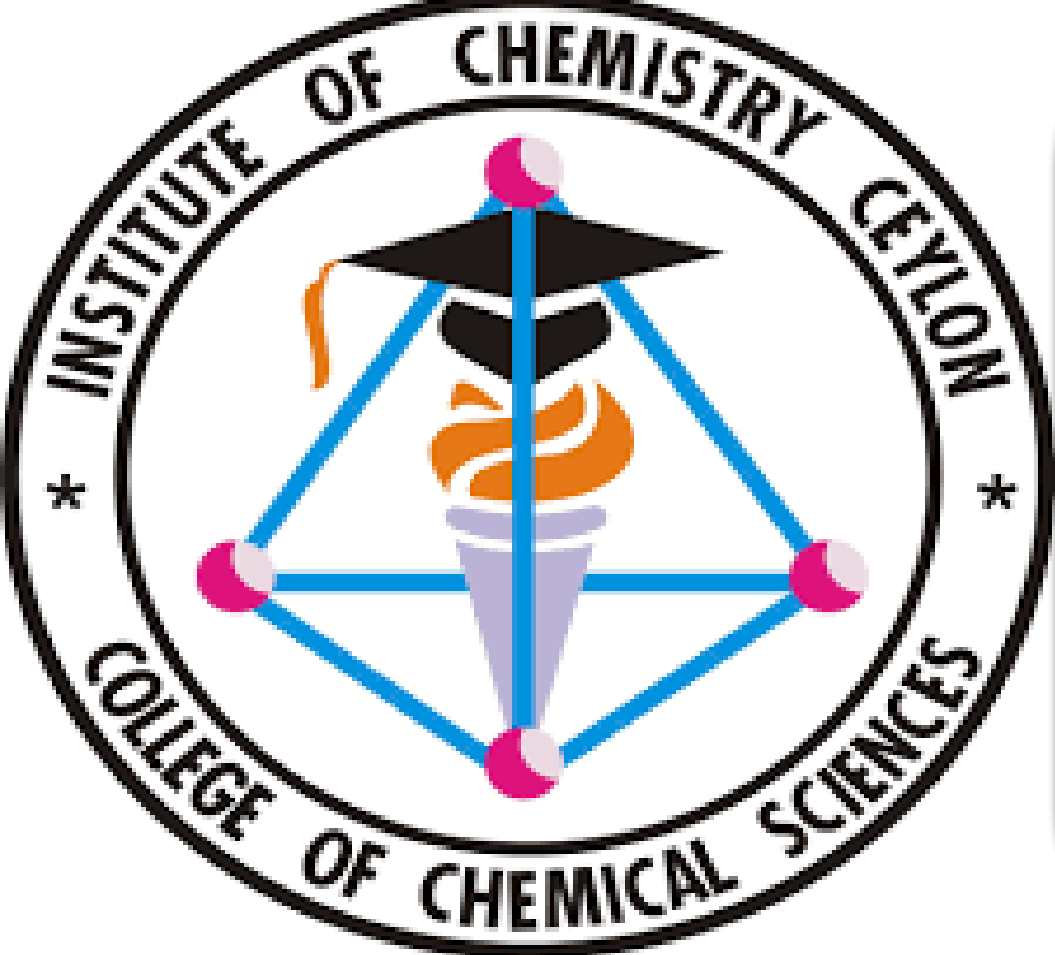




Preparation of chitosan-based clove oil coating to combat crown rot disease in banana

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Introduction

- Crown rot is a serious postharvest disease in bananas, causing major economic losses and reduced fruit quality. Conventional antifungal agents are mostly synthetic, non-biodegradable, and raise health and environmental concerns. This study evaluates a chitosan-based nanoemulsion formulated with clove (*Syzygium aromaticum*) oil, ethanol, and Tween 80 as a natural antifungal treatment against *Fusarium verticillioides*, the main crown rot pathogen.
- Nanoemulsions (250–5000 ppm) were tested using the poisoned food technique. Characterization was carried out using FTIR, UV, zeta potential, and particle size analysis. The formulation showed strong antifungal activity, with complete inhibition (100%) at 5000 ppm and MIC was determined to be 2500ppm.

Objective

- To develop an eco-friendly, cost-effective alternative to chemical fungicides, to combat Crown Rot disease in banana by maintaining fruit quality and extending shelf-life.

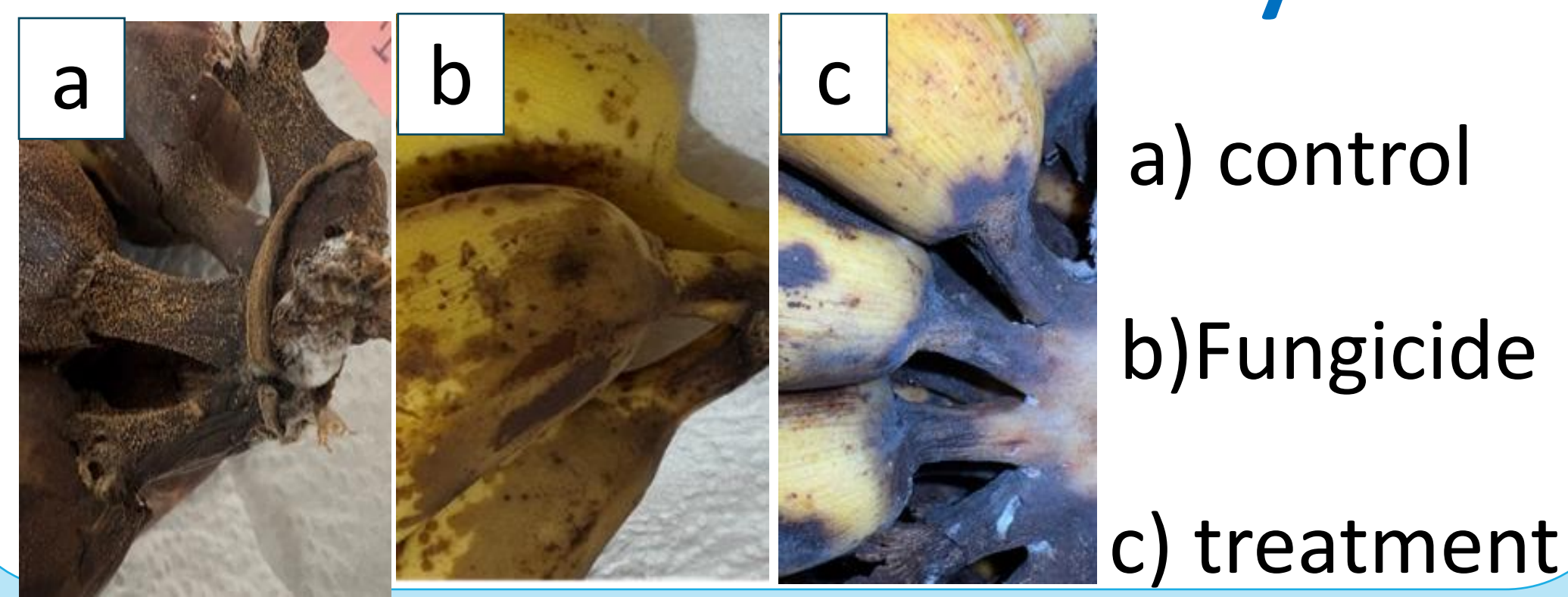
Methodology

- Clove essential oil (CEO), Tween 80, and ethanol were mixed in a 1:1:2 ratio to form the oil phase.
- A 1% (w/v) chitosan solution was prepared in acetic acid (pH 5.2) and stirred at 45 °C until completely dissolved.
- The oil phase was then added dropwise into the chitosan solution under continuous stirring, followed by homogenization at 5000 rpm for 15 minutes to obtain a stable nanoemulsion.

Observations of the fungus

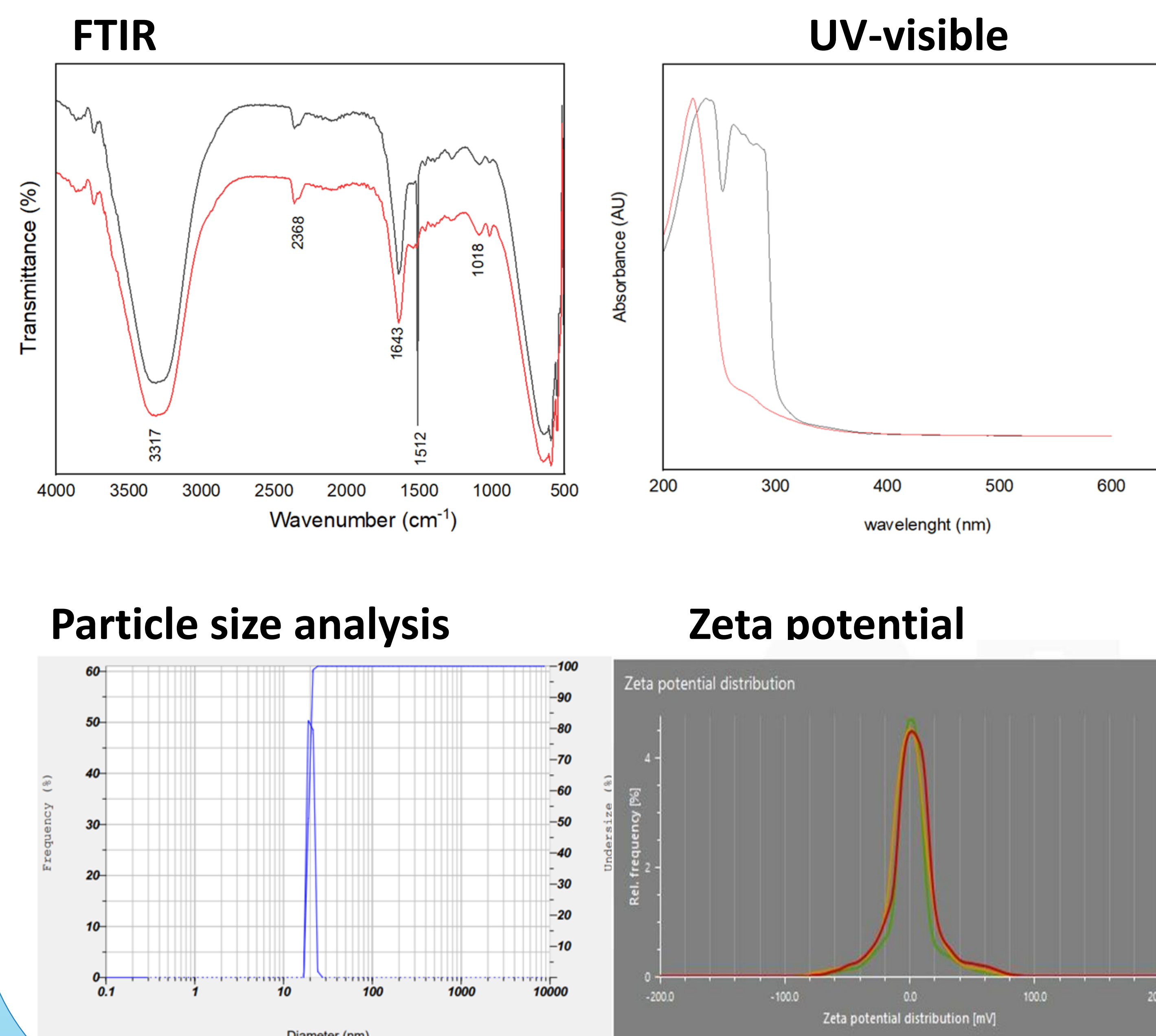


Disease severity



a) control
b) Fungicide
c) treatment

Characterizations

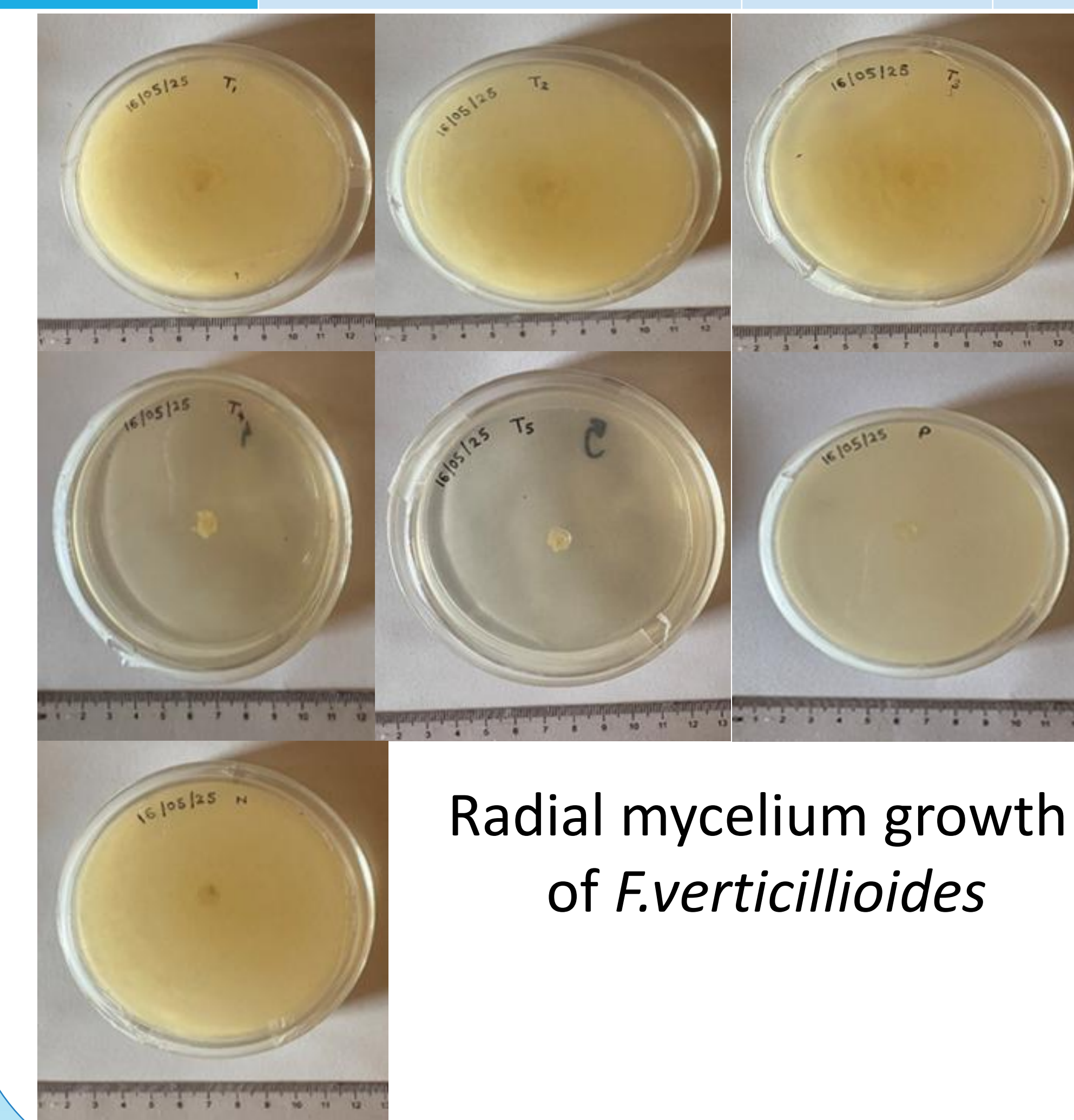


Conclusion

- Chitosan-based clove oil emulsion effectively inhibits the *Fusarium verticillioides* and offers a stable, eco-friendly strategy for post-harvest management of banana.

Antifungal activity

Treatments (ppm)	Mean radial diameter (mm)	%Inhibition
250	85.0	0 ^a
500	85.0	0 ^a
1000	85.1	0 ^a
2500	0.0	100 ^b
5000	0.0	100 ^b
Fungicide	0.0	100 ^b
Negative control	85.0	0 ^a



Radial mycelium growth of *F.verticillioides*