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Microbiological Quality Evaluation of Commercially Available Poultry Feeds Sold in Peshawar, Khyber Pakhtunkhwa, Pakistan

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Abstract : *The toxic fungi and bacteria contaminate the poultry feedstuffs, making them unsafe for use. The detection of microbial flora in the 100 samples of poultry feeds from different market of Peshawar was carried out. Pour Plate technique was used for total plate count bacteria (TPC), yeast and mold, while Most Probable Number (MPN) techniques were used for coliforms and fecal coliform bacteria. The highest TPC in broiler starter was 8 x 10^5 cfu/g at Chargano Chowk, while in broiler finisher, the highest TPC was 5 x 10^8 cfu/g at Warsak Road. The coliforms bacteria between 240->1100MPN/g and fecal coliforms bacteria were found in the range 20-460 MPN/g. The Yeast count ranges from 1×10^2cfu/g to 6×10^4cfu/g, whereas the Moulds values from 2×10^3 cfu/g to 5 ×10^7 cfu/g.*

Keywords: *TPC, Coliform bacteria, Fecal Coliform bacteria, Yeast, Mould.*

INTRODUCTION

Groundwater is the most vital natural resource, which forms the core of the ecological system. It has become The food items are used for growing the poultry birds. Poultry comprises all household birds which are consumed as a resource of meat and egg production for mankind utilization (Obi & Ozugbo, 2007). The birds being generally acceptable are; guinea fowl, duck, turkey and chicken. The feeds of poultry are considered as a full feed because they are formulated to comprise all the nutritive ingredients required for suitable growth, egg and meat production in chickens. Numerous types of poultry feeds are available in the markets i.e. chick mash, starter mash, layer mash, finisher mash and grower mash, which are depending on the role they carry out in the aves (Ige et al., 2012).

In quality assurance system assessment of microbiological conditions is a significant factor during feeding, trade and animal feeding stuffs' production (Elzbieta et al., 2005). Numerous physical parameters such as oxygen, pH, storage time, room temperature, humidity and moisture affect mycotoxins production and fungal growth (Jean et al., 2013).

Pakistan is located in the sub tropical area (Williams et al., 2004). The precise location of Pakistan lays North latitude of between 24° and 40°. The sub tropical countries climatic conditions are damp, moist and warm, providing favorable situation for microbial growth. Agricultural material is generally used for poultry feed preparation; therefore, it basically relies on the prominence of these materials (Anjum et al., 2000). It is one of

the general practices in most of the countries that the best quality grains and cereals are exported, stored and kept for man utility, while cheap quality farming commodity are utilized for animal feeds' production (Jones, 1995). In addition, inadequate conditions for storage, including the high temperature particularly from May to November, and damp weather conditions are the best for the propagation and growth of microbes especially the species of Aspergillus, which produce fungi toxins under described factors (Farhat & Zahoor 2014).

Materials and Methods

Samples Collection

The samples of poultry feed were procured from selected areas of Peshawar city and its surroundings. The samples were kept in pre-sterilized glass bottles and shifted to laboratory for analysis.

Treatment of Samples

The sample preparation processes were carried out in Laminar Air Flow Hood. Two hundred and twenty-five millimeter of peptone water (0.1%) was mixed with 25g of poultry feed samples and blended for 2 minutes in mixer Warring blender and 10^{-1} dilution was produced.

Determination of Total Plate Count

From 10^{-1} dilution, further dilutions 1/100, 1/1000, 1/10,000, 1/10,0000, 1/10,00000, 1/10,000000 and 1/10,0000000 were made for individual sample and 1 mL from each dilution was poured into sterilized Petri dishes, and then 43 – 47 °C fifteen millimeter of nutrient agar was added. After solidification, the Petri dishes were incubated for 24Hrs at 37°C. After incubation, each dilution plates were counted in a colony counter for colonies' quantification (Elzbieta et al., 2005).

Yeast and Mould Enumeration

From the previous dilutions (Total Plate Count), one millimeter of each sample and each dilution were transferred to duplicated sterilized Petri dishes and fifteen millimeter media (Dichloran Rose Bengal Chloramphenicol agar) was poured at 43 – 47 °C. Inoculated plates were incubated at 25 °C ± 1 °C for five to seven days and after completion of incubation period, the yeast and mould colonies were counted (Elzbieta et al., 2005).

Enumeration of Coliforms

From the previous made dilutions i.e. 1/10, 1/100 and 1/100, one millimeter from every dilution was taken and poured into ten millimeters lauryl sulfate tryptose broth (LST) with a sequence of 3 tubes. For 48 hours at 35ºC, the SLT tubes were incubated (Murilo et al., 2006).

Those SLT test tubs which observed gas production and turbidity were chosen and inoculum of hundred microliters were shifted to EC Broth and Brilliant Green Lactose Broth (2%). The tubes of Brilliant Green Lactose Broth were kept at incubator for 48 hours at 35ºC, while EC broths tubes were kept in a coliform water bath for 48 hours at 45.5ºC. After completion of incubation periods of both broth tubes, the quantification of coliform and fecal coliform was quantified using the Most Probable Number (MPN) table (Murilo et al., 2006).

Results and Discussion

The microbiological analysis of poultry feeds' samples is shown in Table 1. Generally, the broiler finisher was more contaminated as compared to broiler starter. The fecal coliforms bacteria in broiler starter were low as compared to broiler finisher in all the areas (Figure 1).

Table 1: Microbiological Analysis of Poultry Feed

Localities	Poultry feed	TPC (cfu/g)	Coliform (MPN/g)	Yeast (cfu/g)	Mould (cfu/g)
Khyber Bazar (n=20)	Broiler starter	3×10^3	460	1×10^2	2×10^3
	Broiler finisher	2×10^4	1100	2×10^2	3×10^3

Karhano Market (n=20)	Broiler starter	8×10^3	240	3×10^2	$3x\ 10^3$
	Broiler finisher	9×10^4	1100	3×10^2	3×10^4
Chargano Chowk (n=20)	Broiler starter	8×10^5	>1100	2×10^3	7×10^2
	Broiler finisher	8×10^6	>1100	2×10^3	5×10^7
Board Bazar (n=20)	Broiler starter	7×10^2	240	5×10^4	4×10^6
	Broiler finisher	6×10^4	1100	4×10^2	4×10^2
Warsak Road (n=20)	Broiler starter	6×10^6	>1100	6×10^4	5×10^6
	Broiler finisher	5×10^8	>1100	6×10^4	9×10^6

TPC= Total plate count, cfu= Colony Forming Unite, MPN= Most probable number

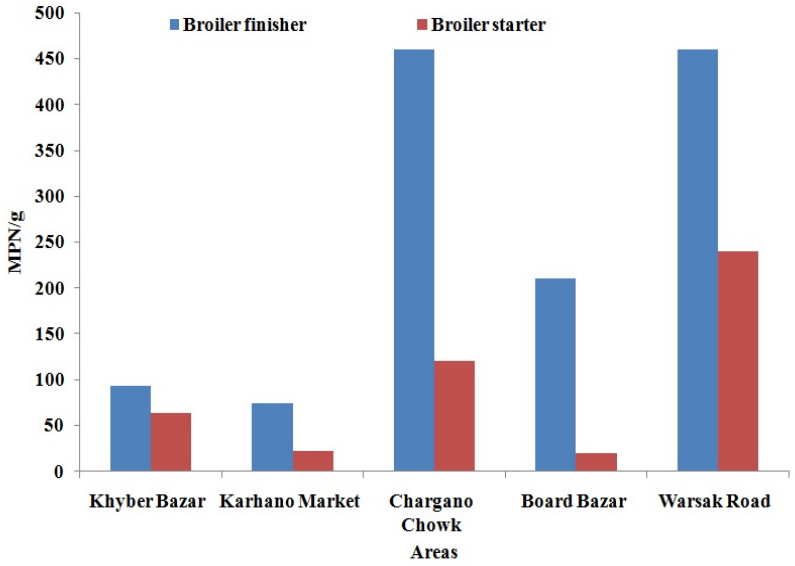

Figure 1. Fecal coliform bacteria in Poultry Feed

The coliform microbes are thought to be a marker for fecal pollution in water and feed, which comprise the Enterobacter spp., Klebsiella spp., and Escherichia spp., (Michael et al., 2005). The microbial contamination depends on storage conditions, bacteriological quality of feed items, production technology and feed composition (carbohydrate, fat and protein level). It was observed that the incident of pathogenic microbes in feed is straightforwardly which is connected with the intensity of pollution by microbes (Elzbieta et al., 2005).

The spores of mould count generally have been recognized to predict the hazardous risk of feed that may perhaps create the health issues in poultry. However, the quantification, were observed to be extremely changeable among lots of feed producers at dissimilar ecological points (Vesna et al., 2011). Commonly the mould count is a useful marker to predict the hygienic quality of feed, and the plate count would not go beyond 1×10^5 CFU/g values (Dalcero et al., 1998). The naming of the contaminating microbes is necessary for quality control purposes because it gives an information on its latent synthesis of its toxic metabolites and is a supportive marker to verify feed safe condition (Mariana et al., 2014).

It was observed that pre-harvest contaminations significantly influence the microbial flora in storeroom (Ige et al., 2012). The occurrence of microbes for concentration in the cargo space tactic is utilized by the feed producers, sellers and storage room condition distributions (Murphy et al. 2006). The maximum degree of microbial contamination might come from insect, plant debris and soil (Atehnkeng et al., 2008) which works as a pool of cultures for contamination of kernel in the farm. The raw material microbial contamination was occurred during the postharvest periods, pre-harvest periods and the final feeds are bare during storage, transportation, processing and production [Mariana et al., 2014]. It was investigated that microbe's incidence shows a discrepancy depending on humidity, temperature and geographical location (Pilar et al., 2012).

Conclusion

Public health and Government organization would move up community awareness on the mankind ailments that could probably spread from birds that use unhygienic feeds and the high concentration given for pathological security in trade poultry industries. It is advisable that poultry feed producers would offer customer sales point where potentials poultry growers can buy healthy feeds without microbial pollution. It is recommended that both retailers and producers are sound skilled on appropriate dealing of feeds. The vendors should give clear cut instructions to not open the feeds to pollutant such as dust particles and flies attracting admittance to the feeds which are open. Finally, the latest scientific and standard of the art technologies as well as good manufacturing/agricultural practices should be carried out.

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Conflict of Interest

We (authors) have no conflict of interest.

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