AN OPINION ON

imported inoculants for our soybean crop

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"If you are unhappy with the quality of your rhizobia inoculant, change your supplier...not your strain."

Inoculation with *Bradyrhizobium japonicum* is an essential facet of soybean production in South Africa, because this species of rhizobium is not native to our soils. The symbiotic relationship between the rhizobia and the soybean host plant can potentially provide all the nitrogen required by the plant to produce a bumper crop. Apart from the cost of the inoculant, this nitrogen is free and it is one of the economic aspects of production that favours soybeans over many other crops which need fertiliser nitrogen.

There are various methods of inoculating soybeans and the method selected will depend on the formulation of the inoculant. Dry or peat-based inoculants are made into a slurry and applied onto the seed as a seed treatment shortly before planting.

Liquid inoculant may be applied directly into the seed furrow at planting, and there are pros and cons to each methodology. It is important that the bacteria are alive and in a sufficiently high concentration to successfully infect and nodulate the soybean root system at an early stage. In fields that have had soybeans before, *Bradyrhizobium japonicum* populations may be present in the soil that could successfully nodulate the new crop of soybeans.

The survival (in high enough populations) of previous inoculations is not consistent in our soils and it is safer to inoculate every year, regardless of the crop rotation that has preceded it. It is generally safe to say that if the crop is dark green in colour and the roots have many nodules which are pink in colour (inside), then the nitrogen fixation process is underway.

Poor nodulation is a problem that occurs every year and it is unfortunately a phenomenon that causes a lot of finger pointing. A low live bacterial count is often the allegation directed at the supplier of the inoculant, but poor inoculation methodology and dubious on-farm storage conditions are equally likely to be the culprit. Recently, new suppliers of inoculant have flooded into the market with promises of high bacterial counts and efficient proprietary strains of rhizobia. Whether or not the new suppliers have better bacterial counts than the traditional suppliers, is not the point of this debate. The issue in question is the use of new strains of rhizobia and the implications for local production.

**Cultivar-strain relationship**

The strain that has been in commercial use in South Africa since 1997 is known as WB74, which was selected after much research by the Plant Protection Research Institute. Some of the selection criteria included the effectiveness in fixing nitrogen, ability to infect a broad range of South African cultivars, adaptation to different local soils and competitive ability with other rhizobia strains.

The relationship between the soybean host and the rhizobia strain is very similar to the relationship between a cultivar and a disease. As an example, in wheat, some cultivars are susceptible to a particular strain of wheat stem rust, but resistant to others. Some others are intermediate to all and there may be those that are totally resistant to all known strains.

This same situation applies to the relationship between a soybean cultivar and a rhizobium strain. There is genetic diversity in the ability of soybean cultivars to nodulate with any particular strain. It is important that the strain of rhizobia used is able to firstly infect the roots of all the cultivars on the market and then efficiently fix nitrogen for that plant’s use.

A cultivar’s performance is linked to its ability to successfully nodulate with the rhizobia. All the historical performance data linked to that cultivar is only valid for predicting future performance if the same strain of rhizobia is used. If only one strain is used commercially, cultivars
are bred and selected for performance based on their relationship with that strain of rhizobia.

Good cultivars that have a poor relationship with that strain, will not survive the selection process, and eventually all the commercial varieties will have a good relationship with the rhizobial strain through a process of elimination.

When new strains of rhizobia are used for the first time, historical performance data is worthless. The consequence and risk of using a new strain (untested on the particular cultivar planted) is the same as planting an untested cultivar. Cultivars that have performed consistently in the past may perform entirely differently with a new strain of rhizobia. For each new strain that is introduced, a new set of performance data needs to be generated on which to base cultivar selection.

**Interaction between strain and soil conditions**

Individual rhizobia strains may react differently in soil. The ability to persist is a soil type x rhizobia strain interaction that may vary quite considerably between different combinations of strains and soil conditions.

Rhizobia strains vary genetically in their competitive ability to infect soybean roots, and the pecking order of their competitiveness may differ across soil types. It may in some cases be almost impossible to introduce a new strain to a soil that has a high population of naturalised rhizobia, if the resident rhizobia are more competitive than the introduced strain.

In the same vein, it may be very difficult to get rid of a highly competitive strain of rhizobia that was introduced without due care. Rhizobia strain interaction with the soil is a complex one and all aspects of the strain response need to be considered carefully before new strains are introduced, because the effect could last for generations.

**Conclusion**

In order to remain competitive in the world market, we need to be continually improving aspects of soybean production so as not to be left behind the rest of the world. This would include improving input technology and general husbandry.

Selecting improved rhizobia strains could contribute to the improved competitiveness of our soybean crop and undoubtedly should rank highly in the priorities of our national research programme. However, as an input supplier that commits many years to cultivar performance assessment, the seemingly cavalier way in which new rhizobia strains (that have a direct influence on our product performance) have entered the commercial market, is of concern to us.

Where suppliers of rhizobia inoculants are using strains directly imported from countries such as Argentina, France and the USA, it would be prudent to ask to see their cultivar and location specific performance data on their strain of rhizobia before committing your crop to this inoculant. If their research has not been thorough, the risk to the producer is significant.

It is easy to be impressed by high quality imported inoculants, particularly if nodulation has been problematic in the past. Quite simply, if you are having problems with your inoculant, it is preferable to change supplier, not strain of inoculant, unless the supporting evidence is compelling.

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**Beheerstrategie**

is die sleutel tot sukses vir verbeterde vroopootjiebeheer

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**Beheer**

Benewens die uitstekende resultate, is daar ook geisoleerde gevallae waar seker en omgewingsfaktore vir vroopootjiebeheer kan verhoog. Galmano Plus is in sulke omstandighede meer slegs ‘n gedeelte van die totale beheerstrategie. Dit word egter aanbeveel om spesiale aandag te gee aan kwessies soos gewasrotasie met melies, sonnebloem, kanola, rog en hawe. Waar moontlik, behoort ‘n rotasie met sojabone of Iusens vermy te word, aangesien dit die mangoaanval in die grond verlaag.

Ander beheermaatregels sluit die volgende in:
- Doeltreffende onkruidbeheer (veral grasse aangesien dit as oorlewingbron kan dien)
- Vermy hoë pH-gronde (>pH 8)
- Let op die stikstofbron (verkieslik ‘n ammonium-tipe)
- Manges- en sinkonsumptie verhoog om te versker om die beskikbare fosfatische voldoende is
- Vermy toestande soos ‘n los saadbed, swak dreinering en gekompakteerde gronde
- Swak saad kan bevorderlik wees (besmetting)
- Geesreest kan ook bydra tot die oorlewing van die swarm

**Opsomming**

Die 2011-kommersiële seisoen was suksesvolle demonstrasies en navorsingsproepe die weer eens bevestig dat hierdie middel met sukses en tot groot finansiële voordeel deur kleinplaangprowadente gebruik kan word. Die opbreke van die suksesvolle kom werkelik tot sy volle potensiaal as die saadbehandeling opgevolg word met twee Prosaro beblaarspuitings. Verder is dit teruggevoer deur agente en produusante wat die produkte aanbeveel en gebruik het, baie positief en ons sien uit na ‘n uitstekende 2012-seisoen.

Prosar® en Galmano Plus® is handelsmerke van Bayer CropScience AG, Duitsland. Reg. Nr. 1956/011521/07
Prosar® bevat tebuconazon en prositocarbazole (versig): Reg. Nr. LB310, Wet Nr. 36 van 1947
Galmano Plus® bevat fluquinconazon en prochloraz (versig): Reg. Nr. 1853, Wet Nr. 36 van 1947