MYCOPOPULUTIONS, AFLATOXINS AND OCHRATOXINS A IN SOME SEMI-DRY SAUSAGES

Marija Škrinjar, Vanda Došen-Bogićević and Ivan Vujković

Faculty of Technologi, University od Novi Sad, Boul. Cara Lazara 1, 21000 Novi Sad, Yugoslavia

Key words: semi-dry sausages, moulds, aflatoxins, ochratoxin A, contamination

Background

Presence of moulds on the surface of meat products such as semi-dry and dry sausages is a normal phenomen particularly often in mediterranian countries. Numerous factors relating to environment (air-temperature and humidity) and substrate (composition, pH, a_w) effect the development and metabolic activity of moulds. Many of them, especially from the genus *Penicillium* and *Aspergillus* or their telemorphs are capable to form toxic metabolites (El-Banna at al., 1987, El-Kady at al., 1994, Škrinjar, 1997). Such fungi are undeserable on foods due to harmful effects for human healts.

Objective

The objective of this studi was to examine contamination of some semy-dry sausages with moulds, aflatoxin B1, G1 and ochratoxin A.

Methods

Semi-dry sausages (mortadella - 2 samples, Novi Sad's sausage - 2 samples, barbecue sausage - 11 samples, serbian sausage - 8 samples, beef sausage - 4 samples) were investigated on the presence of moulds, aflatoxin B1 (AB1), G1 (AG1) and ochratoxin A (OA). All samples originated from the market.

Mycological analyses. A part of visibly moulded surface of sausage was cuted and pressed directly on Sabouraud dextrose agar (SDA) with streptomycin (1%) in Petri dishes. Incubation was done at 25 °C for 7 days. Identification of isolated moulds was carried out according to Samson and van Reenen-Hoekstra (1988).

Mycotoxicological analyses. Qualitative and quantitative determination of AB1, AG1 and OA was performed by using a modified TLC method desribed by Balzer at al. (1978). Pure OA from *Aspergillus ochraceus* was supplied by Fluke Biochemika 7411, Switzerland.

Results and discussion

Mycological analyses. Total viable counts of moulds per cm^2 of sausage surfaces aranged from 2.6 (barbecue sausage) to 24.5 (serbian sausage) (Teble 1). Isolated moulds were classified into 8 geners and 25 species (Table 2). The highest number of various fungal species (16) was found on the surface of barbecue sausage. *Penicillium* spp. were dominant in isolated mycopopulation, especially in those from serbian and barbecue saosages (Fig. 1). *P. aurantiogriseum* and *P. chrysogenum* were found to be the most frequent. As it was observed, *P. aurantiogriseum* had a dominant share in mycopopulations isolated from Novi Sad's and serbian sausage and from mortadella as well. *P. chrysogenum* was the main contaminant of barbecue and beef sausages.

About 40% of fungal species isolated in these experiments were potentially toxigenic (Fig. 2) as follows: *A. alternata*, *P. variotti*, *P. aurantiogriseum*, *P. brevicompactum*, *P. chrysogenum*, *P. citrinum*, *P. commune*, *P. echinulatum*, *P. expansum*, *P. griseofulvum*, *P. hordei* and *Rhizopus stolonifer* (Samson and van Reenen - Hoekstra, 1988).

Mycotoxicological analyses. AB1 and AG1 were not detected in sausage samples. OA was found in 2 samples (barbecue sausage - 1, beef sausage - 1) at low concetration (traces).

Table 1. Total viable count of moulds per cm^2 of semi-dry sausage surface

Mortadella		Novi Sad's sausage		Barbecue sausage		Serbian sausage		Beef sausage	
Sample no.	Total viable count of moulds	Sample no.	Total viable count of moulds	Sample no.	Total viable count of moulds	Sample no.	Total viable count of moulds	Sample no.	Total viable count of moulds
1	5,9	1	4,3	1	2,6	1	4,4	1	4,1
2	12,8	2	15,1	2	3,9	2	6,5	2	9,1
				3	5,6	3	5,1	3	5,5
				4	4,0	4	5,0	4	7,8
				5	6,1	5	17,0		
				6	4,6	6	24,5		
				7	17,2	7	17,1		
				8	10,2	8	15,6		
				9	9,4				
				10	14,1				
				11	5,3				
$\bar{x}$	9,4	$\bar{x}$	9,7	$\bar{x}$	7,6	$\bar{x}$	11,9	$\bar{x}$	6,6

Table 2. Mould species isolated from semi-dry sausage surface

Mould species	M	N	B	S	BS
Alternaria alternata (Fr.) Keissler	+				
Aspergillus gracilis Bainer	+	+			
Fusarium sp.			+	+	
Mucor christianiensis Hagen		+	+		
M. heterosporus Fischer			+		
M. hiemalis Wehmer		+	+	+	
M. jansseni Lendn.			+		
M. plumbeus Benorder		+			
M. racemosus Fressenius		+	+	+	
Mycelia sterilia	+				
Paecilomyces variotii Bainer			+		
Penicillium aurantiogriseum Dierckx	+	+	+	+	+
P. brevi-compactum Dierckx	+	+	+		
P. chrysogenum Thom	+	+	+	+	+
P. cyaneo-fulvum Biourge	+	+	+	+	
P. clavigerum Demelius					+
P. commune Thom				+	
P. concentricum Samson, Stolk & Hadlok, spec. nov.	+	+	+	+	
P. echinulatum Fassatiová			+		
P. expansum Link ex S. F. Gray			+		
P. griseofulvum Dierchx	+		+	+	+
P. spinulosum Thom		+		+	
P. steckii Zalaski				+	
P. verrucossum var. ochraceum (Thom) Samson, Stolk & Hadlok, comb. nov.				+	
Rhizopus stolonifer (Ehrenb.) Lind.			+		

M - mortadella; N - Novi Sad's sausage; B - barbecue sausage; S - serbian sausage; BS - beef sausage

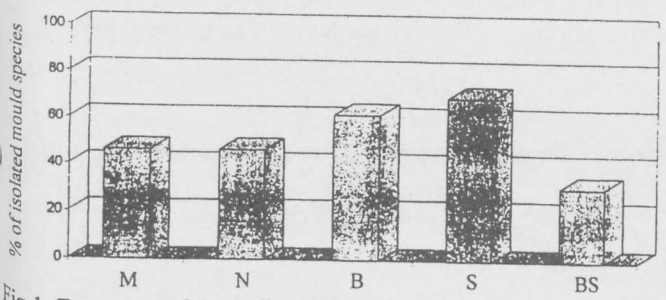

Fig 1. Frequency of *Penicillium* spp. on surface of semi-dry sausages

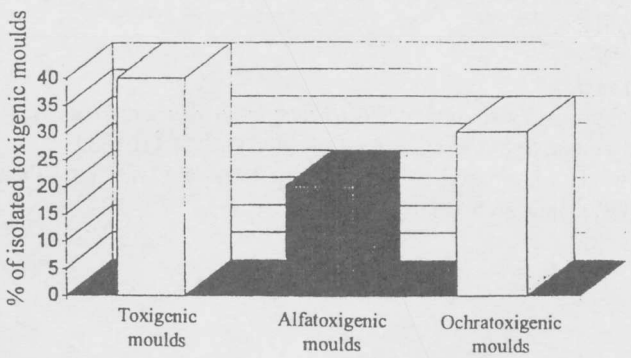

Fig 2. Frequency of toxigenic moulds isolated from semi-dry sausages

Conclusions

Numerous fungal strains were isolated from semi-dry sausages (27 samples) tested. They belong to 8 geners and 25 species. The most frequent were *Penicillium* species. About 40% of isolated fungal species were potentially toxigenic. Two samles (barbecue sausage, beef sausage) were contaminated with OA (traces). AB1 and AG1 were not detected.

References

Balzer, I., Bogdanić C., Pepeljnjak S. 1978. J. Assoc. Off. Anal. Chem. 61, 584-584,

El-Banna A.A., Pitt J.I., Leistner L. 1987. System. Appl. Microbiol. 10, 42-46,

El-Kady I.A., van Reenen-Hoekstra E.S. 1988. Introduction to food-borne fungi. Centraalbureau voor Schimmecultures, Baarn-Delft, The Netherlands,

Škrinjar M. 1997. Tehnologija mesa 2-3, 59-62