AGRO 914

Sterol biosynthesis inhibitors: Modes of resistance and development of *CYP51* mutations

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Sterol-biosynthesis inhibitors, especially the sterol demethylation inhibitors (DMIs), are an important group of agricultural, industrial and clinical fungicides. The target site of the DMIs is the cytochrome P450 CYP51. While some cases of DMI resistance have been reported due to non-target-site mechanisms such as enhanced efflux, most cases of reduced DMI sensitivity are due to mutations or over-expression of *CYP51*. In the wheat pathogen *Zymoseptoria tritici*, over 30 *CYP51* mutations have been reported, in over 60 combinations, conferring a range of sensitivity levels to different DMI fungicides. We discuss the evolutionary pathways and functional constraints leading to these various genotypes, and the implications for disease control and resistance management.

AGRO 915

Effective resistance management with soybean rust: Modes of action used and management strategies

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Asian soybean rust is a serious disease caused by *Phakopsora pachyrhizi*. Several strategies have been adopted in Brazil to manage this disease including: (i) the host-free period, a period of 60 to 90 days from July to September during which farmers are restricted from planting soybean; (ii) growers are advised to plant early maturing group cultivars in the beginning of the season and reduce the sowing window to help the host evade the pathogen; (iii) cultivars with *Rpp* genes are available and are recommended with fungicide; and (iv) fungicides applied preventively or in the first symptoms. More than 100 different fungicidal products are currently labeled for managing rust in Brazil. A weaker efficacy of straight triazoles compounds was observed from 2006/07. Since 2009, only premix of DMI-QoI fungicides have been recommended to control rust. In 2013 the first mixture with SDHI compound was labeled for soybean rust.

AGRO 916

Estimation of uncertainty of sampling for determination of pesticide residues in plant commodities

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The uncertainty of sampling has been estimated based on three independent pesticide residue databases. The results of in vivo studies (residues in 120-300 crop units taken from individual fields, composite samples taken from commercially treated crops, and from supervised residue trials) reflect the situations expectable under practical conditions. In addition, computer modelling from the database of residues in primary samples was applied to simulate the likely distribution of pesticide residues in samples of various sizes with large number of iterations. The results of the modelling indicated that obtaining reliable and accurate estimate requires large number of samples. The confidence intervals for the sampling uncertainty decreased with the number of replicate samples taken from one lot and the number of lots sampled. The estimated relative ranges of sampling uncertainty are independent from the relative standard deviation of the measurand in the sampled commodity. The sampling uncertainties calculated from three different types of pesticide residue datasets with different methods were statistically not different. The applicability of the modelling methods applied has been validated. The supervised trial database was used for estimation of typical sampling uncertainties because it was much larger than that of commercially treated fields. To account for the higher variability expectable under practical conditions and the potential serious consequences of underestimating the sampling uncertainty, the upper confidence limits of the uncertainties are recommended for practical use. The typical uncertainties were determined for 22 different crop groups. These values can be used for the calculation of action limits in a decision making process for verifying the performance objectives of producers and planning risk based early warning monitoring programmes. Inclusion of the typical sampling uncertainties in the combined uncertainty for testing compliance of agricultural products with specification before placing them on the market will reduce the trade dispute cases.

AGRO 917

Sampling uncertainty of pesticide residues in root vegetable crops

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Sampling uncertainty for pesticide residues in carrots and parsley leaves was estimated with simple random sampling and by applying range statistics. Both methods gave practically the same results. The confidence interval for the estimated sampling uncertainty decreased with the number of replicate samples taken from one lot and the number of lots sampled. The estimated relative ranges of sampling uncertainty are independent from the relative standard deviation of the primary samples. Consequently the conclusions drawn from these experiments are generally applicable. There is no optimum for sample size and number of lots to be tested. Taking a minimum of 6 replicate samples from at least 8–12 lots is recommended to obtain a relative 95% range of sampling uncertainty within 50%. The cost of sampling/analyses, the consequences of wrong decision should also be taken into account when a sampling plan is prepared.