SOYBEAN RUST – MANAGING THE RISK OF RESISTANCE TO TRIAZOLE FUNGICIDES

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In the absence of resistant cultivars, the South African (SA) soybean industry is totally vulnerable to Asian soybean rust (SBR), caused by the fungus *Phakopsora pachyrhizi*. SBR is very dependent on fungicides to protect the crop. Initially, crop losses were managed in SA through emergency fungicide registrations followed by an intensive research programme. Over the past 7 years, numerous systemic fungicides have been registered for the control of SBR in SA. At present SBR can be controlled with 1-2 sprays applied at flowering, using the registered fungicides on the market.

Because of their high level of efficacy, the triazoles have been used widely to control SBR. At present, no resistance by *P. pachyrhizi* to triazole fungicides has been detected in SA. However, if farmers continue to use triazoles, without alternating with other registered fungicides with different modes of action, then this aggressive pathogen is very likely to develop resistance to triazoles. So, the challenge facing SA soybean farmers is to use these fungicides to best effect without running the risk of losing them to resistance.

To slow down resistance development, and to extend the life of a fungicide, it is advisable to follow the recommendations of the Fungicide Resistance Action Committee (FRAC), specifically:

1. Rotate fungicides with different modes of action e.g., triazoles / strobilurin/ triazole or triazole / protectant / triazole
2. Use a premix e.g. triazole plus strobilurin or protectant
3. Reduce exposure to two applications of each systemic fungicide group per season
4. Use a full dose, not a reduced dose of the fungicide.

Resistance to triazoles is based on the accumulation of several mutations. This is described as “continuous selection” or “shifting”. Resistance to triazoles is therefore stepwise, characterized by a gradual loss of efficacy under field conditions. Total resistance to triazoles has rarely been observed. This relatively slow development of resistance provides opportunities for effective resistance management programmes.

The use of, for example, a strobilurin-triazole mixture, is the major strategy, promoted by the agricultural industry, for reducing risk of resistance towards both fungicide groups. These two active ingredients are complimentary in their action because strobilurins inhibit fungal respiration and consequently inhibit spore germination, whereas triazoles inhibit germ tube elongation, fungal penetration and mycelial growth.

However, the choice of dual product fungicides with activity against rusts is limited in SA. Unfortunately, carbendazim is not effective against rust, so the mixing of triazoles with carbendazim does not protect against resistance development of rusts, the way it does against grey leaf spot of maize (*Cercospora zeae-maydis*).

Triazole fungicides remain vital to the economic production of soybeans in SA, playing a vital role in controlling SBR. It is, therefore, crucial that all members of the soybean community recognize the vulnerability of the family of fungicides and that soybean farmers commit to the FRAC recommendations to manage resistance development, by mixing fungicide groups, alternating groups, only spraying triazoles twice a season and using full recommended doses.

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