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A study of moulds contamination of table eggs in Baghdad city

Moutaz A.W.A. Mounam*, Aseel I. Al-Ameed and Nagham M. Al-Gburi

College of Veterinary Medicine, University of Baghdad, Iraq.
*Corresponding author: drmoutaz@yahoo.com

Abstract

The study was conducted to detect the moulds contamination of table egg-shells and contents. A total of 50 random brown egg samples (every sample is a batch of 5 eggs) were collected from markets in Baghdad city, divided into two part: broken egg shells and egg contents homogenized by mechanical agitation , a (1ml) or (1g) of samples was inoculated to a (9ml) of sabouraud dextrose broth (SDB) and incubated at 25-30ºc for (7-10) days. The culture from each tube was inoculated on sabouraud dextrose agar (SDA) and incubated at 25-30ºc for (7-10) days then the suspected moulds were identified. proteolytic activity of moulds was detected by using skim milk agar (SMA). The results showed that the moulds isolated from both egg shells (11%) and egg contents (4%). The most prevalent mould species was *Mucor* (10%) of the total isolates from egg shells, *Pacilomyces victoria* from both egg shells and egg contents (2%), other mould strain isolate from egg shells followed by *Trichoderma* spp., *Aspergillus fumigatus*, *Cladosporium herborum*, *Alternaria alternata* and *Pencillium* spp. (2%) of each mould, while *Fuserium gramenearum* isolated from egg contents with (2%). The results also reveal that all isolated moulds have the proteolytic activity of milk in variable rates, *Aspergillus fumigatus* was a higher proteolytic activity followed by *Pencillium* spp*., Alternaria alternate, Fuserium gramenearum, Cladosporium herborum, Trichoderma* spp*., Mucor* spp*., Pacilomyces victoriae.* These findings suggest contamination of shells and contents of table eggs with different moulds and we recommend that these products should be monitored carefully to ensure public health.

Keywords: Table eggs, Shells, Contamination, Moulds, Baghdad.

Introduction

Eggs are one of the few foods that are used excessively throughout the world; thus egg industry is an important segment of the world food industry. Eggs are an important part of human diet since the dawn of recorded history. The use of eggs in human diet includes pastries ,stews and beverages (Osei *et al*., 2003). Recently, eggs have been an important commodity in international trade. Moreover, eggs provide a unique well balanced nutrients for persons of all ages. Their high nutrient content, low caloric value and easy of digestibility make eggs valuable in many therapeutic diets for adults (Heranz, *et al.*, 2007; Ebubekir, *et al.*, 2008) Although, the majority of freshly laid eggs are sterile inside, Several factors have been implicated in egg contamination (Al-Obaidi *et al.*, 2011). Among these are faeces of the birds, litter material, egg crates, packing and storage. Others are cloths and hands of poultry workers, dust, the environment, weather conditions, transporting and marketing. Among the common contaminant organisms pathogenic to human beings are *Salmonella* spp., *Staphylococcus* spp., *Bacillus*, *Mucor*, *Corynebacteria*, *Aspergillus*, *E. coli* and *Diplococci* (Osei, *et al*., 2003). Food borne diseases caused by microorganisms are a large and growing public health problem. Most countries with systems for reporting cases of food borne diseases have documented significant increase over the past decades in the incidence of diseases caused by microorganisms in food (WHO, 2005). The egg has various barriers to protect itself from microbial invasion. Unfortunately, these barriers are probably temporary and offers no protection against the infiltration of mould hyphae through the shell and membrane, which produce jelling of albumen and offensive odors due to proteolytic and lipolytic enzymes produced by mould growth (Board, 1980). Different types of moulds were isolated by several investigators as, (El-Essawy *et al*.,1989; Bekhit *et al*.,1992; Aman *et al*.,1993; Hassan, 1995; Martin *et al*., 1998; Abdel–Latif Deena, 2001) these mould including, *Penicillium*, *Cladosporium*, *Aspergillus*, *Alternaria alternata*, *Mucor* and *Rhizopus* genera from examined avian eggs. Because of the continuous consumer demands worldwide for eggs, periodical assessment is required to offer safe and

good quality eggs for consumption. The present investigation was, therefore, planned to assess shell and interior quality of consumed eggs at retail levels in Baghdad city, Iraq.

Materials and Methods

A total of 50 random brown egg samples (every sample is a batch of 5 eggs) were collected from markets in Baghdad city. The samples were collected in sterile Plastic container and transported aseptically to the laboratory of Zoonotic Disease Unit in the College of Veterinary Medicine, University of Baghdad, and divided into two part: broken egg shells and internal egg contents homogenized by mechanical agitation using stomacher for 3-5 min. in sterile plastic bags. A (1ml) or (1g) of samples was inoculated to a (9ml) of sabouraud dextrose broth (SDB) and incubated at 25-30cº for (7-10) days. The culture from each tube was inoculated on sabouraud dextrose agar (SDA) at 25-30ºc for (7-10) days then the suspected moulds were identified according to (Samson *et al*., 1996).

Detection of proteolytic moulds: Proteolytic moulds detected by using skim milk agar (SMA), which is a plate count agar with 10% sterile skim milk added just before pouring the plates. small amount of mycelium of each mould was inoculated in the central of each plates then incubated at 25-30Cº for(5-7) days. Proteolytic moulds surrounded by a translucent clear zone due to hydrolysis of casein (milk protein) into soluble nitrogenous compounds. For confirmation of correct protein hydrolysis, each plates was flooded with 1% Hcl or 10% acetic acid for one minute. True proteolytic zone will remain clear after flooding the plates with the acid whereas false-positive zones will produce turbidity. This method is used for the detection of proteolytic moulds which may significantly shorten the keeping quality of storage table-eggs (Samson *et al*., 1996; Joy *et al*., 2005).

Results and Discussion

The results obtained in table (1) showed that the moulds isolated from both egg shells (11%) and egg contents (4%). The most prevalent moulds species was *Mucor* which represented about (10%) of the total isolates from egg shells, inspite of isolation of *Pacilomyces victoria* from both egg shells and egg contents (2%), other mould strain isolate from egg shells followed by *Trichoderma* spp., *Aspergillus fumigatus*, *Cladosporium herborum Alternaria alternata* and *Penicillium* spp. (2%) of each mould, while *Fuserium grmenearum* isolated from egg contents with (2%).

The results also reveal that all isolated moulds have the proteolytic activity of milk in variable rates, *Aspergillus fumigatus* was a higher proteolytic activity followed by *Pencillium* spp., *Alternaria alternate, Fuserium gramenearum, Cladosporium herborum, Trichoderma* spp., *Mucor* spp., and *Pacilomyces victoria* (Table 2).

Table (1): Incidence of isolated moulds from the examined egg shells and egg contents.

Isolates	Egg shells		Egg contents	
	No. of isolate	%	No. of isolate	%
		10	0	0
Mucor spp.	5	2	1	2
Pacilomyces victoriae	1	2	0	0
Trichoderma spp.	1	2	0	0
Aspergillus fumigatus	1	2	0	0
Cladosporium herborum	1	2	0	0
Alternaria alternata	1	2	0	0
Pencillium spp.	1	2	0	0
Fuserium gramenearum	0	0	1	2
Total	11	22	2	4
Total all +^{ve} samples = 13	26			

Table (2): Proteolytic activity of isolated moulds

Isolated mould	strength of Proteolytic activity
Aspergillus fumigatus	+++
Pencillium spp	++++
Alternaria alternate	+++
Fuserium gramenearum	++
Cladosporium herborum	++
Trichoderma spp	++
Mucor spp	+
Pacilomyces victoriae	+

+++(Strong Activity),++(Medium),+(Weak)

Freshly laid eggs are generally devoid of organisms. However, following the exposure to environmental conditions, eggs become contaminated with different types of micro-organisms from various sources including soil, dust and dirty nesting materials (Ellen *et al*., 2000; Smith *et al.*, 2000). Consequently the bad storage of eggs under very humid conditions could support the multiplication of these contaminating micro-organism present on egg shells. Furthermore, these microorganisms may contaminate the egg contents either by penetration or withdrawal through pores of the shells. After laying, freshly laid eggs cool and the contents contract leading to drawing of water and microorganisms through the shell pores. Some factors influence the microbial penetration such as environmental temperature and humidity enhancing the infection and spoilage (Speck,1976; Frazier and Westhoff,1987; Theron *et al*., 2003).

Some moulds especially *Fusarium* and *penicillium* species could penetrate into the eggs at different temperatures and produce their toxins which increase with the storage time (Torkey, 1982). *Aspergillus* species may induce pulmonary aspergillosis, pulmonary allergy skin infection, nasal infection, as well as nail and external ear infections while *Mucor* and *Rhizopus* species are frequent contaminants of foods. These members may involve the rhino facial, cranial area, the lungs, gastrointestinal tract, skin and possibly other organ systems, as well as they can induce intra ocular infection, external otomycosis, orbital cellulitis and deep wound infection (Washington, 1981). Our study indicated that 26% of a total samples contaminated with moulds and contaminated of egg shells was greater than egg contents which agreement with (Rajmani *et al*., 2011; Abdul Aziz *et al*., 2012). Also the result revealed that Mucor was the predominant 10% isolated from egg shells, but not from egg contents this not agreement with results recorded by (Salem *et al*., 2009) who mentioned that the *Alternaria alternata* was the predominant in both egg shells and egg contents while not isolate *Mucor*, but this result agree with (Ansah *et al*., 2009) who isolate Mucor from both egg shells and egg contents also agreement with (Abdul Aziz *et al*., 2012) that *Mucor* have been recovered from eggs and their wash water.

Other moulds strain isolated are *Pacilomyces victoriae*, *Trichoderma* spp. *Aspergillus fumigatus*, *Cladosporium herborum*, *Alternaria alternata* and *Pencillium* spp. which agrees with published reports where most of these strains have been recovered from shell content,shell surface and wash water (El-Essawy *et al.*,1989; Abdul Aziz *et al*., 2012; Salem *et al.*, 2009; Obi and Igbokwe, 2007) *Fuserium gamenearum* and *Pacilomyces victoriae* was isolated from egg contents which accordance with (Torkey, 1982; Rajmani *et al*., 2011; Ahmed *et al*., 1974; Moursy *et al.,* 1982; Amer, 1990; Neamatallah, 2009).

Our results showed that all isolate proteolytic enzymes activity which causing digestion of Casein to peptones, peptides and amino acids which agreement with (Frazier and Westhoff, 1987) who reported that *Pencillum*, *Cladosporium*, *Sporotrichum*, *Mucor*, *Tbammidium*, *Botrytis*, *Alternaria* causing mouldiness of eggs and also agreement with (Torkey, 1982) who reported the proteolytic activity of some *Penicillium* spp. and *Fuserium gamenearum,* and with (Mirian *et al*., 2011) who found proteolytic activity of some strain of *Fuserium*, *penicillum, Paecilomyces* spp. and *Aspergillus* spp. (USDA, 2006) reported that microorganisms can be found on the outside of egg shell, this may be due to the fact that the egg emerges from hens body through the same passageway feces is excreted, Microorganisms inside an un-cracked or whole egg may be due to the presence of pathogens within the hens ovary or oviduct before the shell forms around the yolk and albumin. Fecal contamination could also occur through the pores on the shell after they are laid. from the public health point of view, certain strains of moulds were implicated in food poisoning outbreaks due to production of Aflatoxins, as well as some moulds are capable of forming toxins that cause mycotoxicosis in man and neoclassic diseases

including leukemia (Ray, 2001). As the protein contents of eggs is high, the study of the contamination ability of moulds in eggs and proteolytic activity of the isolated moulds is important (Samson *et al*., 1996).

Conclusions

It can be concluded that table egg should be monitored carefully and the implementation of Hazred Analysis and Critical Control point (HACCP) programs in table eggs industries are essential for addressing food safety for population of Baghdad province, as well as intervention and education of people involved in the production , processing and monitoring the table eggs.

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