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PRESENCE OF AFLATOXIN B_1 IN THE SHELLED PEANUTS IN KARACHI

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A preliminary survey conducted for the presence of aflatoxin in peanuts available in the city of Karachi, during 1977-1986, revealed that out of 512 samples analysed 158 (31%), were contaminated with aflatoxin B_1. Most of the samples contained high amounts of aflatoxin B_1 (above 100 µg/kg) and, therefore, can be hazardous for human health. The highest amount detected was 723 µg/kg.

Key words. Aflatoxin B_1, Peanuts, *Aspergillus flavus*.

Introduction

Peanuts or groundnuts (*Arachis hypogia* L.) are grown in various countries and in some it is a major economic crop. It has been shown that 27% unblemished kernels of undamaged fruits of peanut were infected by different fungi and the most dominant was *Aspergillus flavus* and a large number of fruits were infected by this fungus before harvest [1]. The amount and the population of *A. flavus* in soil [2], drought stress before digging [3], type of plant residue [4], damage to peanut fruit by organism or mechanical injury before harvest [5], all these lead to aflatoxin production in peanuts both in field and storage. Brazilian peanut meal was the first agricultural commodity in which aflatoxin was initially detected in 1960 [6]. In Sudan out of 173 samples of peanuts, 41%were positive for aflatoxin B_1 among these 24% contained this toxin upto 250 µg/kg, 9% had concentrations between 250 and 1000 µg/kg and the remaining 8% had concentrations over 1000 µg/kg [7]. In Mozambique 153 samples of peanuts for human consumption showed mean content 1036 µg/kg of aflatoxin B_1 [8]. In Thailand, set of 216 samples of peanuts, 49% were positive for aflatoxin B_1, the mean content was 426 µg/kg [9].

Since considerable amounts of peanut are consumed all over the world, if contaminated by aflatoxin it will find its way in human food chain in different forms and can cause hazardous effect on human health. Keeping this in view a survey was started in the year 1977 to determine the magnitude of aflatoxin contamination in this commodity in Karachi.

Materials and Methods

The samples of shelled peanuts were collected from various godowns, wholesale dealers and retail shops situated in different localities of Karachi. The samples were collected randomly and a rigorous sampling plan was followed. About one to two kilogrammes of representative samples were collected and analyzed within 24 hours. The samples were ground in a mill and passed through sample divider to get the representative sub-sample for aflatoxin analysis. The extraction and cleanup was done according to the Official Methods of Analysis as laid down in the Association of Official Analytical Chemists [10]. Quantification was done through thin layer chromatography by comparison with standards. Precoated silica gel TLC plates were used and ether methanol water solvent system was used for developing these plates. Confirmation was achieved by making derivatives with trifluoroacetic acid and 50% sulfuric acid spray on the TLC plates. During 1977-1981, the randomly selected 224 peanut kernels from 56 samples were inoculated in the Potato Dox Agar and Czapecks Dox Agar for isolation of fungi. From the fungi isolated various strains of *A. flavus* were inoculated on autoclaved raw peanut to know their potential for aflatoxin production. These peanuts were incubated at $28 \pm 1°$ for ten days.

Results and Discussion

Over the period of last ten years 512 samples of shelled peanuts were collected and analyzed for aflatoxins (Table1).. Out of these 158 (32%) were found positive for aflatoxin B_1 the range being 4-723 µg/kg with an average content of 56 µg/kg. The lowest (17%) and highest (49%) of the positive samples were found in the year of 1979 and 1985, respectively. The highest average content of aflatoxin B_1 (82 µg/kg) was met in the year 1983 and the lowest (33 µg/kg) in 1984. During the period of study 79 samples, (50% of the positive) contained AFB_1 less than 20 µg/kg while 54 samples, (34%) contained AFB_1 between 21 to 100 µg/kg and the remaining 25 samples (16%) were found having more than 100 µg/kg of AFB_1. The highest amount of AFB_1 detected in these samples were 723 µg/kg. Aflatoxin B_2 was also found in some samples. Out of 158 AFB_1 positive samples 41 samples (26%) were positive for AFB_2

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TABLE 1. PRESENCE OF AFLATOXIN B_1 µg/kg IN HE PEANUTS COLLECTED FROM KARACHI.

Year	Samples collected	No. of positive samples	Percent positive samples	Average AFB_1	Range
1977	74	16	22	84	6-481
1978	57	14	25	60	2-289
1979	35	06	17	39	7-124
1980	51	19	37	71	2-419
1981	48	14	29	34	2-125
1982	22	09	41	49	4-247
1983	86	27	30	82	4-723
1984	63	21	33	33	2-136
1985	39	19	49	60	3-532
1986	37	13	35	46	6-263
Total	512	158	32	56	4-723

with an average of 22 µg/kg and the amount ranged from 3 to 87 µg/kg.

The shelled peanuts were screened for the presence of different fungi. The predominant fungi were the members of the Mucorales, Aspergilli and Penicillia. Among the Aspergilli, *A. flavus* and *A. niger* were most prevalent. Among all the fungi the frequency of occurrence of *A. flavus* was around 21 percent. About 43% of the strains of *A. flavus* showed their potential for aflatoxins production on raw autoclaved peanuts. The highest amoumt of aflatoxin B_1 and B_2 produced by any strain of *A. flavus* was 7421 µg/kg (7063 µg/kg of AFB_1 and 358 µg/kg of AFB_2) and the lowest amount of aflatoxins produced by any aflatoxigenic strain was 431 µg/kg (346 µg/kg of AFB_1 + 85 µg/kg of AFB_2) The amount of aflatoxin produced by these strains showed that if optimum conditions were met during harvest, transportation and storage the plausible production of aflatoxin would be very high and may cause serious health problems for humans and animals.

The peanut is not a major crop of Pakistan and only 4360 hectares are under cultivation and 61600 tonnes are produced annually [11]. The whole of it is consumed by human being in roasted form. The amount of AFB_1 found in 79 samples containing between 21-723 µg/kg can be a serious health problem for the consumer. However, it depends upon the total amount consumed by a person. Although its consumption is low in Pakistan yet strict regulatory measures have to be taken to eliminate this toxic compound from the human food chain. Food authorities in Pakistan should make rules and regulation for maximum permissible limit for aflatoxin for this commodity, and for others as well.

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