

INFORMATION ON PhD DISSERTATION

Dissertation title: Study on the effect of some selected endophytic bacterial strains on growth and development of Robusta coffee (*Coffea canephora* Pierre var. *robusta*).

Field: Crop Science

Code: 62. 62. 01:10

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1. SUMMARY OF THE PhD. DISSERTATION

1.1 Aims of the dissertation

The dissertation was conducted to evaluate the effects of some selected endophytic bacteria strains on growth, development of Robusta coffee in greenhouse and in field conditions. Based on these results, further studies were conducted to determine the effective dose and compatible combination of the strains on the growth and yield of the coffee in the field. The aims of this research were to reduce the amount of inorganic fertilizers but the growth and development of Robusta coffee were sustainably enhanced.

1.2. Research contents of the dissertation

The study was carried out with 9 endogenous bacteria strains: *Bacillus cereus* M15, *Bacillus subtilis* EK17, *Enterobacter cloace* EK19, *Bacillus* sp. Cu8, BH8, *B. cereus* BMT7, *Bacillus pumilus* BMT4, *Bacillus* sp. BMT8 and *Bacillus* sp. BMT11 with the following basic research contents:

- Evaluate the effects of endophytic bacteria strains on the growth of coffee seedlings in greenhouse conditions;
- Evaluate the effects of selected endophytic bacteria strains on the growth of Robusta coffee trees in vegetative stage;
- Evaluate the effects of selected endophytic bacteria strains on the growth and development of mature Robusta coffee.

2. INNOVATIVE CONTRIBUTIONS OF THE DISSERTATION

- Three endophytic bacterial strains, namely: *B. cereus* M15, *B. pumilus* BMT4 and *B. subtilis* EK17 were selected thanks to their abilities to stimulate the growth of Robusta coffee seedlings. These endophytic bacterial strains increased the leaf chlorophyll, N% and P% contents, thus, enhanced growth parameters of Robusta coffee seedlings.

- The combinations of *B. cereus* M15 + *B. subtilis* EK17, *B. subtilis* EK17 + *B. pumilus* BMT4 and *B. cereus* M15 + *B. pumilus* BMT4 are compatible, do not inhibit each other *in vitro* condition. Therefore, they are able to be mixed and apply in field conditions.

- The mixture of B1 (*B. cereus* M15 + *B. subtilis* EK17) and B2 (*B. subtilis* EK17+ *B. pumilus* BMT4) showed the best effect on N and P nutrient uptake, thus enhancing the growth of young Robusta coffee trees when being applied at the dosage of 20 - 30 ml of bacterial suspension (10^9 CFU/mL) per tree each time.

- The bacterial suspension mixture of B1 (*B. cereus* M15 + *B. subtilis* EK17) and B2 (*B. subtilis* EK17+ *B. pumilus* BMT4) when being applied at the dosage of 20 - 30 ml/tree/time (10^9 CFU/mL) had positively affected on the leaf chlorophyll content, N and P nutrient uptake, resulting in promoting growth and development of mature coffee trees, increasing the number of fruits/bunch. As a result, the coffee productivity increased 14.8 - 20.9% despite of 25% reduction of recommended N and P dose.

- Applying the bacterial suspension mixture of B2 (*B. subtilis* EK17+ *B. pumilus* BMT4) and B3 (*B. cereus* M15 + *B. pumilus* BMT4) at the dosage of 20 - 30 ml/tree/time for vegetative coffee or 30 - 40 ml/tree/time for mature coffee effectively reduced the density of *Meloidogyne* sp. and *Pratylenchus* sp. down to 80%.

3. APPLICATIONS / APPLICATION POSSIBILITIES IN PRACTICE, ISSUES NEED FURTHER STUDY

- Bacteria strains *B. cereus* M15, *B. subtilis* EK17 and *B. pumilus* BMT4 have great potential for application in sustainable coffee production, contributing to reducing the amount of inorganic fertilizer and chemical pesticides needed for coffee production. These are important materials for conducting research and development of bacteria formulation apply in coffee trials.

- Further research on bacteria mechanism in plant growth promotion and nematode suppression need to be conducted

- It is necessary to study the effect of these bacterial suspension mixtures on the growth promotion of other important crops in the Central Highlands.