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PUBLIC HEALTH HAZARDS OF MYCO-CONTAMINATION OF SOME CEREALS TO HUMAN AND ANIMAL HEALTH

(With One Table)

By

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مخاطر التلوث الفطرى لبعض الحبوب على صحة الانسان والحيوان

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من بين ١٠٠ عينه من مختلف الحبوب أختبرت فطريًا وجد أن ٩٢ عينه تحتوى على الفطريات . مثل الأسبرجيلس أغلبية الفطريات المعزوله (٨١ ر ٧٢ ٪) تلاه البنسليوم بنسبة (٥٠ ر ٣١ ٪) . بينما عزلت فطريات الفيوزاريوم . الميوكر . الريزوبس . الأبسيديا والألترناريا بنسب ضئيله . تم تصنيف فطر الأسبرجيلس فلافس بنسبة عاليه (٦٧ ر ٦٥ ٪) تبينت قدرة الفطريات المعزوله على إنتاج الأيض الأولى مثل أنزيمات تحليل البروتينات لها من أهميه للحكم عليها فى افراز السموم الفطريه .

SUMMARY

Out of 100 different cereal samples examined mycologial, 92 were detected to contain myco-flora. Aspergillus species were the majority (72.81%) followed by Penicillium (31.50%)> Fusarium, Mucor, Rhizupus, Absidia, and Alternaria were isolated to a lesser extent. *Aspergillus flavus* was characterized in a high percentage (62.67%)> The probability of the isolated fungi to produce primary metabolites as proteolytic enzymes was revealed which is of importance to rely on its production of mycotoxins.

Keywords: Public health, mycobacterium, human, animal.

INTRODUCTION

Recently the world has been well acquainted with fungal contamination of food and its effect on human and animal health.

Contamination of food ingredients by moulds has several drawbacks, one is the production of a low nutritive value food as the result of fungal growth *(BARTOV, 1983)*. A marked decrease in the protein and fat contents of mouldy grains was recorded *(OGUNDERO, 1986)*, also grains or other food contaminated by fungi could be a source of their biproducts of which mycotoxins are very dangerous. Contamination of foods by biologically active substances arising as the result of metabolic processes of fungal contaminants has been existed, *(CHRISTENSEN, 1979)*. and many fungal genera of them are recognized to be toxigenic *(EDDS, 1979)*.

For many years many species of several genera of fungi were isolated from cereals, used for human food and entered in animal and poultry rations, and Aspergillus species occurred on a wide range as a contaminant of animal and human foods *(CULVENOR, 1974; HASSAN, 1978)*.

All cereal grains used for human and animal foods are liable to be contaminated by fungi of which a majority is toxigenic *(KURATA* et al., *1968; EL-KADY,* et al., *1982 and MAZEN* et al., *1984)*.

Aspergillus and *Pencillium* are the most frequently isolated fungi from cereals like rice, barley, wheat, corn, beans *(HASSAN, 1978; LILLEHOJ and GORANSSON, 1980; ABDEL-HALEEM, 1983 and MOUBASHER* et al., *1983)*. The least frequent encountered genera are Fusarium, Mucor, Rhizopus and Alternaria *(HITAKOTO,* et al., *1981; YOUSSEF* et al., *1985 and SANCHIS* et al., *1986)*.

The aim of this work is to throw light on fungi contaminating some kinds of cereal grains used as human and animal foods, and to arouse the public health importance of such contamination on human and animal health.

MATERIAL and METHODS

100 samples of grains were collected randomly from cereal shops in Assiut City, comprising 20 samples of each of white corn, red beans, Soyabean, rice and barely, contained in a clean plastic pack of about 50 gm weight.

Using a sterile technique, 1 gm of the crushed sample was inoculated into a sterile tube containing 9 ml of saline solution from which 1 ml was transferred into a sterile petridish and mixed with molten media at 54°C. The tube was incubated at 25°C till fungal growth was observed. The solid media used were:

1. Sabouraud's dextrose agar *(CRUICKSHANK et al., 1975)*.
2. *Modified Czapek. Dox medium (WALLERSTROM, 1967).*

Identification of the produced fungi was done macroscopically and microscopically according to *FREY et al. (1979).*

Proteolytic activity of *Aspergillus flavus* and *Fusarium* isolates was performed by inoculating fungal colony on milk digestion media *(CRUICKSHANK et al., 1975)*, the plates were incubated at 37°C for 24-48 hrs. A clear zone appeared around colonies of the proteolytically active strains.

RESULTS

There was no difference between the two utilized media, however the Modified Czapek-Dox showed earlier growth because it is more enriched than the other medium.

Mixed cultures of moulds were detected in some samples. The number and percentage of fungal isolates of the examined cereal samples are illustrated in table (1).

All the tested strains. of the isolated fungi showed variable abilities to produce proteolytic enzymes.

Aspergillus species isolates were specified due to its public health importance, and *Aspergillus flavus* was predominant (44 strains. : 65.67%), followed by *Aspergillus niger* (23 strains. : 34.33%).

DISCUSSION

During the last thirty years the progressive scientific documents reported fungal contamination of food ingredients as an important public health problem to human being, also all the units of animal production could suffer from the problem.

The problem of seed-borne mycofloras is not due to lowering the nutritive value of the contaminated food but seriously associated with the production of toxic substances (mycotoxins) which is a secondary metabolites of fungi:

In the present study, the probability to isolate Aspergillus, Penicillum, Fusarium, Mucor, Rhizupus, Absidia pnd Alternaria from cereals was proportionated to *KURATA* et al. *(1968); MISLVEC* et al. *(1975); FLANNIGAN (1978) and MOUBASHER* et al. *(1983)*, who isolated such genera as seed-borne mycofloras.

The high percentage of Aspergillus isolates (72.81%), is in accordance to CZEBIOTKO et al. *(1981); ABDEL-FATTAH* et al. *(1982), ABDEL-HALEEM (1983) and MAZEN* et al. *(1984)*. However the predominance of *Aspergillus folavus* (65.67%), was previousely recorded by *YOUSSEF* et al. *(1985) and SANCHIS* et al. *(1986)*.

Rice was found less liable to be contaminated by mycoflora in comparison with other cereals as corn and barely, this is agreed with *YOUSSEF* et al. *(1985)*, it is most probably due to the low moisture content of ricse and the industerial processes to prepare it for marketing.

Mycotoxins are secondary metabolites produced as the result of fungal growth in contaminated food, its effect is not restrected directly upon human and animal consuming such food, but there is an indirect effect which takes two important views. The first is the effect on public health, when consumption of animal products contaminated by residues of mycotoxins occurs. The other is an economic view due to increase mortality and coasts in the animal production units.

Secondary metabolism is crucially dependent on the levels of primary metabolites *(AHARONOWITZ and COHEN, 1981)*, so the production of mycotoxins by fungi, will be limited by its synthesis of proteolytic enzymes that are primary metabolites.

The study revealed the ability of the isolated fungi to produce proteolytic enzymes, this proteolytic activity is in accordance to *BARTOV (1983) and ADAMS (1987)*. Toxigenic strains. of Aspergillus in its growth on contaminated food led to considerable decrease of protein and oil of the food *(OGUNDERO, 1986)*.

The accumulating knowlege on mycotoxins in grains or other foodstuffs and their hazards on human and animal health strongly call for the study of cereal grains-borne fungi. Isolation of *Aspergillus* and *Fusarium* species would be of great public health importance because it has been well known that they are producers of *Aflatoxins*, *Ochratoxins* and *Fusariotoxins*, whihc have different biological effects on human and animal health. Mycotoxins can be found in all human and animal foods, though there is no food substance not infected by fungi and physical or chemical means of detoxification found to be ineffecient.

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Table I: Number and Percentage of fungi isolated from 100 samples of cereals.

	No. of samples	No. of samples Negatives	No. of samples Positives	No. and % of fungal isolates																	
				Aspergillus sp.		Penicillium sp.		Fusarium		Mucor		Rhizupus		Absidia		Alternaria		Yeasts	
				No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Corn	20	0	20	14	15.12	5	5.43	3	3.26	0	0	0	0	1	1.08	0	0	0	0
Rice	20	4	16	8	8.69	3	3.26	0	0	1	1.08	1	1.08	0	0	0	0	0	0
Bean	20	3	17	13	14.13	5	5.43	1	1.08	1	1.08	0	0	0	0	0	0	0	0
Soyabean	20	1	19	16	17.39	9	9.78	1	1.08	4	4.34	4	4.34	1	1.08	1	1.08	3	0
Barely	20	0	20	16	17.39	7	7.60	2	2.17	1	1.08	1	1.08	0	0	0	0	0	0
Total	100	8	92	67	72.72	29	31.50	7	7.59	7	7.58	6	6.50	2	2.16	1	1.08	0	0