Ability of two *Lactobacillus plantarum* strains for Ochratoxin A reduction in coffee cherries during post-harvest processing carried out at the farm

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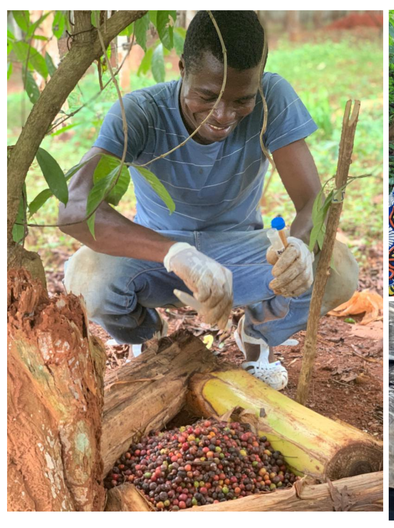
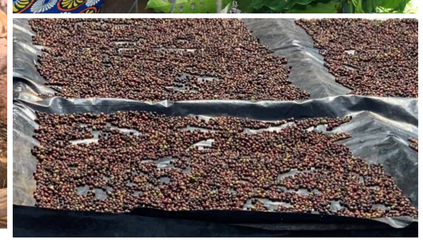
Introduction

Coffee beans and end-products are frequently contaminated by ochratoxin A (OTA) producing molds belonged to genera *Aspergillus* and *Penicillium*. OTA is reported to be possibly carcinogenic to humans and causes significant economic losses for coffee producers. This research aimed to determine the ability of lactic acid bacteria (LAB) strains to reduce the OTA content in contaminated coffee beans at the farm level.

Material and Methods

- **Coffee cherries** (Robusta) were harvested in 2018 from a paysan plantation located at Akoupé, a main coffee producing region, Côte d'Ivoire.
- **Lactic acid bacteria (LAB):** Isolation, phenotypical characterization and molecular identification by 16S rDNA sequencing.
- **Screening of LAB presenting anti-OTA activity :** Co-cultures in CYB of 7 antifungal LAB cells suspension (CS) (10^{10} ufc.mL^{-1}) with OTA producing *Aspergillus carbonarius* strain AcA41 (10^5 conidia.mL^{-1}), 2, 4 and 6 days incubation at 30°C, 150 rpm. Measurement of 0TA was carried out using HPLC-FD.
- **Inoculation** of fresh coffee cherries samples with the 2 more efficient OTA-reducing *Lactobacillus plantarum* (D12 and D13) and *A. carbonarius* AcA41.





Results

- **LAB isolated from coffee cherries:** Morphological and molecular identification showed 16 LAB strains belonging to *Lactobacillus plantarum* (13), *Weissella paramesenteroides* (2) and *W. confusa* (1) (Fig. 1)
- Fig. 2 illustrates strong and consistent **adhesion of both *L. plantarum D12* and *D13* cells to fungal conidia** and lysis of conidia after 6 days (fungicidal activities) and fungistatic activities by the formation of LAB cell aggregates and strong colonization of the environment by other strains of LAB tested.
- **Antifungal LAB**: 7 antifungal LAB strains tested exhibited greater OTA reduction ability reaching more than 99% **(**Fig. 3**)**.
- **Reduction of OTA content in coffee beans** by ***L. plantarum* D12 and D13** (82.2 and 63.2 % respectively) when inoculated during post-harvest processing (Fig. 4).

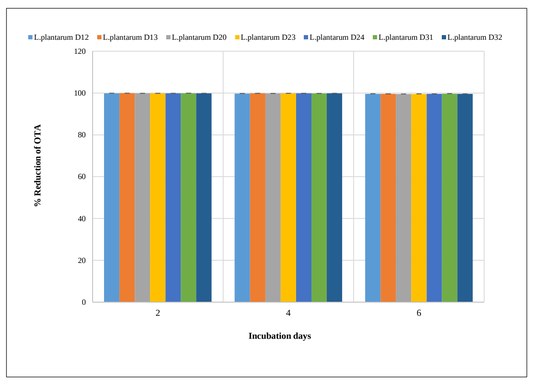


Figure. 3. *In vitro* reduction of OTA content by 7 antifungal LAB isolated from coffee cherries

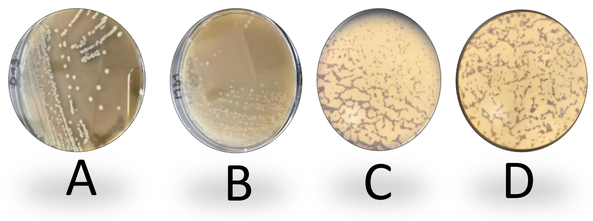


Figure. 1. Macroscopic aspect of **(A)** *Lactobacillus*, **(B)** *Weissella* and microscopic observation of **(C)** *Lactobacillus*, **(D)** *Weissella*

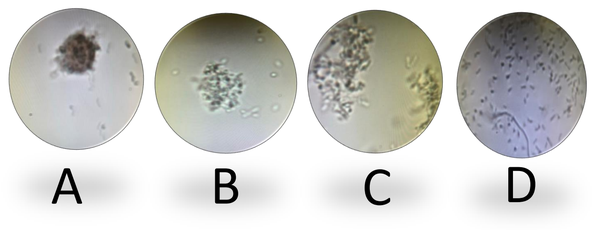


Figure. 2. Microscopic observations of co-cultures of LAB and *A. carbonarius* conidia**.** Fungicidal mechanisms **(A, B)**, fungistatic activities **(C, D).**

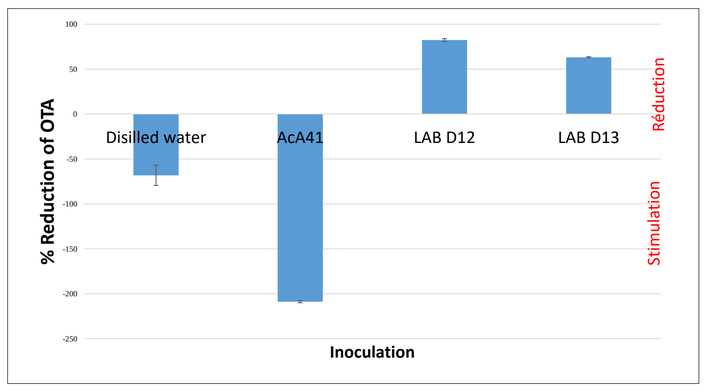


Figure 4. Effects of *L. plantarum* strains on OTA content of coffee beans

Conclusion and Perspectives

- 16 LAB strains belonging to *Lactobacillus* and *Weissella* genera were isolated from fresh coffee cherries.
- 7 *L. plantarum* strains reduced OTA *in vitro* up to 99 %. 2 *L. plantarum* D12 and D13 were fungicidal against *A. carbonarius in vitro* and reduced OTA content in coffee beans by 82.2 and 63.2 % respectively.
- These *L. plantarum* strains appear to be promising potential bicontrol agents for the OTA reduction in coffee beans.

References

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- **Pereira, G. V. D. M., Neto, D. P. C., Medeiros, A. B. P., Soccol, V. T., Neto, E., Woiciechowski, A. L., & Socco, C. R. (2015).** Potential of lactic acid bacteria to improve the fermentation and quality of coffee during on-farm processing. International Journal of Food Science and Technology, 51, 1689–1695.