

## ABSTRACT

Anthracnose is a plant disease that significantly reduces the yield and quality of economically important crops. The primary causal agents are fungi in the genus *Colletotrichum*, which cause severe postharvest losses. While chemical fungicides are commonly used to control *Colletotrichum* spp., their application can result in pesticide residues. As an alternative, biological control using microorganisms such as bacteria and endophytic fungi has gained attention. This study aimed to evaluate the antifungal potential of metabolites derived from endophytic fungi against *Colletotrichum* sp. isolated from anthracnose lesions. Pathogenic fungi were obtained from symptomatic ripe mangoes and bananas and confirmed through pathogenicity tests. Four *Colletotrichum* species were identified; two from mangoes and two from bananas. Endophytic fungal strains were isolated from various healthy plant tissues, cultivated in liquid medium for metabolite production, and assessed for antifungal activity using the agar diffusion method. The results demonstrated that three endophytic isolates; LC10-12, LC47-2, and RM22-6 effectively inhibited the growth of all four *Colletotrichum* spp. These isolates will be further scaled up for metabolite production and subjected to IC50 determination. The most potent extract will be tested for its efficacy in reducing anthracnose lesions on mangoes and bananas. These findings highlight the potential of endophytic fungi as sustainable biological control agents against anthracnose, contributing to safer disease management strategies for economically important fruit crops.

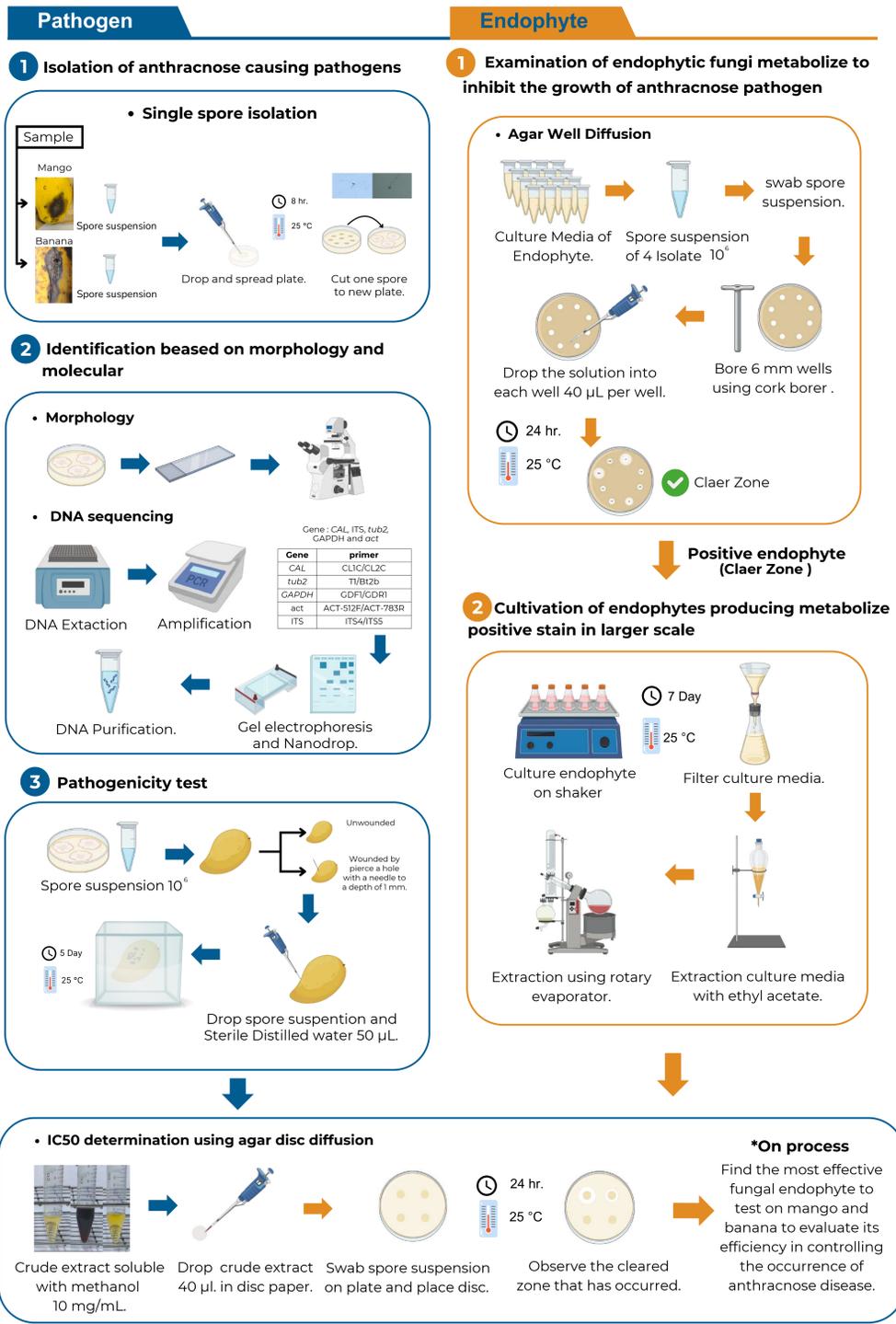
## INTRODUCTION



## OBJECTIVE

- To assess the efficacy of metabolites produced by the endophytic fungus in inhibiting the growth of *Colletotrichum* sp. the causal pathogen of anthracnose

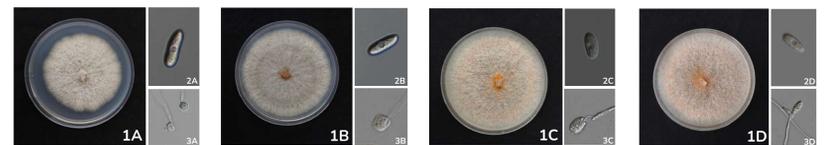
## METHODOLOGY



## RESULTS

### Isolation and identification of anthracnose pathogen

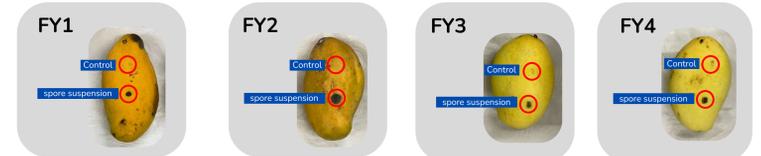
Isolation and identification of anthracnose pathogen Four pathogens were isolated from anthracnose lesions of mango and banana using the single-spore isolation method. Two isolates were obtained from mango (FY1-FY2), and two were obtained from banana (FY3-FY4). The pure cultures differed in colony morphology on half-strength PDA (Figure 1).



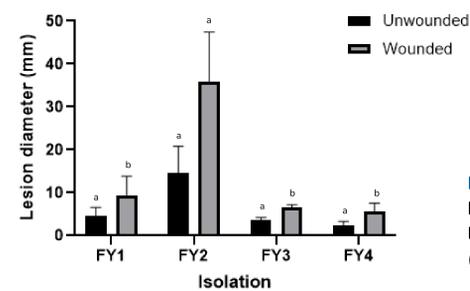
**Figure 1** Colony morphology of anthracnose fungal pathogens on half-strength PDA at 25°C for 5 days. (A) FY1, (B) FY2, (C) FY3, (D) FY4; 1: Colony, 2: Conidia, 3: Appressoria.

### Pathogenicity Test of FY1-FY4

After inoculating the spore suspension of each fungal isolate onto the sterile surface of mango and banana using Koch's postulates and incubating for 5 days, the appearance of anthracnose lesions was observed. All isolates (FY1-FY4) induced small, circular brown or dark brown anthracnose lesions (Figure 2), with FY2 causing the largest lesion diameter (Figure 3). In contrast, the control treated with sterile water did not develop anthracnose symptoms. These results confirm that all four isolates are anthracnose pathogens.



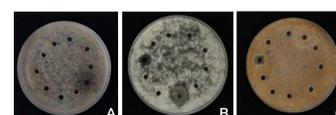
**Figure 2.** Pathogenicity test: Appearance of anthracnose lesions on mango after inoculation with FY1-FY4 spore suspensions, compared to an uninoculated control treated with sterile water.



**Figure 3.** Anthracnose lesion diameter produced by pathogens FY1-FY4. Bars with different lowercase letters indicate significant differences ( $p < 0.05$ ).

### Ability of endophytic fungal metabolites to inhibit the growth of anthracnose pathogens FY1-FY4

Ability of endophytic fungal metabolites to inhibit the growth of anthracnose pathogens FY1-FY4 The culture filtrates of 130 endophytic fungal isolates were tested for their ability to inhibit the germination and growth of pathogens FY1-FY4 using the agar well diffusion method. The presence of a clear zone around the agar well indicated a positive result. Among the 130 endophytic fungal metabolites, three isolates LC47-2, LC10-12, and RM22-6 showed positive results against the growth of all pathogens FY1-FY4 (Figure 4). These three isolates are currently undergoing IC50 determination, and the most effective strain will be selected for in vivo efficacy testing on mango and banana to evaluate its potential for anthracnose control.



**Figure 4.** Clear zone formation indicating the inhibition of anthracnose pathogens FY1-FY4 by endophytic fungal metabolites (A) LC47-2, (B) LC10-12, and (C) RM22-6.

## ACKNOWLEDGE

This study was completed with the support of the Research Center of Microbial Diversity and Sustainable Utilization (RCMU) and the Algal and Cyanobacterial Research Laboratory, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand.

## REFERENCES

- Rattanakreetakul, C., Keawmanee, P., Bincader, S., Mongkolporn, O., Phuntumart, V., Chiba, S., & Pongpisutta, R. (2023). Two newly identified *Colletotrichum* species associated with mango anthracnose in central Thailand. *Plants*, 12(5), 1130. <https://doi.org/10.3390/plants12051130>
- Benatar, G., Wibowo, A., & Suryanti. (2021). First report of *Colletotrichum* asianum associated with mango fruit anthracnose in Indonesia. *Crop Protection (Guildford, Surrey)*, 141(105432), 105432. <https://doi.org/10.1016/j.cropro.2020.105432>

## CONCLUSION

- Four anthracnose pathogens (FY1-FY4) were isolated from mango and banana, and pathogenicity tests confirmed all isolates induced lesions on both fruits.
- Three endophytic fungal isolates—LC47-2, LC10-12, and RM22-6—successfully inhibited the growth of all four anthracnose pathogens.
- The most effective isolate will undergo IC50 determination and in vivo efficacy testing on mango and banana for potential biocontrol applications.