Development of Commercial Grade Inoculant

4th Annual Meeting of the Chickpea Innovation Lab
ICRISAT
13/11/2017
What is Rizobacter?
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### Microbiological Products
- Inoculants
- PGPM’s & Bio-Fertilizers
- Bio-Control

### Non-Biological Products
- Adjuvants
- Seedcare Products
- Insecticides for stored grains
- Baits for pest control

### Crop Nutrition
- Micro-granular Fertilizer

### Services
- Professional Seed Treatment (NTR)
From lab to farm

- Strain selection: 3-4 years
- Formulation development: 2-3 years
- Field Evaluation: 0-3 years
- Registration

Commercial Stage

www.rizobacter.com.ar
Chickpea Inoculant Portfolio

Nowadays: 6 month shelf-life
2018: at least 9 month shelf-life
Rizobacter in the World

HQ & Subsidiaries
Dealers
Next

RIUSA
RIBRA
RIBO
RIPA
RIU

MANAGED BY ROTW

MANAGED BY ROTW
UC-Davis & Rizobacter agreement

- Research Collaboration started in March 2017.
- Objective: development of rhizobia inoculant technologies.
- 33 isolates shipped from UCDavis for execution of lab and field trials in April 2017.
- 10 isolates selected for a first stage and formulated in May 2017.
- Growth chamber trial planted in June 2017.
- 2nd batch in August 2017
- Ongoing field trials in Ethiopia and India
### Rhizobia strains from CRC project

<table>
<thead>
<tr>
<th>Strain ID</th>
<th>Origin</th>
<th>Taxonomy*</th>
<th>Host of origin</th>
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</thead>
<tbody>
<tr>
<td>ET-24</td>
<td>Ethiopia</td>
<td><em>M. plurifarum</em></td>
<td><em>Cicer arietinum</em></td>
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<td><em>M. sp. 1-2</em></td>
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<tr>
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<tr>
<td>kar-203</td>
<td>Turkey</td>
<td><em>M. ciceri</em></td>
<td><em>Cicer echniospermum</em></td>
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<tr>
<td>CW-185</td>
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<td><em>M. loti</em></td>
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<td>B2O3</td>
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<td><em>M. mediterraneum</em></td>
<td><em>Cicer reticulatum</em></td>
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<td><em>Cicer arietinum</em></td>
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<td><em>Cicer arietinum</em></td>
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</tbody>
</table>

*Closest named species
Formulation development

- Growth curves
- Stability (cfu/ml, pH)
- Purity
- Biological efficacy (growth chamber)
Production of inoculant

- Culture medium
- Broth with bacteria strain
- Stabilizing agents
- Formulated liquid inoculant
On-package evaluations

Viability: bacteria count on plate

Microbiological purity (detection of contaminant fungi and bacteria)

pH
Microbial control methods

Concentration (CFU/ml)

Days after manufacture

USDA 3383
hyd-22
43P5S1
kar-203
43P2S2
80P4S2
ET-24
ET-26
B203
2P3S1-b
27P3S2
Nodulation assessment in growth chamber

Nodulation performance

<table>
<thead>
<tr>
<th>Variety</th>
<th>Nod Number (#/pl)</th>
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<tr>
<td>kar-203</td>
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<td>USDA 3393</td>
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<td>Hyd-22</td>
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<td>80P452</td>
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<td>B203</td>
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<td>B</td>
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Nodulation assessment in growth chamber

Nodulation performance

<table>
<thead>
<tr>
<th>Nod dry mass (mg/pl)</th>
<th>kar-203</th>
<th>43P2S2</th>
<th>USDA 3388</th>
<th>Hyd-22</th>
<th>2P3S2</th>
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<td>A</td>
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Nodulation assessment in growth chamber

Control
Nodulation assessment in growth chamber
Nodulation assessment in growth chamber

Kar-203
Nodulation assessment in growth chamber
Final comments

- Two strains are particularly promising, kar-203 \((M.\text{ciceri})\) from Turkey and 43P2S2 \((M.\text{pluriafarium})\) from Ethiopia
- Further work can be done to improve formulations
- Competitiveness of strains in soils with naturalized rhizobia has to be explored
- Field trials will help understand interactions between strain/host/site
“I can do things you cannot, you can do things I cannot; together we can do great things.”
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