

Mycotoxins in tree nuts (15 February 2016)

What are tree nuts?



Laboratory analyst Sophie Mangena and intern Reuben Ramphersad weigh pecan and macadamia nuts respectively in preparation for mycotoxin testing.

The Food and Agricultural organisation states that Good Agricultural Practices (GAP) represent a critical line of defence against contamination of nuts with aflatoxins, followed by the implementation of Good Manufacturing Practices (GMP) and Good Storage Practices (GSP) during the handling, processing, storage and supply of nuts for human consumption.

These practises are applicable to all types of tree nuts, including almonds (*Prunus amygdalus*), macadamia nuts (*Macadamia spp.*), pecans (*Carya spp.*), pistachio nuts (*Pistacia spp.*) and walnuts (*Juglans spp.*).

How do aflatoxins (a mycotoxin) contaminate tree nuts?

Aflatoxins are produced by a fungus called *Aspergillus flavus* in areas with hot humid climates. Under stress conditions such as drought or insect infestation, aflatoxin contamination is likely to be high. Poor storage conditions can also lead to aflatoxin contamination after crops have been harvested.

When the nuts are still on the tree, the outer hull (dry outer covering of the nut) splits when the shell splits open (early-splits) and sometimes the hull is damaged by wind, insects or other pests. If insects or other pests damage the nut shell, then conditions exist for *Aspergillus* spores to invade and grow on the inner kernel and potentially produce aflatoxins.

How can we reduce the contamination of tree nuts with aflatoxins?

As recommended by the FAO in its proposed draft code of practice for the prevention and reduction of aflatoxin contamination in tree nuts (Accessed 3 February 2016);

- After the outer casings are broken open, the damaged nuts should be removed. During storage, the nuts should not be exposed to rodents or other animals which may lead to damage to the shells of the nuts, with the potential of allowing entry of any mould into the nut.
- Some procedures used to reduce and prevent aflatoxin production according to the FAO include:
 - To select resistant varieties, if possible,
 - Reduce the presence of insects and other pests in the orchard during the growing phase,
 - Minimize physical damage to nuts during harvesting and transportation,
 - Make sure that nuts are properly cleaned, dried and labelled when placed in a storage facility that is properly equipped with temperature and moisture controls.
- Irrigation should be implemented in areas where the temperatures are high with low rainfall during the growing season to minimize tree stress, however, irrigation water should be prevented from contacting the nuts and foliage. Water used for irrigation must also be of suitable quality for its intended use.
- Many visual (manual) and electronic sorting techniques should be used to remove foreign materials and nuts with various defects. Nuts should not be used for processing unless they are free from faecal contamination, infestations, decomposition and other defects.
- Special precautions must be taken to reject insect-damaged or early-split nuts because they are often linked to aflatoxin contamination.
- Good storage practices should be implemented to reduce the levels of insects and fungi in storage facilities. This may include the use of suitable, registered insecticides and fungicides or appropriate alternative methods. Nuts stored in sacks should be placed on pallets to allow good ventilation.

What role does the PPECB Laboratory play in the tree nut industry of South Africa?

The PPECB Laboratory (T0248) tests all types of nuts (tree and groundnuts) for mycotoxins, pesticide residues and rancidity using ISO 17025 accredited methods within 24 to 48 hrs of sample receipt. In recent years the laboratory has received predominantly macadamia and pecan tree nuts for testing of **mycotoxins, rancidity and moisture content**.

Results obtained can be used by our customers (farmers, processors, exporters, importers, retailers) to make informed decisions about the quality of the nuts for further processing.

Further recommended reading

Russell J. Molyneux , Noreen Mahoney, Jong H. Kim, Bruce C. Campbell. Mycotoxins in edible tree nuts. *International Journal of Food Microbiology* 119 (2007) 72–78

Codex Standard 193-1995, Sampling Plans for Aflatoxin Contamination in Ready-to-Eat Treenuts and Treenuts Destined for Further Processing: Almonds, Hazelnuts, Pistachios, and Shelled Brazil Nuts, http://www.fao.org/fileadmin/user_upload/agns/pdf/CXS_193e.pdf.

<http://www.fao.org/docrep/meeting/008/j2262e/j2262e22.htm> Proposed draft code of practice for the prevention and reduction of aflatoxin contamination in tree nuts. Accessed 3 February 2016

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