INTRODUCTION

Soybean is a pillar crop in the agriculture driven Zimbabwean economy. Benefits derive from Biological Nitrogen Fixation (BNF) with their microbial symbiotic partners, rhizobia. This removes the need for costly and potentially environmentally damaging nitrogenous fertilizer.

Research has indicated that there are limited soybean nodulating rhizobia in Zimbabwean soils (Fig 1). Inoculation with sufficient numbers of effective strains is essential to realize sustainable crop yields. Therefore, elite exotic rhizobial strains have been used to inoculate soybean in Zimbabwe. However, they may be poorly adapted to local climatic and edaphic conditions or poorly competitive against background indigenous rhizobia.

In order to maximise soybean yields, the effects of agro-ecology and farm management styles on persistence and performance of introduced strains must be understood. In addition, as bacterial horizontal gene transfer can affect symbiotic effectiveness, the interactions of introduced strains with local rhizobia populations needs to be studied.

TABLE 1: Host range of isolates representative of species diversity

<table>
<thead>
<tr>
<th>Species identity</th>
<th>B. japonicum</th>
<th>B. elkanii</th>
<th>B. diazoefficiens</th>
<th>B. ottaawaense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mug bean</td>
<td>Effective</td>
<td>Ineffective</td>
<td>No nodulation nodules</td>
<td>No nodulation nodules</td>
</tr>
<tr>
<td>Crotalaria juncea</td>
<td>No nodulation nodules</td>
<td>No nodulation nodules</td>
<td>Effective</td>
<td>Ineffective</td>
</tr>
<tr>
<td>Common bean</td>
<td>Ineffective</td>
<td>Ineffective</td>
<td>No nodulation nodules</td>
<td>No nodulation nodules</td>
</tr>
<tr>
<td>P. vulgaris</td>
<td>No nodulation nodules</td>
<td>No nodulation nodules</td>
<td>Effective</td>
<td>Ineffective</td>
</tr>
</tbody>
</table>

RESULTS

- A total of 217 isolates were recovered
- 138 isolates authenticated as root nodulating rhizobia
- All authenticated strains are slow-growers
- recA gene sequencing revealed 4 species of *Bradyrhizobium* (Fig 2)

- Of the 5% MAR 1491 inoculant strain-like isolates, none were recovered from research farms.
- Rhizobial diversity is richer in the smallholder farmers’ fields (Fig 3).

RESEARCH DIRECTION

Guided by current results, future work will:
- identify inoculant strain candidates through further symbiosis tests across a wider range of soybean varieties.
- assess the top performers for genetic stability with respect to symbiosis genes.
- scan the indigenous rhizobia for symbiosis genes obtained by horizontal gene transfer.

REFERENCES


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