Beware of new inoculants for soya beans

New rhizobia bacterial inoculants for soya bean producers are flooding the market. But if you’re unhappy with the quality of your current inoculant, first try changing your supplier, not the strain, cautions Antony Jarvie, a soya bean breeder with Pannar Seed.

Inoculating soils with Bradyrhizobium japonicum is an essential facet of soya bean production in South Africa, because this rhizobium species isn’t native to our soils. The symbiotic relationship between the rhizobial inoculant and the soya bean host plant can potentially provide all the nitrogen the plant requires to produce a bumper crop.

Poor nodulation is a problem that occurs every year in soya beans, causing a lot of finger pointing. A low live bacterial count is often blamed on the supplier of the inoculant, but poor inoculation methodology and on-farm storage conditions are equally likely culprits.

Recently, new inoculants have flooded the market, with suppliers promising high bacterial counts and efficient proprietary strains of rhizobia.

Whether or not the new suppliers have higher bacterial counts than traditional suppliers isn’t the point. The issue in question is the use of new strains of rhizobia and the implications for local production.

CULTIVAR-STRAIN RELATIONSHIP

The strain in commercial use in South Africa since 1997 is WB74, which was selected after much research by the Plant Protection Research Institute.

Some of the selection criteria included effectiveness in fixing nitrogen, ability to infect a broad range of SA cultivars, adaptation to different local soils and competitive ability with other rhizobia strains.

SOIL CONDITIONS

The competitiveness of different rhizobia strains’ ability to inoculate soya bean roots varies genetically, and the pecking order of their competitiveness may differ across soil types.

WITH NEW STRAINS OF RHIZOBIA, A CULTIVAR’S HISTORICAL DATA IS WORTHLESS.

The relationship between the soya bean host and the rhizobium strain is very similar to that between a cultivar and a disease. In wheat, for example, some cultivars are susceptible to a particular strain of wheat stem rust, but resistant to others. Other cultivars, meanwhile, may be totally resistant to all known strains.

It’s important that the strain of rhizobium used is able to, first, nodulate the roots of all soya bean cultivars on the market, and second, efficiently fix nitrogen for the plant’s use.

A cultivar’s performance is linked to its ability to successfully nodulate with the rhizobium, and its historical performance data will only be valid for predicting future performance if the same rhizobium strain is used. When new strains of rhizobia are used for the first time, historical performance data is worthless.

When using a new strain that’s untested on the particular cultivar planted, the risk factor is the same as planting an untested cultivar. Cultivars that have performed consistently in the past may perform entirely differently.

For each new strain that’s introduced, a new set of performance data needs to be generated on which to base cultivar selection.

BE CAREFUL

To remain competitive in the world market, South Africa needs to continually improve aspects of soya bean production, including input technology and general husbandry. Selecting improved rhizobia strains could help make our soya bean crop more competitive, and should undoubtedly be a high priority for our national research.
Inoculation insights

There are various ways of inoculating soya beans with *Bradyrhizobium japonicum*. 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 shortly before planting. Liquid inoculant may be applied directly into the seed furrow at planting. The bacteria must be alive and in high enough concentration to successfully infect and nodulate the soya bean root system at an early stage. In fields that have been planted to soya beans before, there may already be *Bradyrhizobium japonicum* in the soil. This can successfully nodulate the new crop. But high enough populations don’t survive consistently in our soils and it’s better to inoculate every year regardless of crop rotation. It’s generally safe to say that if the crop is dark green and the roots have many nodules which are pink inside, then nitrogen fixation is underway.

programme. However, as an input supplier that commits many years to cultivar performance assessment, Pannar Seeds is concerned about the seemingly cavalier way in which new rhizobia strains (which have a direct influence on our product performance) have entered the commercial market. Where suppliers of rhizobial inoculants are using strains directly imported from countries such as Argentina, France and the US, it’s prudent to ask to see their cultivar- and location-specific performance data before committing your crop to this inoculant. If their research hasn’t been thorough, the results could be disastrous. It’s easy to be impressed by high quality imported inoculants, particularly if inoculation has been problematic in the past. But if you’re having problems with your inoculant, first change your supplier, not the strain, unless the evidence for doing so is compelling.

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BIO MONITOR

Strong Indian Ag-Biotech

India has made remarkable agricultural progress over the last 10 to 20 years and transformed from a major importer into a major exporter, especially in cotton. The country exports R13 billion of agricultural products to the US and imports only R6 billion from the US. Agricultural biotechnology has become the third biggest sector in the national biotech industry with total annual revenue of R32 billion. The agricultural biotech industry is flourishing with annual revenue of R4,5 billion.

India’s cotton production was boosted by rapid adoption of Bt insect-resistant biotechnology and the development of hybrid varieties. Cotton farmers have access to 300 different hybrid varieties from a range of companies. GM cotton covers over 90% of cotton area and contains six different genetic modifications. These modifications are the product of multinational, Chinese and Indian innovations.

Cotton remains the only commercial GM crop being grown, as the release of Bt eggplant is still under a moratorium. At present, public and private parties are conducting field trials with GM banana, cabbage, cassava, cauliflower, chickpea, cotton, eggplant, canola, papaya, potato, maize, tomato, watermelon, wheat, okra, and rice.

In India, genetic modification biotech is regulated by a Genetic Engineering Approval Committee (GEAC) under the Ministry of Environment and Forestry (MoEF). The Department of Biotechnology (DB) in the Ministry of Science and Technology has drafted a national biotechnology strategy, under which the DB has to establish an independent biotechnology regulatory authority. The MoEF hasn’t made a decision on the strategy yet, but will enable individual states to decide on approvals for GM crops.

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ARC fighting off imported grape mites

The Agricultural Research Council has tentatively identified dangerous grape mites on imports, which could threaten SA’s wine industry and grape trade. Peter Mashale reports.

The Agricultural Research Council’s Plant Protection Research Institute (ARC-PPRI) has found a mite species on grapevines imported from Egypt that is so far unknown in SA and has to be prevented from entering the country. Dr Charmie Craemer, mite expert at the ARC, said government’s Plant Health Division collected mites from the grapevines that were identified as the Egyptian grapevine mite pest (*Colomerus oculiitis*), which could cause severe problems for the SA wine industry. “These mites were also found in large numbers on fresh grapes imported from Spain to South Africa, seriously jeopardising trade in fresh grapes between the two countries,” she explains. An ARC study will conclusively identify the mites so that the problems in the grape trade can be ironed out. “The ARC’s Biosystematics Programme is crucial in solving these types of problems and preventing huge financial losses,” Dr Craemer says.

Initial results show these mites to be three different strains of *C. vitis*, including *C. oculiitis*. “But the mites are very similar in appearance and their morphology may vary,” she explains. On grapevines, the different strains of *C. vitis* cause distinct symptoms. The bud-dwelling strain severely stunts growth, distorts new growth and causes poor berry set, while the leaf gall and leaf curl strain are named for their effects. *C. oculiitis* causes similar symptoms to the bud mite strain. Dr Craemer says SA already has over 65 mite species recognised as serious pests on crops and ornamental plants.

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