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Review on Removal of aflatoxin from maize by using plant extract

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Abstract
This review summarizes the historical development of aflatoxin problems in maize and the attendant responses in the agricultural research community. Originally, studies were focused on the stored commodity, since the two toxin-producing species, *Aspergillus flavus* and *A. parasiticus*, were considered storage fungi. Laboratory investigations identified major factors influencing development of the toxin-producing species in storage, such as moisture, temperature, aeration and substrate. Various modifications of key components of the storage environment were developed to control the fungi. The discovery of preharvest infection of developing maize kernels by *A. flavus* or *A. parasiticus* and subsequent production of aflatoxin introduced a new facet of mycotoxicology. The same environmental factors that influence fungi in storage appear to affect the processes of field infection contamination to varying degrees. However, in the developing maize ecosystems, agricultural activities dramatically influence interacting species, including host plants, attendant microbes, arthropods and other pests. The prevention of fungal growth is still the best practice to prevent contamination by aflatoxins in foods and feeds, other measures are also necessary.
Keywords: aflatoxigenic, *Aspergillus flavus*, maize, fungal and *Aspergillus parasiticus*

1. Introduction

The current epoch of fungal research in food/feed safety emerged as a result of an outbreak of disease in turkeys in England in 1960[1]. Fortunately, the English penchant for thorough and detailed explanations initiated a search for the causative agent of the disease; this effort was the beginning of a new area of agricultural research that has been labeled mycotoxicology. Initial histological examination of tissues from the diseased birds demonstrated an acute hepatic necrosis associated with bile-duct proliferation. Since the disease was not infectious, the possibility of poison was considered. Examination of bird rations showed that a common factor in disease outbreaks was the use of a Brazilian peanut meal [1]. Aflatoxins are mycotoxins produced by *Aspergillus flavus* and *Aspergillus parasiticus* on many agricultural commodities ammoniation and the use of volatile organic acids are some of the chemical methods used in the detoxification of aflatoxins. However, these chemicals cannot be incorporated to food substrates due to their hazardous nature [2]. A worldwide trend exists towards limiting the use of chemical fungicides in grain and food. Natural plant extracts and volatile products of plant origin may provide an alternative to synthetic chemicals as they contain antifungal compounds [3]. The object of this review is to systematically summarize publications in local and international journals for evidence of removing afflation from maize and foods using different plant extracts and comparing plant antifungal activity. The data is important for public health and veterinary sectors in the region as decisions need to be made on the implementation of specific plant extract against afflation producing fungi.

2. Methods of prevent the growth of aflatoxin

Physical, chemical and biological methods have been investigated in order to prevent the growth of aflatoxin producing fungi and to eliminate or reduce the levels of aflatoxins or to degrade or detoxify aflatoxins in foods and feeds [4]. One of the most effective ways to control the problems caused by aflatoxins is to prevent the growth of fungi in the substrate, for example by the use of chemical inhibitors to suppress the spore germination of the fungi, as well as the development of the fungal mycelium, in the substrate susceptible to contamination by these toxins [5]. Aflatoxins are secondary metabolites of *Aspergillus* ***spp***. molds, which can grow on a wide variety of agricultural commodities. Aflatoxins are toxic and carcinogenic, cause crop losses and represent a significant hazard to the food chain. The use of plant extracts with anti-microbial and antifungal properties has been of wide interest in efforts to remove these aflatoxins from food and feed. *Aspergillus flavus* can produce the aflatoxins B1, B2, G1 and G2 in sorghum [6]. Aflatoxin contamination of maize is an important problem in warm, humid regions in which *Aspergillus* may infect the crop prior to harvest and remain viable during storage. Indeed, thousands of camels in Saudi Arabia may have been killed by the consumption of aflatoxin contaminated fodder. Growing concerns about food safety have led to the development of natural antimicrobials for food preservation [7].

3. Antifungal activity of plant extract

The fungicidal activity of five methanolic plant extracts from *Lantana camara, Salvadora persica, Thymus vulgaris*, *Zingiber officinale and Ziziphus spina-christi* were evaluated for their antifungal efficiency on tomato

phytopathogenic fungi, *Fusarium oxysporum, Pythium aphanidermatum and Rhizoctonia solani*, the causative agents of tomato damping-off diseases. Three of five plant extracts were effective against thees phytopathogenic fungi. *T. vulgaris* and *Z. officinale* extracts were strongly active and showed fungistatic and fungicidal activities against the phytopathogenic fungi with minimal inhibitory concentration [8]. The advantage of using-plant produced compounds as a source of safer and more effective control substances than synthetically produced antimicrobial agents can be demonstrated both practically and in terms of consumer acceptance. Several studies have focused on the potential use of essential oil applications in biological control of aflatoxin producing fungi and insect pests. Certain essential oils can be applied as mold inhibitors in order to prevent the growth of aflatoxigenic fungi in stored food. However, the appropriate application of essential oils should further be investigated. While dealing with grain protection, fumigation is the preferred method for applying substances into the bulk in order to control the biotic factors which damage the grain. Other researchers have suggested that the antimicrobial components of the plant extracts cross the cell membrane and interact with the resident membrane proteins, producing a flux of protons toward the cell exterior that induces changes in the cell and, ultimately, cell death[9].

4. Conclusions

It can be concluded that plants have excellent potential to against antifungal activity and used to remove aflatoxin. The presence of aflatoxin has its own effect on human health and economy in addition it also affect trade of the country due to low quality of maize. But present day, thereis no research done in Ethiopia about plant extracts against antifungal activity from maize. Since different plant have different effect on removal of aflatoxin from maize, researchers should care and conduct research in order to fill the gap in the future.

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