
CODE OF PRACTICE FOR THE REDUCTION OF AFLATOXIN B₁ IN RAW MATERIALS AND SUPPLEMENTAL FEEDINGSTUFFS FOR MILK PRODUCING ANIMALS

CXC45-1997¹

1. BACKGROUND

- 1.1 Aflatoxin B₁ contamination of animal feedingstuffs can be a very serious problem, occurring in part due to inadequate storage conditions. Contamination may also occur at the preharvest stage and be exacerbated by inadequate storage conditions. Good cropping practices, use of seed varieties bred for resistance to seed infecting fungi and insect pests as well as the use of appropriate approved pesticides represent reasonable preventive measures to control contamination in the field. Even with application of these practices, conditions created by the environment and/or traditional agricultural procedures may defeat any preventative measures.
- 1.2 Practices that reduce aflatoxin B₁ contamination in the field and after harvest should be an integral part of animal feedingstuff production, particularly for the export market because of the additional handling and transport steps required to get the product to the final destination. The factors most amenable for prevention of fungal infection and aflatoxin B₁ production involve proper drying and storage of the feedingstuff prior to transport. The problems created by too much moisture are magnified greatly by deficient post harvest crop handling techniques.
- 1.3 Investigations concerning the biological fate of aflatoxin B₁ (AFB₁) in lactating dairy cattle have demonstrated the transmission of residues into milk, occurring as the metabolite aflatoxin M₁ (AFM₁). Although AFM₁ is considered to be less carcinogenic than AFB₁ by at least an order of magnitude, its presence in dairy products should be limited to the lowest level practicable. The amount of daily ingested AFB₁ which is transferred into milk is in the range of 0.17 to 3.3%.
- 1.4 To ensure the lowest possible level of AFM₁ in milk, attention should be given to residues of AFB₁ in the lactating dairy animal's daily feed ration.
- 1.5 To date there has been no widespread government acceptance of any decontamination treatment intended to reduce aflatoxin B₁ levels in contaminated animal feedingstuffs. Ammoniation appears to have the most practical application for the decontamination

¹ The Codex Code of Practice for the Reduction of Aflatoxin B₁ in Raw Materials and Supplemental Feedingstuffs for Milk Producing Animals was adopted by the 22nd Session of the Codex Alimentarius Commission, 1997. The Code has been sent to all Member Nations and Associate Members of FAO and WHO.

of agricultural commodities, and has received limited regional (state, country) authorization for its use with animal feed under specified conditions (i.e. commodity type, quantity, animal). Also, research suggests that the addition of the anticaking/binding agent "hydrated sodium calcium aluminosilicate" to aflatoxin contaminated feeds may reduce AFM₁ residues in milk, depending on the initial concentration of AFB₁ in the feed.

2. RECOMMENDED PRACTICES

2.1 Crop production

- 2.1.1 Prepare seed bed for new crop by destroying or removing the seed heads or fruits (e.g. corn ears, peanuts, etc.) of aflatoxin susceptible crops.
- 2.1.2 Utilize soil tests if possible to determine fertilizer needs and apply fertilizer and soil conditioners to assure adequate soil pH and plant nutrition to avoid plant stress, especially during seed development.
- 2.1.3 When feasible, use seed varieties bred for fungal resistance and field tested for resistance to *Aspergillus flavus*.
- 2.1.4 As far as practicable, sow and harvest crops at times which will avoid high temperature and drought stress during the period of seed development/maturation.
- 2.1.5 Minimize insect damage and fungal infection by the proper use of appropriate approved insecticides and fungicides and other appropriate practices within an integrated pest management program.
- 2.1.6 Use good agronomic practice, including measures which will reduce plant stress. Such measures may include: avoidance of overcrowding of plants by sowing at the recommended row and intra-plant spacings for the species/varieties grown; maintenance of a weed free environment in the growing crop by the use of appropriate approved herbicides and other suitable cultural practices; elimination of fungal vectors in the vicinity of the crop; and crop rotation.
- 2.1.7 Minimize mechanical damage to crops during cultivation.
- 2.1.8 Irrigation is a valuable method of reducing plant stress in some growing situations. If irrigation is used ensure that it is applied evenly and individual plants have an adequate supply of water.

2.2 Harvest

- 2.2.1 Harvest crops at full maturity unless allowing the crop to continue to full maturity would subject it to extreme heat, rainfall or drought conditions.
- 2.2.2 As much as possible avoid mechanical damage during harvest.
- 2.2.3 Where applicable dry crops to a minimum moisture content as quickly as possible.
- 2.2.4 If crops are harvested at high moisture levels dry immediately after harvest.
- 2.2.5 Avoid piling or heaping wet freshly harvested commodities for more than a few hours prior to drying or threshing to lessen the risk of fungal growth.
- 2.2.6 Ensure adequate protection from rain during sun drying.

2.3 Storage

- 2.3.1 Practice good sanitation for storage structures, wagons, elevators and other containers to ensure that stored crops will not be contaminated. Proper storage conditions include dry, well ventilated structures that provide protection from rain or seepage of ground water.
- 2.3.2 For bagged commodities, ensure that bags are clean and dry and stack on pallets or incorporate a water impermeable layer between the sacks and the floor.
- 2.3.3 Ensure that crops to be stored are free of mould and insects and are dried to safe moisture levels (ideally crops should be dried to a moisture content in equilibrium with a relative humidity of 70 %).
- 2.3.4 Prevent insect infestation by the use of appropriate approved insecticides.
- 2.3.5 Ensure that the storage facilities are free of insects and mould by good housekeeping and/or the use of appropriate approved fumigants.
- 2.3.6 Prevent access by rodents and birds.
- 2.3.7 Store at as low a temperature as possible. Where possible aerate commodities stored in bulk through continuous circulation of air through the storage vessel to maintain proper temperature and moisture.
- 2.3.8 Use of a suitable authorized preservative e.g. an organic acid such as propionic acid, may be beneficial in that such acids are effective in killing moulds and fungi and preventing the production of mycotoxins. If organic acids are used, it is important that

the amounts added are sufficient to prevent fungal growth and is consistent with the products end use.

2.4 Transport

- 2.4.1 Make sure that transport containers and vehicles are free of mould, insects and any contaminated material by thoroughly cleaning before use or re-use. Periodic disinfestation with appropriate approved fumigants or other pesticides may be useful.
- 2.4.2 Protect shipments from moisture by appropriate means such as airtight containers, covering with tarpaulins, etc. Care must be taken in the use of tarpaulins to avoid sweating of the commodity that could lead to local moisture and heat build up which are prime conditions for fungal growth.
- 2.4.3 Avoid insect and rodent infestation during transport by the use of insect resistant containers or insect and rodent repellent chemical treatments.

2.5 Feed production and disposition of AFB₁ contaminated animal feeds

- 2.5.1 Ensure that milling equipment is kept clean, free of dust and feed accumulation.
- 2.5.2 Use an appropriate sampling and testing program to monitor outbound and inbound shipments for the presence of AFB₁. Because AFB₁ concentration in shipments may be extremely heterogeneous refer to FAO recommendations for sampling plans. Adjust frequency of sampling and testing to take into account conditions conducive to aflatoxin B₁ formation, the regional source of the commodity and prior experience within the growing season.
- 2.5.3 If aflatoxin B₁ is detected, consider one or more of the following options. In all cases ensure that the aflatoxin B₁ level of the finished feed is appropriate for its intended use (i.e. maturity and species of animal being fed) and is consistent with national codes and guidelines or qualified veterinary advice.
 - 2.5.3.1 Consider the restriction of AFB₁ contaminated feed to a percentage of the daily ration such that the daily amount of AFB₁ ingested would not result in significant residues of AFM₁ in milk.
 - 2.5.3.2 If feed restriction is not practical, divert the use of highly contaminated feedingstuffs to non-lactating animals only.