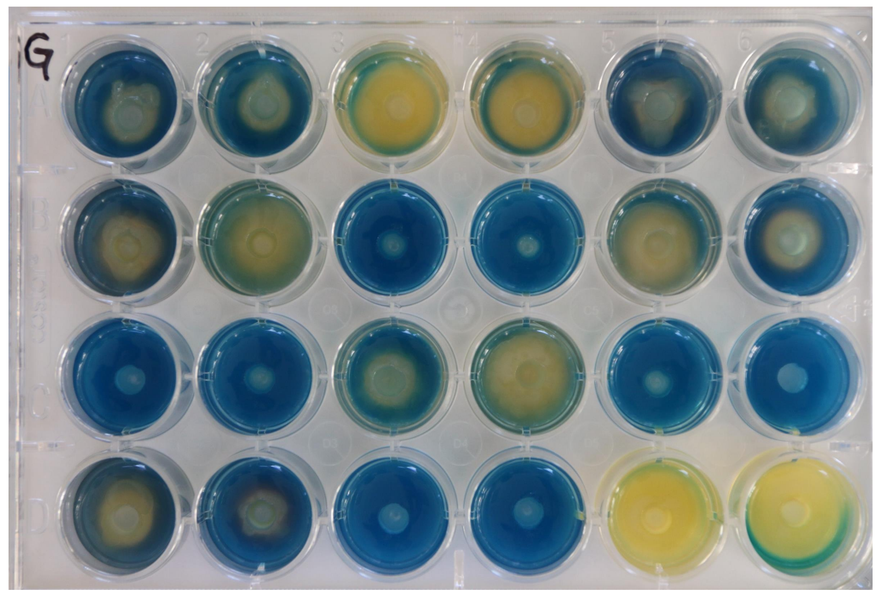
Bacterial endophytes associated with the tropical forage grass *Brachiaria* spp.



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Project summary

Endophytes are microorganisms that live within plant tissue, for all or at least part of their life cycle, and cause no apparent infections. The roles of endophytic and plant associated bacteria in the fitness (including enhanced adaptation to abiotic stresses and biotic stresses) of temperate grasses have been well documented but little known on the tropical grasses. Bacterial endophyte research at the BeCA-ILRI Hub seeks to develop and validate scientific protocols for the isolation, identification, and functional characterization of bacterial endophytes of Brachiaria grasses; with a view to exploring such organisms to enhance the adaptation of important forage and food crops to adverse climatic and environmental conditions.

Outputs

- Methods for isolation, identification and characterization of endophytes were developed, tested and validated.
- Over 100 strains of bacterial endophytes have been isolated from the Brachiaria leaf (33%), root (32%) and rhizosphere soil (35%) of Brachiaria grass; identified by 16S gene sequencing; and deposited to BecA-ILRI Hub microbial culture collection for long term storage.
- The 16S gene sequences revealed 84 bacterial strains into three phyla, five classes, eight orders, twelve families and fifteen genera.
- Among the bacterial strains isolated were members of the Enterobacter, Pseudomonas, Rhizobium, Bacillus and genera which have been documented to have plant growth-promoting properties (Figs. 1&2).
- Inoculation of five of the isolated bacterial strains consistently resulted in an increase in total plant biomass productions of maize seedlings compared to un-inoculated maize seedlings.

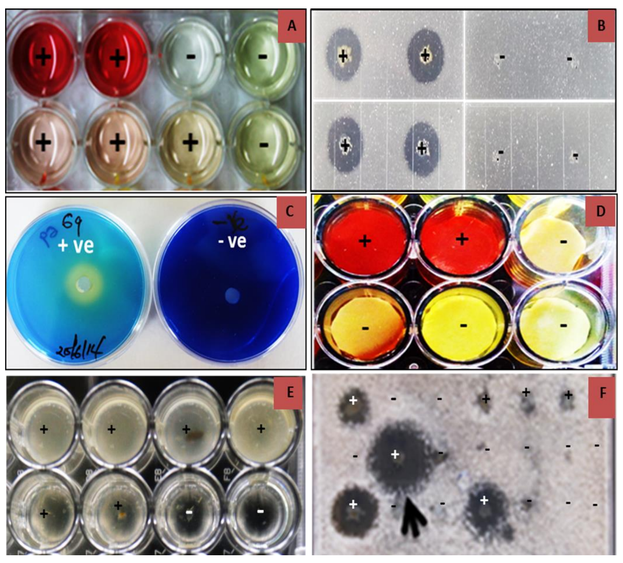

Fig 1. Functional characterization of bacterial endophytes

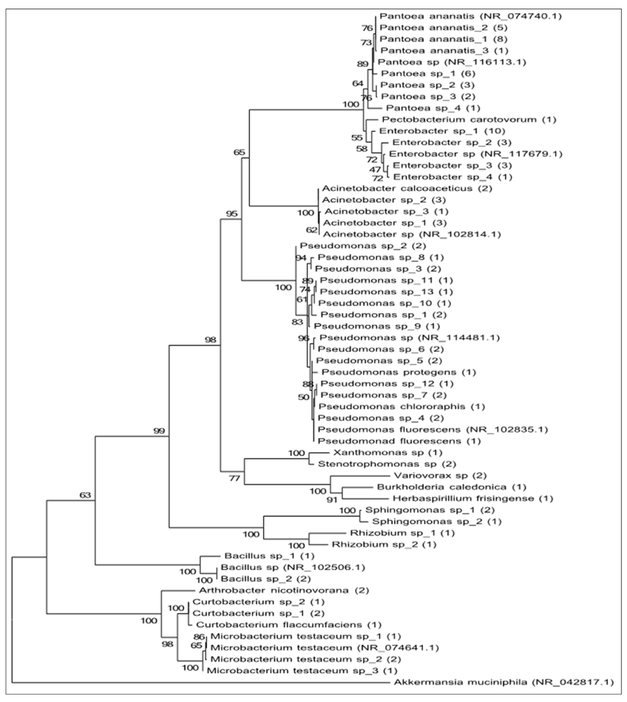

Fig 2. Phylogenetic relationship among bacterial strains inferred from 16S-sequence analysis.

Outcomes

- Microbial methods developed to study endophytes and other plant associated microbes in Brachiaria grass have been utilized by program researchers and partners, visiting African NARS scientists, graduate students and interns. These methods have also are in use within BecA-ILRI Hub to develop a core collection of bacterial endophytes for long term storage and uses.
- The full agricultural potential of the diverse group of isolated bacterial strains is yet to be elaborated. Preliminary test results have revealed all 84 test bacterial strains with at least two properties that are beneficial for plant growth and development.
- An upsurge in interest on the role of bacterial endophyte in plant health, and their potential applications in improving forage productivity, among stakeholders across various disciplines and industries.

Partnerships

1. Kenya Agricultural & Livestock Research Organization, Kenya
2. Rwanda Agriculture Board, Rwanda
3. International Center for Tropical Agriculture, Colombia
4. Grasslanz , New Zealand
5. AgResearch, New Zealand

Potential to scale-up

- Shortage of animal feed is one of the major factors that limit the potential of African animal agriculture. The use of microbes to enhance the availability of forages is a climate-smart, environmentally-friendly and cost-effective way of improving the forage production, and therefore animal productivity, in sub-Saharan Africa.
- Microbial technology can be explored by regional NARS and development agencies to enhance the adaptation of various forage and food crops to diverse environmental and climatic conditions including drought, soil salinity, soil acidity, and aluminum toxicity.

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