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## The Determination of Mould Flora of Some Turkish Cheese Types (Kasar, Civil, Lor, Tulum)

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**Abstract:** In this study a total of 91 mould isolates were obtained from 69 cheese samples, 18 kasar cheese, 22 civil cheese, 23 lor (whey curd), 6 tulum cheese (lor + civil), collected from Erzurum and neighboring provinces in Turkey. The mould isolates were 69.3% *Penicillium*, 14.3% *Geotrichum*, 7.7% *Chrysosporium*, 5.5% *Mucor*, 3.3% *Rhizopus* spp. *Penicillium* genus were dominant in all cheese types. Particularly *P. roqueforti* and *P. expansum* were identified in almost all cheese types.

**Key words:** *Penicillium*, cheese, mould, Erzurum, Turkey

### Introduction

Some 4000 cheese types have been produced worldwide (Topal, 1993). Although the major cheese types produced in Turkey are white pickled cheese, kasar cheese and tulum cheese, some traditional cheese types such as mihalic cheese, dil cheese, civil cheese, otlu cheese are produced and consumed in some regions (Kebeci, 1995).

Civil cheese is produced in eastern provinces of Turkey in homesteads and small scale milk plants from skim milk. It is stored in brine or is pressed into plastic containers mixed with lor (whey curd) and consumed during winter (Ünlütürk *et al.*, 1998). During ripening period the cheese mixture in plastic containers is molded naturally (without inoculation) and particular surface of cheese turns blue. The blue civil cheese is one of the most preferred cheese types with distinctive taste and aroma.

As mould lowers the quality of cheese on which it grows, it also produce some toxic metabolites (mycotoxin) and pose health risk for consumers. Consumption of food containing mycotoxin may cause mycotoxicosis and even fatal poisoning (Hasenekoglu, 1991).

Depending on environmental conditions and composition of food some mould strains grow widely in many products. Among them are often members of *Aspergillus*, *Penicillium*, *Fusarium*, *Alternaria* genus (Chapman *et al.*, 1981).

Although mould grows in fermented milk products generally to a lesser extent, it grows in cheese at low temperatures more abundantly. They cause problems for producers during ripening period, and for retailers during storage at low temperatures. The colour and aroma defects, undesired appearance caused by mould growth lead to economic loss. The aim of present study was to investigate the dominant mould strains in kasar (18), civil (22), lor (23), tulum (civil+lor)(8) collected from Erzurum and neighbouring provinces in Turkey, and also to know the measures to be taken for safe consumption.

### Materials and Methods

A total of 69 cheese samples (23 lor, 22 civil, 18 kasar, 6 tulum) were collected from Erzurum and neighboring provinces and transferred to Atatürk University, Food Engineering Department immediately in ice chest.

One gram cheese from each sample was homogenized in a porcelain with 10 ml sterile physiological water to obtain a yogurt viscosity and then adequate dilutions were prepared. To prevent overspread of bacterial colony growth, 30 mg/ml of rosebengal and streptomycin were added into pepton-dextrose-agar medium. For each cheese sample five petri

plates were inoculated with 1 ml of 1:10000 dilutions. The mould strains that grew at 25°C for 10 days were examined using microscope. The colonies of *Penicillium* were inoculated into Czapek agar medium (CPA), and the other colonies were inoculated into Potatoes dextrose agar medium (PDA). The mould that grew at 25°C for 10 days were identified (Ayyildiz *et al.*, 1985).

### Results and Discussion

A total of 91 mould isolates were obtained from 69 cheese samples investigated. The outstanding mould strains were members of genus *Penicillium* (69.3%) and *Geotrichum* (14.3%). The rest were *Chrysosporium* (7.70%), *Mucor* (5.50%), and *Rhizopus* (3.3%) respectively. *P. roqueforti* and *P. expansum* from *Penicillium* genus; *G. candidum*, *R. stolonifer* from *Rhizopus* genus, *Chrysosporium inops* from *Chrysosporium* genus, and *M. hiemalis* from *Mucor* were found widely (Table 1).

The results of this study are in well consistence with those of previous research. Bullerman and Olivigni (1974) determined that 82% of the mould species isolated from 349 moldy cheese samples were the members of *Penicillium* genus. Bullerman (1976) determined that 87% of 366 mould isolates obtained from Swiss cheese belonged to *Penicillium* genus and the rest (13%) were of various mould genera.

Chapman *et al.* (1981) reported that the dominant mould flora of 52 mouldy cheese samples belonged to *Penicillium* genus, mainly *P. roqueforti*, *P. viridicatum* and *P. chrysogenum*.

Lund *et al.* (1995) recorded 91% of 371 mould isolates obtained from various cheese types belonging to *Penicillium* and the rest were various mould species. A similar research revealed that *Penicillium* constituted 70% of mould flora of cheese samples (Cafarchia *et al.*, 1995). Alperden (1978) isolated 167 mould strains from 85 cheese samples from Marmara region and determined that 54% were members of *Penicillium* genus.

Çoksöyler and Kösker (1980) recorded that all the 12 mould strains isolated from 4 mouldy tulum cheese samples, collected from Isparta, Konya, Mersin provinces of Turkey, belonged to *Penicillium*. Sert (1992) determined that *Penicillium* was the dominant mould genus in civil, kasar, tulum and white cheese samples collected from Erzurum province. Hasenekoglu (1991) reported that 73 out 129 isolates from cheese samples collected from Erzurum vicinity belonged to *Penicillium* genus. Ayyildiz *et al.* (1985) determined the presence of *Penicillium* in more than 50% of cheese samples sold in Erzurum. Aran (1993) recorded that no *A. flavus* or *A. parasiticus* were found in tulum and civil cheese. Together with *Penicillium*,

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Table 1: The number of mould strains obtained from Kasar, Civil, Lor and Tulum cheese, and their rates in cheese and their rates

Mould genus	Kasar		Civil		Lor		Civil+lor		The rate in
	Total	The rate	Total	The rate	Total	The rate	Total	The rate	
<i>Chrysosporium inops</i>	5	27.80%	1	4.50%	1	4.30%	-	-	7.69%
<i>Geotrichum candidum</i>	2	11.10%	6	27.30%	4	17.40%	1	1.70%	14.30%
<i>M. hiemalis</i>	-	-	1	4.50%	1	4.30%	-	-	2.20%
<i>M. racemosus</i>	-	-	-	-	-	-	1	1.70%	1.10%
<i>M. ramosissimus</i>	1	5.50%	-	-	-	-	-	-	1.10%
<i>M. saturninus</i>	-	-	1	4.50%	-	-	-	-	1.10%
<i>Penicillium chrysogenum</i>	-	-	1	4.50%	-	-	-	-	1.10%
<i>P. camemberti</i>	-	-	-	-	1	4.30%	-	1.10%	-
<i>P. cytopium</i>	-	-	-	-	1	4.30%	-	-	1.10%
<i>P. expansum</i>	6	33.30%	7	31.80%	8	34.80%	-	-	23.10%
<i>P. frequentens</i>	-	-	-	-	1	4.30%	6	100	1.10%
<i>P. roqueforti</i>	11	61.10%	11	50.00%	10	43.50%	-	-	41.80%
<i>Rhizopus sp</i>	-	-	1	4.50%	-	-	1	1.70%	1.10%
<i>Rhizopus stolonifer</i>	1	5.5%	-	-	-	-	-	-	2.20%

Çoksöyler and Kösker (1980) found mould belonging to *Alternaria*, *Aspergillus*, *Cladosporium*, *Geotrichum* and *Mucor* genera.

In conclusion the main mould genus in almost all cheese types was *Penicillium* genus, particularly *P.roqueforti* and *P.expansum* (except tulum cheese). Considering the fact that *P.roqueforti* produces PR toxin and *P.expansum* produces patulin; even though lower the risk level for health, moldy cheese may pose health risk when hygiene precautions are not met and suitable mold culture is not used.

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