





An exploration of the impact of endophytic fungi from Yunnan Arabica coffee on its flavor

Minghua Qiu_{1,2,3}, Chenxi Quan_{1,2,3}, Lin Zhou_{1,2}, Yuancao Shu_{1,2}

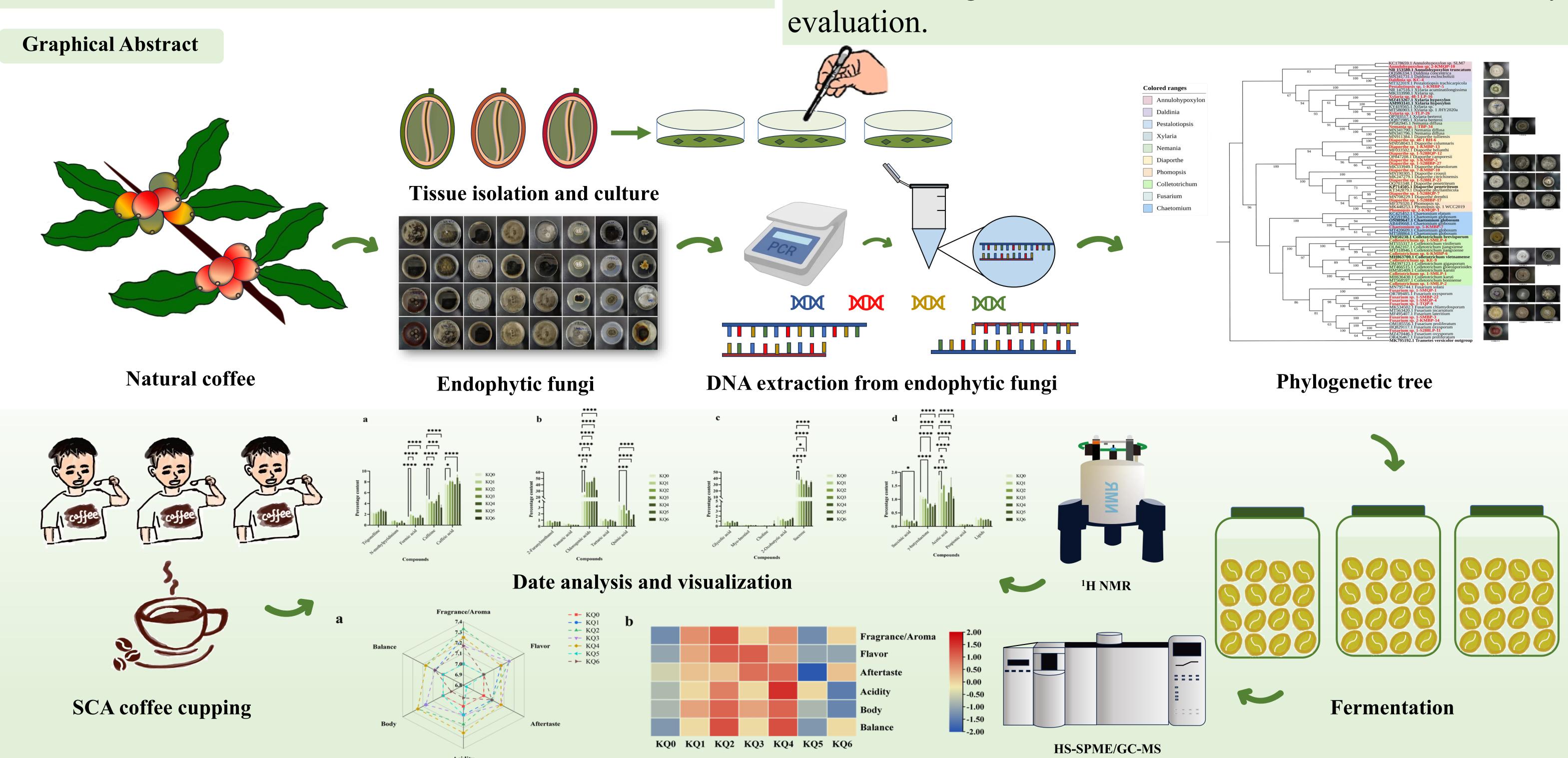
1 State Key Laboratory of Phytochemistry and Natural Medicines, Kunming Institute of Botany, Chinese Academy of Sciences, Kunimg, China; ²Yunnan International Joint Laboratory of Coffee Research, Mangshi, Yunnan Province, China; 3University of the Chinese Academy of Sciences, Beijing 100049, People's Republic of China

Introduction

valued for its unique sensory characteristics and bioactive cherries using tissue culture, and was identified by properties. While diverse microbial communities drive the morphological characteristics and ITS sequencing. Then, natural fermentation process responsible for developing its Six dominant strains were selected to ferment Sarchimor characteristic aroma and flavor compounds, the specific coffee fresh fruits. Changes in key compounds and cupping influence of endophytic fungi native to coffee plants on scores from fermentation with different endophytes were these critical attributes remains understudied.

Methods

Coffee, one of the three major beverages globally, is Endophytic fungi were isolated from Arabica coffee assessed using ¹H NMR, HS-SPME/GC-MS, and sensory



Results

From three maturity stages (green, yellow, red cherry) of five dominant *Coffea arabica* cultivars in Yunnan, China, 655 endophytic fungal strains were systematically isolated and characterized. Six strains were selected for coffee cherry fermentation. Endophytic fungal inoculation significantly altered bean chemistry, with *Talaromyces funiculosus* KQ2 imparting unique vanilla-cinnamon notes through exceptional flavor-enhancing properties. Integrated ¹H NMR and HS-SPME/GC-MS analysis demonstrated a 14.61% sucrose increase, 32.41% caffeine reduction, and 12.84% elevation in furan derivatives in coffee. Multivariate analysis further identified 40 strain-specific markers (8 water-soluble, 32 volatile) in roasted coffee produced from fresh Yunnan cherries fermented with selected endophytic fungi. This study establishes chemical foundations for endophytic fungi-mediated coffee flavor enhancement, providing metabolomic insights for developing targeted fermentation strategies.

Conclusions & Perspectives

Sensory evaluations demonstrated that endophytic fungal fermentation altered the flavor attributes of coffee and enhanced its quality. It provides greater process control, improves degumming efficiency, and enhances final flavor quality for developing distinctive coffee products.

References

Food Quality, 2019, 1-6.

Acknowledgements

1. Wang, Y., Wang, X., Quan, C., Al-Romaima, A., Hu, G., Peng, X., & Qiu, M. (2024). Optimizing commercial Arabica coffee quality by integrating flavor precursors with anaerobic germination strategy. Food Chemistry: X, 23, 101684. 2. Bressani, A. P. P., Martinez, S. J., Batista, N. N., Simão, J. B. P., Dias, D. R., & Schwan, R. F.. Co-inoculation of yeasts starters: A strategy to improve quality of low altitude Arabica coffee. Food Chemistry, 2021, 361, 130133. 3. Haile, M., & Kang, W. H.. The role of microbes in coffee fermentation and their impact on coffee quality. Journal of

This study was supported financially by the National Natural Science Foundation of China, China (No. U1902206), Key Research and Development Project of Yunnan Province (202003AD150006), Project of Yunnan International Joint Innovation platform (202203AP140106), and Postdoctoral Fellowship Program of CPSF (GZC20232766), Special Research Assistant of Chinese Academy of Sciences, Project of Expert workstation of Yunnan Science and Technology Association (2024).