

Rhizobia:

The star of the show

By Elmarie Helberg

Rhizobia inoculation is a critical practice for soya bean production in South Africa and around the world, but some concerns are continuously being raised about this practice. These concerns were discussed during the Rhizobia Symposium 2022 held in September at the Council for Scientific and Industrial Research International Convention Centre, by the Oil and Protein Seeds Development Trust and the Oilseeds Advisory Committee (OAC).

Rhizobia is a group of soil bacteria that infects the roots of legumes to form root nodules. It is found in the soil and after infection, produces nodules in the legume where they fix nitrogen gas (N_2) from the atmosphere, turning it into a more readily useful form of nitrogen (N).

A key component to yield

"We try to improve on yields on a continuous basis in the industry, but we have to start exporting our soya beans and must therefore produce at export parity. To be able to maintain that, we need to be highly competitive," said Dr Erhard



Experts from around the world discussed the challenges and opportunities regarding rhizobia practices at the 2022 Rhizobia Symposium presented by the Oil and Protein Seeds Development Trust and the Oilseeds Advisory Committee.

Briedenhann, chairperson of the OAC. "Rhizobia is one of the key components in terms of saving on N and increasing yields, therefore we received international expertise at the symposium to share information regarding the challenges and opportunities in this regard."

One of the challenges is the tremendous amount of confusion regarding the registration of rhizobia. "There are two different categories

under which you can register rhizobia, depending on the wording, so we would love to get some clarity on that. The amount of time it takes to get the product registered is also very challenging. The availability of new technology in South Africa is slowed down by the registration process."

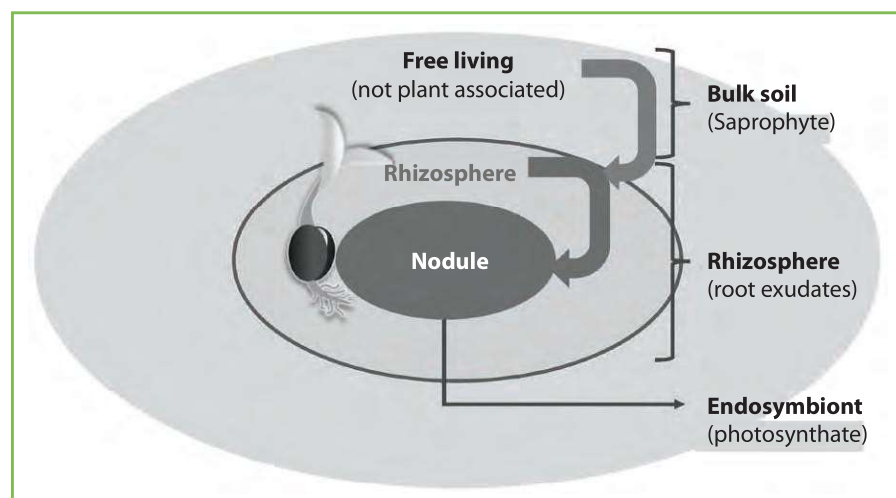
Dr Briedenhann added that the industry is also looking for clarity regarding the documentation and processes needed to be able to get registered.

Thilivhali Nepfumbada, managing director at Retrose Scientific, discussed the red tape surrounding the registration of rhizobia in South Africa as well as other legislation impacting the importation of biological organisms used in agriculture.

Importance of nitrogen

Jonathan Etherington of Microbial Biological Fertilizers International (MBFI) discussed the importance of N in the plant. "Nitrogen is an essential part of the compounds which regulate plant growth and development. It is also an important part of the plant structure and makes up part of the chlorophyll in plants. It is found in proteins and enzymes in the roots, which help the nutrients and water to be absorbed into the plant."

Figure 1: The rhizosphere is considered the immediate soil zone around the plant roots, influencing microbial associations, proliferations and activities. (Source: Dr Ronel Hendriks, Mikrobika)



According to Etherington, 70 to 105kg of N is required per ton of soya beans – 94% of yield is directly linked to N assimilation, which is directly linked to soya bean yield increases. He also elaborated on how bacterial inoculants work and the mutualistic symbiosis between the bacteria and the plant.

“Bacterial nodules aid in facilitating the root system with N-based compounds. Plants provide bacterial nodules with organic carbon, and shelter the bacteria from the influences of the external soil environment. This symbiosis is essential for providing the plant with usable N-based compounds without polluting the surrounding soil environment with excess N and subsequent nitrates.”

Desiccation is, however, one of the most important factors resulting in poor survival of rhizobia on legume seeds. Therefore, additives to improve the survival of rhizobia exposed to desiccation stress should have high stabilisation and optimum moisture absorption properties.

Dr Ronél Hendriks, chief scientific officer at Mikrobika, discussed *Rhizobium* and cultivar interaction (Figures 1 and 2). Nodulation patterns were tested in

Figure 2: The plant's rhizosphere is a microbial hotspot and is considered one of the most complex ecosystems on earth. (Source: Dr Ronel Hendriks, Mikrobika)

The rhizosphere ('root interface')



pH 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0

- **5mm** of soil surrounding the root.
- **Root exudates** (feed microbes).
- **Biofilm**: Protects rhizosphere microbes.
- **Unique pH**.
- **Chemically independent** from bulk soil (soil food web).
- **Crop-specific/cultivar-specific**.

different cultivars in Carletonville, North West. According to Dr Hendriks, more insight is needed into how different legumes host cultivars and different *Rhizobium* strains interact to unlock full yield potential. 🌱

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