Isolation, antagonistic activity, chemical characterization of soil-borne and plant-beneficial bacteria from Burundi

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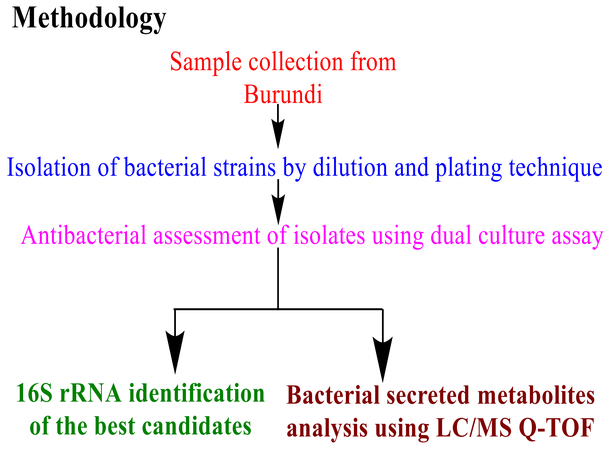
Introduction

- Global food production is seriously affected by plant diseases and pests (Strange & Scott, 2005). So far, conventional pesticides represent the main used treatment despite the damage caused to the environnemnt and health.
- Plant Beneficial bacteria, with pathogen antagonistic and plant resistance inducing activities, represent one of the most promising alternative in order to reduce the use of these chemicals.
- Therefore, isolation and characterization of new efficient bacteria constitute the first step in the discovery of potential ecofriendly option to boost crop yields and limit the deleterious effects of pesticides in developing country including Burundi..

Methodology



Results

- Among 19 bacterial isolates, six were most active at inhibiting a broad range of bacterial phytopathogens such as *Xanthomonas campestris*, *Clavibacter michiganensis*, *Rhodococcus fascians*, *Pectobacterium carotovorum*, *Pseudomonas cichori*, *P. fuscovaginae.*
- One isolate (III_1) is particularly interesting as effective against all the tested phytopathogens, with more than 60% activity compared to reference *Bacillus velezensis* QST713 (SERENADE ASO) (Fig. 1 and Fig. 2)
- LC/MS analyses reveal its ability to produce at least 3 known bioactive metabolite families : surfactins, iturins; and polyketides (Fig. 3)
- Surfactins have antibacterial and plant immunity inducing activities, iturins possess antifungal activity (Ongena & Jacques, 2008) while polyketides are good antibacterials (Chakraborty et al., 2017)
- Isolate III_1 was identified as a strain of *Bacillus nakamurai*, while the other five active isolates belong to *Bacillus pumilus* strains (all produce pumilacidin).

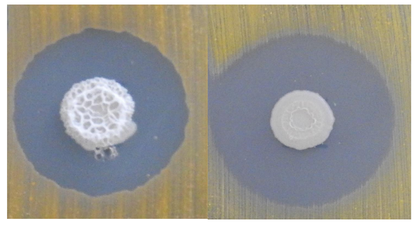


Fig.1: Antagonism of *B. velezensis* QST713 (left) and III_1 (right) against *Rhodococcus fascians*

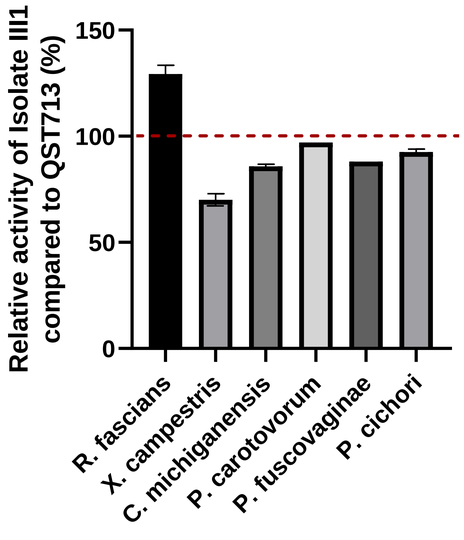


Fig. 2: Relative activity of III_1 compared to *B. velezensis* QST713 (100%)

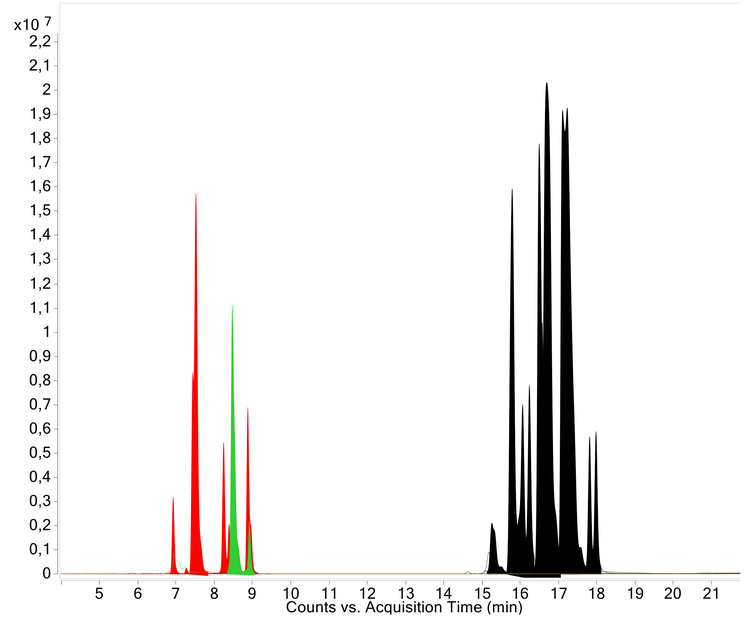


Fig.3: Chromatogram of the LC/MS Q-TOF analysis of III_1 culture supernatant. Red peaks represent iturins, black peaks surfactins and green peaks polyketides

Conclusion

The soil isolate III_1 is a promising candidate that could be used in the biocontrol of plant diseases. We are further investigating its potential to inhibit a range of important fungal pathogens affecting the most cultivated crops in Burundi.

References

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