Fast Facts

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Adventitious Presence in Canola

The potential commercial release of genetically modified canola varieties in Australia this year has raised concerns regarding unintentional mixing of genetically modified canola with conventional canola varieties and associated risks of market access into canola markets where differentiation of GM and non-GM canola may exist. This paper has been developed to aid in the understanding of the issues surrounding adventitious presence and to bring together information relating to this topic.

Unintentional mixing of trace amounts of seed, grain or other products of one plant variety with another variety is commonly referred to as "adventitious presence".

Low levels of impurities are inherent in grain crops due to the nature of grain production and handling; crops are grown in close proximity to other crops, paddocks are usually rotated from year to year and common equipment is used to plant, harvest, transport and store the crops. Industry has long recognised this and developed grain standards with tolerances that accommodate low levels of impurities.

Australian and international regulatory authorities as well as representative industry bodies have also recognised the need for establishing practical levels of adventitious presence. Many export markets such as Japan have established tolerances for GM grain in non-GM grain, although these tolerance levels may vary between different markets. Food Standards Australia and New Zealand (FSANZ) have established a law that allows up to 1% GM in non-GM foods.

Despite the influence of wind and insects, only 10% of pollen is found to transfer further than 20m from its original plant source.

In the case of highly refined foods, such as canola oil, labeling is not required as there is no remaining presence of any genetic material following processing.

Similarly, the Australian Oilseeds Federation has established a non GM canola standard with an adventitious presence of 1% in order to satisfy non-GM market opportunities.

Adventitious presence can occur by either of two ways;

- seed movement
- pollen flow.

Seed Movement

Physical seed movement is the most likely means of GM seed being present in a non-GM product because, in many cases, conventional canola and GM canola varieties will share a common supply chain.

There are a number of different potential sources of seed movement that may lead to adventitious presence. This includes planting seed purity, seed equipment, harvesting machinery, transport equipment and storage facilities.

Adventitious presence of GM seed may even occur through seed movement by birds, other animals, and wind or water movements.

Unintentional presence of GM seed movement can be controlled by implementing appropriate management practices through the seed supply chain to maintain seed hygiene within threshold levels.

The Gene Technology Grains Committee (GTGC) has established Canola Industry Stewardship

Management processes can significantly contribute to the control of seed movement in the supply chain where GM and non-GM canola may share common elements.

Protocols that identify the key risk points in the supply chain where adventitious presence may occur and the appropriate management processes required to meet practicable market based tolerances.

The Protocols identified the necessary management processes required to maintain seed and grain integrity at the Pre-Farm, Farm and Post Farm phases of the supply chain so that regulatory and customer requirements can be met.

Similar management practices are already used by industry to meet specific markets that require higher levels of seed and grain integrity, such as monounsaturated sunflowers.

Pollen Flow

Adventitious presence may also occur through outcrossing where canola pollen is transferred from a GM crop to a non-GM crop and fertilisation, or outcrossing, occurs. However, in most cases the level of successful outcrossing from pollen flow is very low, so that the potential for contamination through seed moment is likely to be a more significant factor.

Pollen movement

Canola pollen (B. napus) is heavy and sticky by nature although it can still become airborne and float due to its minute size.

The canola pollen is transferred primarily by wind although insects, particularly honey bees, birds and other animals can also play a role in pollen transfer over longer distances.

Pollen movement decreases quickly with distance with the vast majority of pollen travelling less than 10m, although in extreme

Australian canola growers can use a basis of sound crop management practices and minimal buffer zones to meet current market and regulatory requirements.

cases with wind transfer it can travel up to 1.5km and 4km with insect transfer.

Studies have shown that approximately half of the pollen produced by an individual plant falls within 3m. Pollen can be dispersed over much longer distances than this although pollen concentration reduces quickly when this occurs. Reports shown a 90% decrease in pollen concentration at 20m from the source.

Outcrossing rates

Outcrossing can readily occur between canola crops. Most outcrossing occurs within the first few metres of the pollen source and the levels of outcrossing decrease quickly as distance increases.

A recent study was conducted to examine the rates of outcrossing between imidazolinone tolerant (IT) canola and conventional canola in Australian conditions.

The study which involved the collection of 48 million seeds from 63 fields across southern Australia showed that no outcrossing was detected in 69% of the sites.

The highest rates of outcrossing were 0.197%, 0.151% and 0.115% for field trials in South Australia, Victoria and New South Wales respectively and 0.225% for a plot trial in Western Australia.

A general decline in outcrossing rates was experienced over distance, which supported other international research.

When the study was reflected in terms of outcrossing on a complete field basis, similar to how they would be expressed when used commercially, the majority of fields sampled showed outcrossing rates below 0.03%, well below the regulatory and commercial tolerances that have been introduced.

It should be noted that care needs to be taken when extrapolating data from small plots as outcrossing rates are usually higher than on a complete field analysis.

Thresholds

Scientific evidence from outcrossing studies in UK, France and recently in Australia indicates that pollen flow only leads to very low levels of outcrossing and minimal isolation distances would be required to meet a 1% threshold.

However, a small buffer zone will be an important management tool to separate GM and non-GM canola in order to minimise adventitious presence that may occur during harvesting.

Greater isolation distances are likely to be required for tighter thresholds such as has been adopted in seed production where higher levels of seed purity may be required.

The combination of sound crop management practices and minimal isolation or buffer zones provides a basis for Australian growers to meet the current market and regulatory non-GM requirements.

References

Salisbury, P.A., (2002) "Genetically modified canola in Australia: agronomic and environmental considerations"

Glover, J., (2002) "Gene flow study: implications for the release of genetically modified crops in Australia".

Gene Technology Grains Committee., (2002) "Canola industry stewardship protocols". Available at: www.avcare.org.au

Food Standards Australia New Zealand,.(2000) Labeling genetically modified food. Available at: www.foodstandards.gov.au

Key points

- ***Low levels of impurities are an inherent and accepted part of the main stream grains industry and market based thresholds for adventitious presence are required with the possible introduction of GM canola.***
- ***Risks associated with adventitious presence are greatest in the physical movement and handling of canola where a common supply chain is shared for the vast bulk of the Australian grains industry.***
- ***Implementing minimal isolation or buffer zones and good crop management practices will allow growers to meet the 1% adventitious presence food labeling standards and the vast majority of domestic and international markets.***
- ***Small buffer zones will be an important management tool for growers to minimize adventitious presence during harvesting.***
- ***Greater isolation distances may be required where tighter levels of adventitious presence are required.***