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MYCOLOGICAL CONTAMINATION OF SOME MEAT ADDITIVES

BY

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INTRODUCTION

Meat products are new wide distributed allover the world. Generally, meat products formed of meat and other additives; as fillers; starch, milk powder, spices as black pepper, capsicum.. etc and other seasonings (Karmlich et al., 1973).

The use of untreated meat additives especially spices is the usually most common cause of mycological contamination of meat products. Mycological examination of these meat additives were done by many authors; (Schoenberg, 1955, Walz, 1957 Coretti, 1957 and Hadlok 1970).

Yesair and Williams (1942) examined 25 different types of intact and ground types of spices (totally 66 samples). The total mould count per gram in ground spices was more than that of intact smaples.

Christensen et al. (1967) examined 30 samples of ground black pepper. The total mould count ranged from 1.7 x 10^3 to 3.1 x 10^5. The indian red pepper contain more moulds than the american ones (3.2 x 10^3 and 2.4 x 10^6/ gm. respectively).

In West Germany, Hadlok (1970) examined 103 samples of fine ground spices (Cummin, Marjoran, Capsicum, Black and White pepper, Mustard, Piment, Onion powder, and Thyme) and found that the total mould count ranged from 1.9×10^3 to 1.3×10^6. The isolated moulds were mostly Aspergillus and Penicillium beside Mucor, Rhizopus, Paecilomyces and Cladosporium.

In Egypt, Yossef et al, (1985) examined mycologically 12 types of grains including rice and fenugreek. The total fungal count/gm ranged from 1.6×10^3 to 2.2×10^4, and isolated moulds were Aspergillus, Penicillium, Rhizopus, Abdisia, Mucor, Cladosporium, Alternaria, Cephalosporium, Paecilomyces, Fusarium, Trichoderma, Stemphylium and Monosperium.

The aim of the present work was to determine the different types of moulds in some selected meat additives and to conclude the main source of mould contamination through these meat additives to meat products.

MATERIAL AND METHODS

1. Samples:

A total of 75 samples of meat additives were collected from different factoris of meat products and markets in Cairo and Giza governorate, including Black peper, Cummin, Capsicum, Mixture of them, Cinnamon, Fenugreek, Coriander, Soyaprotein, milk powder, Starch, Rice, Common salt, Onion, Garlic and casings used in sausage production (five samples of each). Fifty grams of each sample were collected in labelled plastic bag.

2. Mycological examination:

Enumeration of moulds:

Using the method described by Raper et al (1965) and Hadlok (1970).

Isolation and identification of moulds:

By using acidified malt extract agar and Czapek agar according to the method recommended by Raper et al., (1965), Hadlok (1970). Domsch et al. (1980) and Samson et al. (1981).

RESULTS AND DISCUSSION

It is evident from table (1) that the mean values of the total count/gm. of the different samples of meat additives; black pepper, cummin, capsicum, and their mixture, cinnamon fenugreek, cariander, non-meat proteine (soyaprotein), milk powder, starch, rice, common salt, onion, garlic, and casing were 1.2×10^6, 1.2×10^6, 1.9×10^6, $18. \times 10^7$, 1.3×10^5, 1.5×10^5, 1.1×10^4, 2.1×10^3, 4.1×10^3, 3.1×10^4, 3.7×10^5, 2.3×10^5 2.7×10^6, 4.0×10^6 and 4.6×10^4 respectively. Such number/gm. in spices samples is nearly in agreement with that obtained by Yesair & Williams (1942), Coretti (1975), Pohja (1957) and Hadlok (1970), While the total mould count/gm. of Rice and Fenugreek samples (3.7×10^5 & 1.5×19^6) was higher than that obtained by Youssef et al. (1985) (2.1×10^3 & 7.0×10^3).

From table (2) it is evident that the total isolated moulds were 1831. The isolated genera were Penicillium 633 (34.57%), Aspergillus 572 (31.24%), Cladosporium 382 (20.86%), Rhizopus 96 (5.24%), Verticillium 50 (2.73%), Scopulariopsis 45 (2.45%), Absidia 25 (1.37%), Mucor 11 (0.60), Alternaria 8 (0.44%) Fusarium 5(0.27%) Thamnidium 4 (0.23%).

These results agree with that obtained by Hadlok (1970) in which Aspergillus and Penicillium species were the most common. It could be concluded from the achieved

Table (1): Statistical analytical results of total mould count / gm. of the examined samples

Samples	Minimum	Maximum	Mean value	St.E ±*
Black pepper	2.3×10^{5}	2.2×10^{6}	1.2×10^{6}	1.3×10^{5}
Cummin	1.4×10^{3}	4.0×10^{6}	1.2×10^{6}	3.0×10^{5}
Capsicum	1.5×10^{4}	6.0×10^{6}	1.9×10^{6}	4.3×10^{5}
Mixture	8.0×10^{4}	6.0×10^{7}	1.8×10^{7}	4.6×10^{6}
Cinnamon	1.7×10^{3}	2.8×10^{5}	1.3×10^{5}	2.2×10^{4}
Fenugreek	4.0×10^{4}	2.3×10^{6}	1.5×10^{6}	3.0×10^{5}
Coriander	5.0×10	4.6×10^{4}	1.1×10^{4}	3.5×10^{3}
Soyaprotein	1.0×10^{3}	4.0×10^{3}	2.1×10^{3}	5.2×10^{2}
Milk powder	1.3×10^{2}	1.2×10^{4}	4.1×10^{4}	8.9×19^{2}
Starch	1.0×10^{3}	1.2×10^{5}	3.1×10^{4}	8.9×10^{3}
Rice	2.0×10^{5}	5.6×10^{5}	3.7×10^{5}	2.5×10^{4}
Common salt	5.0×10^{3}	6.0×10^{5}	2.3×10^{5}	5.2×10^{4}
Onion	6.4×10^{4}	7.4×10^{6}	2.7×10^{6}	5.4×10^{5}
Garlic	1.1×10^{4}	1.8×10^{7}	4.0×10^{6}	1.4×10^{5}
Casing	3.0×10^{2}	5.0×10^{4}	1.6×10^{4}	3.7×10^{3}

* Standard Error.

Table (2) Summerised results of isolates from different types of meat additives

Samples / Isolates		Black pepper	Cumin	Capsicum	Mixture	Cinnamon	Fenugreek	Coriander	Soyaprotein	Milk powder	Starch	Rice	Common salt	Onion	Garlic	Casing	Total
Penicillium	No.	2	21	2	362	-	13	24	2	1	21	62	94	23	-	6	633
	%	0.32	3.31	0.32	57.19	-	2.05	3.79	0.32	0.16	3.31	9.80	14.85	3.63	-	0.95	34.57
Aspergillus	No.	26	55	8	58	50	74	9	2	3	101	18	33	104	6	25	572
	%	4.55	9.62	1.40	10.14	8.74	12.94	1.57	0.40	0.53	17.66	3.15	5.77	18.18	1.05	4.37	31.24
Cladosporium	No.	12	97	4	133	13	17	18	4	19	4	13	7	26	15	10	382
	%	3.13	25.40	1.05	32.20	3.40	4.45	4.71	1.05	4.98	1.05	3.40	1.83	6.81	3.93	2.62	20.86
Rhizopus	No.	12	6	10	-	14	8	4	3	5	14	-	5	8	7	-	96
	%	12.5	6.25	10.42	-	14.58	8.33	4.17	3.13	5.21	14.59	-	5.21	8.33	7.29	-	5.24
Verticillium	No.	-	-	-	-	-	-	-	-	-	-	50	-	-	-	-	50
	%	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	2.45
Scopulariopsis	No.	-	1	-	-	-	-	-	-	-	-	-	3	41	-	-	45
	%	-	2.22	-	-	-	-	-	-	-	-	-	6.66	91.19	-	-	2.45
Absidia	No.	13	-	-	-	-	12	-	-	-	-	-	-	-	-	-	25
	%	52	-	-	-	-	48	-	-	-	-	-	-	-	-	-	1.37
Mucor	No.	-	-	-	-	-	-	-	-	-	-	-	11	-	-	-	11
	%	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	0.60
Alternaria	No.	2	-	-	-	-	-	-	-	-	6	-	-	-	-	-	8
	%	25	-	-	-	-	-	-	-	-	75	-	-	-	-	-	0.44
Fusarium	No.	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	5
	%	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	0.27
Thamnidium	No.	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
	%	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.23
Total	No.	71	180	24	453	77	129	55	11	28	146	143	153	202	33	41	1831
	%	3.88	9.83	1.31	29.66	4.21	5.77	3.00	0.60	1.53	7.97	7.81	8.36	11.03	1.80	2.24	100

results that the group of spices (Black pepper, Cummin, Capsicum, and their, mixture) play the greatest role in contamination of meat products with moulds (44.68%). The isolates of rice and fenugreek (Penicillium, Aspergillus, Cladesporium, Rhizopus, Verticillium and Absidia) are little than that obtained by Youssef et al., (1985) who have beside the mentioned genera, Mucor, Alternarice, Cephalosporium, Paecilomyces, Fusarium, Trichoderma, Stemphylium and Monosporium. The predominance of genera penicillium and Aspergillus is also mentioned by Hadlok (1970) and Abd El-Rhaman (1987). In this study, cladosporium was isolated in high percentage (20.86%). Concerning the significance of the isolated strains mycotoxins as (aflatoxins, citreoviridin, citrinin, ochratoxins, patulin, kojic acid, stregmatocystin could be secreted from Aspergillus and Penicillium species and other mycotoxins may be also secreted from other types of moulds as Fusarium, Cladosporium. Mycotoxins (Aflatoxins) were considered as a cause of human liver cancer (Diener & Davis 1966, Bullerman, 1974, Leistner & Eckardt 1981).

Other problems as dark mould formation on meat products (Black Spot.) are caused mainly by cladosporium species (Mueggenburg; 1974).

It could be also concluded from the achieved results that meat additives mainly spices and other fillers as starch, rice were considered the main source of mycological contamination of involved meat products. Decontamination of meat additives by practical method (irradiation) is recommended by Yassien (1988)

SUMMARY

A total 75 samples of some selected meat additives including 14 types and casings used in meat production were mycologically examined. Five samples of each of the following were examined: black pepper, cummin, capsicum, mixture (of the three), cinnamon, fanugreek, coriander, nonmeat protein (soyaprotein), milk powder, starch, rice, common salt, onion, garlic and casings. 1831 moulds were isolated. This includes 633 (34.57%) Penicillium, 572 (31.24%) Aspergillus, 382 (20.86%) cladosporium, 96 (5.24%) Rhizopus, 50 (2.73%) Verticillium, 45 (2.45%) Scopulariopsis, 25 (1.37%) Absidia, 11 (0.60%) Mucor, 8 (0.44%) Alternaria, 5 (0.27%) Fusarium 4(0.23%) Thamnidium. It is evident from obtained results that the incidence of moulds was 3.88%), 1.31%, 29.66%, 4.21%, 5.77%, 3.00%, 0.60%, 1.53%, 7.97%, 7.81%, 8.36%, 11.03%, 1.80%, and 2.24% for black pepper, cummin, capsicum, mixture, cinnamon, fenugreek, coriander, soyaprotin , milk powder, starch, rice common salt onion, garlic, and casings respectively.

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