Fungal Contamination in Eggs


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ABSTRACT

Hundred table eggs (50 hen eggs from organized poultry farm, 50 hen eggs from backyard poultry farm) procured and isolation of mould was attempted from egg shell and egg content. Six fungal genera isolated were Aspergillus, Penicillium, Fusarium, Mucor, Rhizopus, and Alternaria. This study demonstrated that eggs from organized farm had lesser fungal contamination than unorganized poultry farm. Also the isolation rate was higher in egg shell than egg content reflecting the effect of environment, storage and transportation of eggs on fungal growth and contamination.

Keywords: Egg shell, fungus, table egg

Avian eggs are nutritious, economical and provide a unique well balanced source of nutrients for persons of all ages (Bufano-Nancy, 2000). Freshly laid eggs are generally devoid of organisms. However, following the exposure to environmental conditions, eggs become contaminated with different types of microorganisms from various sources including soil, dust and dirty nesting materials. Consequently, bad storage of eggs under very humid conditions could support the multiplication of these contaminating microorganisms present on eggshell (Etuk et al., 2004). Furthermore, these microorganisms may contaminate the egg contents either by penetration or withdrawal through pores of the shells because the freshly laid eggs cool and the egg contents contract leading to drawing of water and microorganisms through the shell pores (Frazier and Westhoff, 1987). The rate of egg contamination depends mainly on hygienic measures at the farm and during transportation, handling and storage of eggs. Egg spoilage causes economic loss as well as poses risk to public health. Keeping this in view the present work was aimed at studying fungal contamination of eggs from organized and unorganized poultry farm.

Fifty eggs from organized poultry farm and 50 eggs from unorganized (Backyard) poultry farm were randomly collected from local markets from Patna (Bihar) city. The eggs were examined for fungal contamination.

For preparation of inoculum from egg shell, each egg was immersed in 50 ml of sterile nutrient broth for 10 min. The nutrient broth was used for assessing the fungal load. For preparation of inoculum from egg content, each egg was wiped with 70% ethanol, a circular cut was made in egg shell and the contents were poured in a sterile petri dish and mixed with sterile glass rod.

The egg shell and egg content samples were inoculated into two sets of Sabourauds dextrose broth.
agar (SDA) tubes and SDA with cloramphenicol (0.05 mg/ml) tubes. One set of tubes was incubated at room temperature, while the other at 37°C. The tubes were examined at weekly interval for growth of fungi. The fungi were isolated and identified according to procedure adopted by Campbell and Stewart (1980) on the basis of gross morphology and microscopic morphology of the colonies. Gross morphology included rate of growth, general topography, texture, surface pigmentation and pigmentation on the reverse side of the colony. Microscopical examination of the sporulated cultures was done by lacto phenol cotton blue staining for proper identification. All culture of *Aspergillus flavus* were inoculated onto Czepak Dox agar and were incubated for a week at 37°C for identification of toxigenic fungi. The toxigenic property was characterized by the development of pink colour on the reverse of the tube.

Total of 129 fungal isolates were isolated from the egg shell, while 66 were isolated from egg content. The isolated mould species were identified in six fungal genera comprising of *Aspergillus*, *Penicillium*, *Fusarium*, *Mucor*, *Rhizopus*, and *Alternaria*. The isolates of genus *Aspergillus* was found to be predominant contaminant of egg shell and egg content (38.5%) followed by *Rhizopus* (20.51%), *Mucor* (11.28%), *Penicillium* (9.23%), *Alternaria* (6.66%) and *Fusarium* (6.66%). The genera *Aspergillus* were further identified into *Aspergillus flavus*, *Aspergillus niger*, *Aspergillus fumigates* and *Aspergillus nidulans*. Out of 75 isolates of *Aspergillus* spp. examined the percentage wise prevalence was found to be as follows: *Aspergillus flavus* 25.33%, *Aspergillus niger* 38.66%, *Aspergillus fumigates* 28% and *Aspergillus nidulans* 6%. Similar finding was observed by various other workers (Sinha et al., 1973; Gulhane et al., 1999). Some unidentified yeast isolates were also isolated from the egg shell and egg content. The percentage wise prevalence of nearly all fungal species from the eggs obtained from unorganized farms was higher than the eggs from organized poultry farms (Table 1).

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<td>18 (36%)</td>
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<td>Egg content</td>
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Table 1. Prevalence of different fungal isolates in hen eggs.
Further, the fungal contamination of egg shells of both type of eggs were greater than that of egg content. Egg shell is made of a protein matrix lined with mineral crystals which acts as a sieve or mechanical barrier to filter external contaminants (Miller and Crawford, 1953). In spite of these protective barriers, microbial contamination of eggs occurs before laying and after laying with a variety of organisms from different existing sources. This can occur through the vent, from nesting materials, floor litter, avian fecal matter improper handling, washing, the type of detergent used, temperature and pH of the washing solution, storage under very humid conditions and inadequate sanitizing of equipment (Board and Fuller, 1994). Microbes affect egg contents by penetrating through the shell and inner membranes and multiplying causing rottening of egg (Zander, 1984). The average diameter of the pores present on the hen eggs is larger than the average diameter of the fungal spore, facilitating its entry into the egg (Tyler, 1956). Contamination of eggs and egg products with microorganisms may lead to spoilage and consequently economic losses or perhaps transmission of pathogens inducing cases of food borne infection or intoxication to consumers constituting public health hazard. According to the Centers for Disease Control and Prevention, USA, eggs are responsible for an estimated 230,000 case of foodborne illness each year (Bufano-Nancy, 2000).

In the present investigation, the isolated mould species were screened for mycotoxins production under laboratory circumstances. Out of 19 isolates of Aspergillus flavus examined for toxigenicity, 7 isolates were found to be toxigenic (36.84%) as evident by production of orange yellow colored pigment. Aflatoxin is considered as health hazard for man, animals and poultry, the possibly teratogenic immunosuppressive, mutagenic and carcinogenic effects on human beings. Aflatoxin also decreases resistance to bacterial, viral, parasitic and fungal disease by interfering with both humoral and cell mediated immunity (Ramasatry et al., 2000; Pitt, 2000; Kovacs, 2004).

It is concluded from the study that may, the pathogenic moulds penetrate and contaminate eggs and may produce toxins under favorable conditions. Therefore, measures such as good management practices application of correct farm hygiene programs, good handling and storage methods, as well as, the periodical examination of eggs and poultry feed are essential.

References