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Short communication

NATURAL OCCURRENCE OF AFLATOXINS IN BREAD IN NIGERIA

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ABSTRACT: A study was conducted in Nigeria on samples of brown bread for growth of moulds and natural occurrence of aflatoxins. Mycological analysis showed the presence of six genera of filamentous fungi, *Aspergillus, Rhizopus, Mucor, Penicillium, Alternaria* and *Geotrichum*. Thin layer chromatography (TLC) analysis of bread extracts revealed the presence of aflatoxins in 11 samples. All the isolates of *Aspergillus flavus* and *A. parasotocis* produced aflatoxins.

Key words/phrases: Aflatoxins, bread, moulds

INTRODUCTION

Mycotoxin contamination of foodstuffs of plant origin such as peanuts, corn, wheat and rice have been reported to occur with a high incidence and in high concentrations, especially in stored conditions (Ciegler *et al.,* 1983). Wheat, maize and groundnuts continue to be major sources of aflatoxins (Bankole and Adebajo, 1993, Bhat *et al.*, 1996) as a result of growth of *Aspergillus flavus* and *A. parasiticus.* Bread made from wheat is one of the staple foods consumed by average Nigerians. Such breads come in various colours because of the addition of colouring agents and growth of moulds is usually not suspected particularly in those with brown colour. The precise contaminating mycoflora and the mycotoxin-producing ability of such mycoflora have not been investigated in Nigeria. The growing evidence that many food products are potential sources of aflatoxin (Verardi and Rosner, 1995) and the direct evidence for human exposure to dietry aflatoxins (Zhu *et al.,* 1987; Maxwell *et al*., 1989; El-Nezani *et al.,* 1995) with the attendant risk to human and animal nutrition and health (Olsen *et al.,* 1988) warrants this investigation.

MATERIALS AND METHODS

A total of 150 brown breads were purchased from street hawkers in three cities in Nigeria namely, Lagos, Ibadan and Ogbomoso over a period of 10 months (February–November 1998). Some of the bread which had been held for up to 9 days was characterised by a distinct musty odour associated with growth of moulds. In some cases the inner portions had become slightly discoloured and appeared sticky when touched. Isolation of mycoflora was by direct plating of small surface or inner portions of each sample obtained with a sterile scalpel onto plates of Potato Dextrose Agar (PDA) supplemented with 60 µg ml^{-1} chloramphenicol as a bacteriostat and Malt Extract Agar (MEA); incubation was at room temperature (28 ± 2°C) for 8 days. Individual species that emerged after 3 days were purified and identified using appropriate manuals (Pitt, 1979; Al-Doory, 1980; Barnet and Hunter, 1987).

Aflatoxins were assayed in the bread samples by the EEC method (Anonymous, 1976) with extraction done according to Pons *et al.* (1972). The aflatoxin content was estimated by comparing the intensities of fluorescence against aflatoxin standards, (B_1, B_2, G_1 and G_2) which were co-chromatographed on the same plate. The quantity of the various aflatoxins was calculated according to Anonymous (1975). The chemical confirmation method used for aflatoxins included derivatization with trifluoroacetic acid (Stack and Pohland, 1975).

The aflatoxin-producing ability of *A. flavus* and *A. parasiticus* isolates was determined on SMKY medium (Diener and Davis, 1966). After inoculation, flasks were incubated in a static condition for two weeks and the detection of aflatoxins investigated as described above.

RESULTS AND DISSUSSION

Nine mould species from six genera were isolated. *Rhizopus nigricans* and *Mucor mucedo* were the dominant mycoflora. *Aspergillus niger, Geotrichum albidum, Penicillium expansum, Aspergillus flavus, Rhizopus stolonifer*, *Alternaria* sp and *Aspergillus parasiticus* occurred less frequently in decreasing order.

Eleven samples were positive for the detection of aflatoxins and the total concentrations of aflatoxins B_1, B_2 and G_1 detected ranged from 14–41 µg kg^{-1}. All the *A. flavus* and *A. parasiticus* isolates were toxigenic in liquid culture. The concentration of aflatoxin B_1 detected in culture filtrates ranged from 0.64–0.72 µg ml^{-1} and 0.29–0.41 µg ml^{-1} for aflatoxin B_1 and B_2 respectively and 0.05–0.17 µg ml^{-1} for afl G_1.

Although the majority of fungal species isolated were not mycotoxin producers, they were undoubtedly biodeteriogens whose presence indicate poor food handling quality. The presence of aflatoxins in bread had not been previously reported in Nigeria. In general aflatoxin contamination of bread occurred with a low incidence and low concentrations contrary to those reported for groundnut cake snacks (Bankole and Adebajo, 1993). The results thus indicate a low level of human exposure to aflatoxins in Nigeria through the consumption of bread. Although the concentrations of aflatoxin detected as a natural contaminant was low in bread, the fact that children also consume bread and are more susceptible to the effects of aflatoxins than adults present some health hazards. This indicates, therefore, the need for some form of quality control procedures aimed at preventing mould growth. The practice of packaging bread in nylon before adequate cooling may encourage the growth of moulds as a result of the warm and humid tropical climate (Bankole and Adebajo, 1993). The presence of fungal growth at the inner portion may be as a result of under-baking of bread, which failed to destroy fungal propagules. Adequate temperature control during baking is recommended to allow the inner portion to be sufficiently heated in order to destroy fungal spores, which may be present in bakery ingredients.

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