

Soybean rust – managing the risk of resistance to triazole fungicides

PROF MD LAING AND DR PM CALDWELL, DISCIPLINE OF PLANT PATHOLOGY, SASA, UNIVERSITY OF KWAZULU-NATAL

In the absence of resistant cultivars, the South African soybean industry is totally vulnerable to Asian soybean rust, caused by the fungus *Phakopsora pachyrhizi*.

Asian soybean rust is very dependent on fungicides to protect the crop. Initially, crop losses were managed in South Africa through emergency fungicide registrations followed by an intensive research programme.

Over the past seven years, numerous systemic fungicides have been registered for the control of Asian soybean rust in South Africa. At present, Asian soybean rust can be controlled with one to two 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 Asian soybean rust. At present, no resistance by *P. pachyrhizi* to triazole fungicides has been detected in South Africa.

However, if producers 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. The challenge therefore facing South African soybean producers 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:

- Rotate fungicides with different modes of action, e.g. triazoles/strobilurin/triazole or triazole/protectant/triazole.
- Use a premix, e.g. triazole plus strobilurin or protectant.

- Reduce exposure to two applications of each systemic fungicide group per season.
- 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, characterised 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 South Africa. 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 zea-maydis*).

Triazole fungicides remain vital to the economic production of soybeans in South Africa, playing a vital role in controlling Asian soybean rust.

It is therefore crucial that all members of the soybean community recognise the vulnerability of the family of fungicides and that soybean producers 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. ■

TABLE 1: CHEMICALS REGISTERED FOR SOYBEAN RUST CONTROL.

Product name	Reg. No. L Act No. 36 of 1947	Active ingredient	Concentrate	Hazard classification	Company
ABACUS	8048	Pyraclostrobin/epoxiconazole	125 g/l	Harmful	BASF
Bayfidan® 250DC	3179	Triadimenol	250 g/l	Harmful	Bayer
CAPITAN® 250EW	6062	Flusilazole	250 g/l	Harmful	DuPont
D-Zole 250 EC	7923	Difenoconazole	250 g/l	Harmful	Universal Crop Protection
Folicur® 250EW	3857	Tebuconazole	250 g/l	Caution	Bayer
IMPACT	4088	Flutriafol	125 g/l	Caution	Cheminova
Lyric® 250 EW	7885	Flusilazole	250 g/l	Harmful	DuPont
Lyric® C	7648	Carbendazim/ flusilazole	125/250 g/l	Harmful	DuPont
PRONTO 250 EC	7602	Difenoconazole	250 g/l	Caution	Meridian Agritech
PUNCH® C	3626	Carbendazim/ flusilazole	125/250 g/l	Harmful	DuPont
PUNCH®-XTRA	4243	Carbendazim/ flusilazole	250/125 g/l	Harmful	DuPont
Scope 250	7942	Difenoconazole	250 g/l	Harmful	Villa Crop Protection
SCORE® 250EC	5132	Difenoconazole	250 g/l	Caution	Syngenta
SHAVIT 25EC	5601	Triadimenol	250 g/l	Harmful	Makhteshim-Agan
Tebucure	7992	Tebuconazole	250 g/l	Caution	Universal Crop Protection
TRISTAR EC	6905	Triadimenol	250 g/l	Harmful	Meridian Agritech

Source: Registrar, Act No. 36 1947, personal communication November 2006
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