Identifying maize with low risk of mycotoxins

Source from growers using effective documented quality standards

Documentation is your best guarantee that your supplier understands your requirements in regard to minimising risks of contamination. It requires a commitment on their part to oversee the process and to assume responsibility for it.

The World Health Organisation and Codex Alimentarius have supported the Hazard Analysis and Critical Control Point (HACCP) system for quality control. A guide to preparing a Quality Plan based on HACCP principles for Australian maize is available on the Maize Association website. (http://www.maizeaustralia.com.au/)

Source from crops not exposed to heat and water stress

Suitable hybrids should be selected for the region and grown at optimal spacing to minimise water stress. This might require a trade-off in terms of some reduction in potential yield. Good nutrition and insect control are also important.

For aflatoxin control, sowing time should be adjusted so that early kernel development does not coincide with extreme summer temperatures (January/February). Climatic modelling using historic regional weather data has provided some guide to aflatoxin risk. For example in the Burnett region, early-maturing hybrids grown under rainfed conditions will on average have a lower aflatoxin risk when planted in October/November than slower hybrids, but when planted in December/January, the early-maturing hybrid have the higher risk. Maize grown under irrigation has much lower risk, but inadequate irrigation due to shallow soil patches or uneven field levelling can provide stressed patches, which if exposed to January temperatures in the MIA will have a high risk of aflatoxin.

Overall, the risks of aflatoxin are lowest in adequately irrigated crops and in cooler locations of northern NSW, southern Qld and the tablelands of far-north Qld.

Increased fumonisin contamination has also been associated with stress from uneven and inadequate irrigation, inadequate nutrition, and insect damage.

Inspect the crop in the field. Some indicators of stressed crops and higher mycotoxin risk are: variable growth; poor weed control; high % of insect damage; obvious mould and cob rots, apart from on the tip; other signs of disease such as stem rot, loose ears and boiled smut; and dull (not bright) grain. This is the best time to reduce your risks by not purchasing for milling or exporting- it is much more suitable for ruminant feed.

Conduct confirmatory mycotoxin assay before contracting to purchase

This step would be most applicable when purchasing maize in bulk from another supplier, rather than directly from farm. Ensure appropriate protocols for grain sampling are followed – large samples of 4 kg must be collected and milled before assay to produce a reliable result.

Testing prior to harvest is occasionally done, but the irregularity of mycotoxin contamination will not permit an accurate estimate. It might be useful to test stressed portions of a maize field, as a 'worst case' scenario. A large number of ears would need to be taken in a systematic manner, shelled, mixed and a large sample ground before assay.

For maize being moved either into or out of storage, the best process is to take regular samples from the grain stream. For large tonnages, a rate of about 100 g per tonne is suggested, to form a composite sample of 30 kg per 300 tonne. This is mixed well and reduced using a riffle divider until four samples, each of 4 kg, are taken. One is submitted to the laboratory, one retained by the potential exporter or his agent, one retained by the grower, and the fourth sent to the potential importer. All samples must be kept cool and dry and in clean conditions.

Use a laboratory that is NATA certified for mycotoxin assay

Obtaining an accurate result in any laboratory depends on the interaction of many factors: effective management with knowledge of client's needs, skilled and well-trained staff, regularly maintained and calibrated equipment, validated methods and techniques, and regular practice on reference samples of known mycotoxin content. Any of these factors can and do go awry at times. Certification with the National Association of Testing Authorities (NATA) provides a safeguard that the operation of the laboratory is regularly checked by other experts in laboratory practice and also that its analytical performance is satisfactory in comparison to other laboratories.

A list of laboratories certified for aflatoxin and other mycotoxin assays can be obtained by searching the NATA website (http://www.nata.com.au/nata/). Costs of NATA accreditation in terms of additional check sample assays, extensive documentation, calibration, staff training, and fees can add 30-40% to the costs of assays, but can pay off in increased reliability of the results.

As the client, you need to discuss your needs with the chosen laboratory, and to ascertain if the assay method to be used has sufficient accuracy and precision for your purpose. You can also ask for details of their certification, and evidence of method validation. Ensure that the chosen laboratory is aware of these protocols, and will abide by your requirements, particularly in regard to grinding of large samples before sub-samples are drawn for assay.

Decide if maize is suitable for end-use, such as export

On the basis of the results obtained, and your confidence about the result arising from your decisions over sampling and methods, decide if the maize is suitable for export, or better used for stock feed. Providing sampling protocols and methodology are up to scratch, a negative mycotoxin test of <0.001 mg/kg should provide good assurance that the maize will pass inspection at the other end. However, if any aflatoxin is detected, even at low levels <0.005, consider the greater risk of further fungal growth during transport in a container in tropical conditions.