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PREVALENCE OF POULTRY DISEASES IN DISTRICT CHAKWAL AND THEIR INTERACTION WITH MYCOTOXICOSIS: 2. EFFECTS OF SEASON AND FEED

A. W. Yunus, M. K. Nasir[*], Tariq Aziz[**] and J. Böhm

Institute of Nutrition, Department of Veterinary Public Health and Food Science, University of Veterinary Medicine Vienna, A-1210 Vienna, Austria
[*]Department of Poultry Production, Dhoke Feroze, Chakwal, Pakistan
[**]Animal Sciences Institute, National Agricultural Research Centre, Islamabad 45500, Pakistan
Corresponding author: awyunus@gmail.com

ABSTRACT

Relationship of season and type of feed with disease incidence and interaction of these diseases with mycotoxicosis in layers and broiler flocks in district Chakwal, were investigated. These investigations were based on postmortem examination of birds submitted to the Poultry Production Institute, Chakwal, during 2003-04. To see the effects of seasonality, year long duration was divided into four equal parts, starting from January. Source of poultry feed, being important influencing factor on disease incidence, was included in the analysis as farmers of this area used feed marketed by 20 different commercial millers. Coccidiosis, *E. coli* infections, New Castle disease (ND), Hydropericardium Syndrome (HPS), mycotoxicosis, ascites, enteritis, and typhoid were among those being highly influenced by feed factors. Incidence of all the respiratory diseases in home-mix feed group and combined incidence of these diseases in commercial feeds was statistically similar (22.3 vs. 27.8%). But, incidence of coccidiosis, enteritis, and mycotoxicosis which are usually thought to be highly influenced by feed factors was low in home-mix feeds as compared to their total share in commercial feeds (16.7, 0.0, and 0.0% vs. 21.0, 2.3, and 3.9%, respectively). However, as generally envisaged, incidence of ascites was 16.7% in home-mix feeds which is very high as compared to 3.0% combined incidence of the problem in all commercial feeds. In broilers, the incidence of coccidiosis, *E. coli* infections, and coryza was equally distributed in all the months. Approximately half of the HPS, and ND outbreaks were noted during Jul-Sep. More than half of the total Chromic Respiratory Disease (CRD) cases were seen during April to June, while most of the (IB) cases (37%) were noted during Jan-Mar. In layers, approximately half of the coryza and one third of the CRD outbreaks were encountered in Apr-Jun. However, most of IB cases (72.8%) were observed during Jul-Sep (monsoon) and Oct-Dec. Newcastle disease was mostly seen during Jul-Sep in layers, and had a high seasonal correlation with mycotoxicosis both in broilers and layers (0.8 and 0.6, respectively). Effects of seasonality elicited higher incidence of mycotoxicosis, ND, and IB during monsoon. On the basis of overall low disease incidence six months, from October to March, seemed to be comparatively safer for both broilers ad layers due to overall lower disease incidence.

Key words: Mycotoxicosis; Coccidiosis; New Castle disease; Prevalence.

INTRODUCTION

Season, an extremely important environmental factor, may have profound effects on occurrence of diseases in poultry. Previous surveys in this regard have reported prevalence of poultry diseases (Siddique *et al*., 1987) and their relationship with age (Ahmad and Irfan, 1981) and weather (Khan and Ajmal, 1982 and Anjum, 1990, Yunus *et al*. 2008). However, interactions of various diseases during different seasons have not been studied in Pakistan, particularly in Chakwal area from where this study originates.

Similar to season, feed being the single most important environmental factor, may be a source of various pathogens including salmonella (Arsenault *et al*., 2007), and has an important role in occurrence and modulation of various diseases (Heres *et al*., 2004). Though, there are dozens of commercial feed brands being marketed in Pakistan, their contribution towards occurrence of various diseases has so far been neglected. This study, therefore, was planned as a preliminary attempt to investigate the relationship between different diseases as affected by different seasons and feed source.

MATERIALS AND METHODS

Present study investigates important causes of mortality in broiler and layer flocks and their interaction with mycotoxicosis as influenced by seasons and feed. The basis of data is postmortem examination of the birds submitted to the Poultry Production Institute, Chakwal to probe causes of mortality during the period from November 2003 to October 2004. The total record was of 2095 cases, in which broilers and layers constituted 81.6 and 18.4%, respectively. Diagnosis was mostly based on history, clinical signs, and postmortem examination.

Hemagglutination inhibition titer was evaluated for confirmation of complicated cases of Newcastle disease (ND) in layers.

Anjum, (1990) applied four seasons of winter (Dec-Feb), spring (Mar-May), summer (Jun-Aug), and autumn (Sept-Nov) to investigate the effects of season on disease incidence. However, we have divided one year into four equal parts with first part starting from January. Although this may not depict the true effects of low and high temperature, but would be an effective way to see the effects of monsoon (heavy rain rainfall in July/August/September with high persistent relative humidity) on various diseases which was prime objective of this study.

Poultry farmers of Chakwal area used poultry feed produced by 20 different feed millers. Data regarding four feed millers was pooled due to their negligible market share (combined share 1.3% hardly).

Data were analyzed in SPSS 13 for windows. Data regarding disease and feed interaction has been presented as disease incidence within a feed. However, data regarding interaction of disease with season has been tabulated as percent within a disease, while it has also been discussed as percent within season wherever necessary.

RESULTS AND DISCUSSION

Incidence of various diseases for each feed is presented in table 1. Diseases which appeared to be not influenced by feed, included those causing early chick mortality (omphalitis, brooder pneumonia, aspergillosis), and Infectious Bursal Diseases (IBD). For some diseases, number of cases was too low to warrant any significant effects (parasites, lameness, pasteurella, prolapse, hepatitis, leukosis, and marex). Though significant disease and feed interaction was found for each of the respiratory diseases, however, there was no correlation between incidences of any respiratory disease with each other. Coccidiosis, *E. coli* infections, ND, HPS, mycotoxicosis, ascites, enteritis, and typhoid were among those being highly affected by type of feed.

Correlation between incidence of ND and mycotoxicosis was not found (r^2 0.014). This may be because effects of feed on occurrence of mycotoxicosis were low, while occurrence of ND was found to be mildly affected by feed company. Feed in this area is usually purchased on credit and we have observed that farmers usually store feed for 2 or more weeks in open sheds. Storage of feed for 2 weeks or longer may result in growth of fungus at the farm which in this case would be irrespective of the feed company. This might be the reason for the aforesaid low correlation between incidence of ND and mycotoxicosis as affected by feed brand / source (feed miller). Furthermore, the occurrence of mycotoxicosis was comparatively more influenced by season (table 2 and 3), and tabulation of disease incidence under various feeds on yearly basis may not be effective to spot the aforesaid correlation.

Incidence of all the respiratory diseases in home-mix feed group and combined incidence of these diseases in commercial feeds was almost similar (22.3 vs. 27.8%). However, incidence of coccidiosis, enteritis, and mycotoxicosis which are usually thought to be highly influenced by feed factors was low in home-mix feeds as compared to their total share in commercial feeds (16.7, 0.0, and 0.0% vs. 21.0, 2.3, and 3.9%, respectively). This either indicates use of better feed ingredients or regular use of feed additives on the part of home-mixers. However, as generally envisaged, incidence of ascites was 16.7% in home-mix feeds which is very high as compared to 3.0% combined incidence of the problem in all commercial feeds. This might be a reflection of imbalanced formulation. Further evidence to this notion comes from the fact that all the ascites cases in home-mix feeds responded well to feed dilution with wheat bran (reflecting improper protein to energy ratios in home-mix feeds).

Seasonal prevalence of diseases in broilers: Seasonal prevalence of various diseases in broilers is presented in table 2. It appears from this table that the period between October and March seems to be comparatively safer due to lower disease incidence (42.7% of the overall incidence). Overall disease incidence during each of the 12 months starting from January was 8.5, 3.8, 6.2, 6.8, 8.2, 12.7, 9.6, 11.9, 9.3, 9.0, 6.6, and 7.7%. Thus total disease incidence started increasing from May and remained high until October (60.7% during these six months). Incidence during June to October was significantly higher than the mean of disease occurrence (6.7%). Incidence of coccidiosis, *E. coli* infections, and coryza was equally distributed in all the months. Early chick mortality due to salmonellosis appeared to be affected by season. Same trend was observed when early chick mortality due to all factors was combined (21.7, 26.1, 30.4, and 21.7%, respectively in 4 seasons depicted in table 2). Approximately half of the HPS, and ND outbreaks were noted during Jul-Sep. Maximum cases of mycotoxicosis also occurred during the same period, resulting in a very high correlation between ND and mycotoxicosis (r^2 0.84; figure 1). This observation is also supported from the literature (Khan, 1994). Most of ascites and enteritis cases were distributed during Oct-Dec. More than half of the total CRD cases were seen during April to June, while most of the IB cases (37%) were encountered during Jan-Mar. Though occurrence of CRD and IB was highly affected by season, the combined incidence of respiratory diseases during different seasons was 19.2, 37.2, 21.3, and 22.3%, which is only moderately correlated with season.

If data for occurrence of CRD in Apr-Jun (when it was the most prevalent disease; 21.1% with "percent within season") are excluded, coccidiosis appeared to be the all time most prevalent disease (30.0, 16.5, 15.1, and 21.0%, respectively during the 4 seasons). It would be interesting to note that coryza, *E. coli* infections, and IBD was the 2nd, 3rd, and 4th most prevalent diseases, respectively during all seasons with almost similar trend throughout the year (19.5, 17.7, 14.3, and 17.3; 13.9, 12.3, 11.2, and 13.3; and 10.1, 9.6, 12.0, and 10.8%, during 4 months for coryza, *E. coli* infections, and IBD respectively).

Seasonal prevalence of diseases in layers: Table 3 indicates seasonal prevalence of diseases in layers. As observed for broilers (table 2), the period between October to March appears to be safer for layers (37.2% of the total disease incidence). Overall disease incidence during each of the 12 months starting from January was 4.2, 3.4, 6.8, 7.5, 11.2, 8.1, 10.1, 14.8, 11.2, 13.0, 5.7, and 4.2%. These statistics again correlate well with those observed for broilers, i.e. the total disease incidence started increasing from May and remained high until October (68.4% during these six months; 60.7% for broilers). Contrary to the case with broilers, all the diseases in layers appeared to be highly influenced by season. However, high incidence of early chick mortality due to salmonellosis in Jan-Mar, and IBD and HPS in Apr-Jun may not be a true indicative of seasonal effects. Rather, these may be an indication of irregular distribution of number chicks being reared during different seasons. Apr-Jun was the most important seasons for the occurrence of respiratory diseases as approximately half of the coryza and one third of the CRD outbreaks were encountered in Apr-Jun. However, most of the IB cases (72.8%) were observed during Jul-Sep and Oct-Dec. Incidence of mycotoxicosis followed the trend of IB resulting in a high correlation between the two diseases. Newcastle disease though mostly seen during July to September also had a high correlation with mycotoxicosis (r^2 0.61 figure 2). The same period between July and September was also important for coccidiosis and enteritis. High occurrence of these diseases in this period may be due to higher rain fall usually observed during August to September (monsoon season). This also partly explains the low correlation between mycotoxicosis and ND, when this was calculated after tabulation of diseases against different feeds (table 1 and figure 2). Finally, Oct-Dec was critical when high incidence of bacterial disease (colibacillosis and typhoid) is taken into account.

Table 1 Occurrence of diseases in broilers and layers as associated with a specific feed in poultry[1]

Primary Disease	Feed [2]																		Total
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	HM	Misc.	
Coccidiosis	20.9	22.9	22.8	16.0	21.3	25.6	21.7	17.3	14.9	26.3	35.1	12.5	20.5	17.5	7.4	12.5	16.7	21.4	20.9
Coryza	16.2	15.9	14.2	16.0	17.6	17.6	16.0	24.5	10.3	12.3	7.0	19.6	25.0	17.5	14.8	25.0	16.7	10.7	16.2
Ecoli infection	13.2	8.2	14.2	14.1	8.1	9.6	6.6	10.2	6.9	14.0	5.3	10.7	4.5	12.5	18.5	4.2	0.0	10.7	10.6
ND	8.3	11.6	7.1	11.5	4.4	9.6	11.3	6.1	5.7	12.3	14.0	17.9	20.5	10.0	18.5	12.5	16.7	21.4	10.0
CRD	10.6	9.9	8.1	8.3	11.8	13.6	9.4	13.3	9.2	7.0	8.8	14.3	-	12.5	11.1	4.2	5.6	-	9.9
IBD	8.1	9.3	10.2	7.7	13.2	7.2	10.4	12.2	13.8	10.5	3.5	10.7	2.3	7.5	3.7	12.5	5.6	7.1	9.1
HPS	6.4	4.0	3.6	7.1	2.2	2.4	3.8	2.0	14.9	5.3	8.8	5.4	4.5	5.0	14.8	8.3	5.6	10.7	5.4
Mycotoxicocis	3.3	4.2	3.0	5.8	5.9	4.8	3.8	3.1	3.4	1.8	-	1.8	9.1	5.0	-	8.3	-	3.6	3.9
Omphalitis	3.5	3.4	3.6	5.1	5.1	2.4	3.8	2.0	1.1	1.8	1.8	1.8	2.3	-	3.7	-	-	3.6	3.2
Ascites	2.5	3.1	3.0	3.8	2.9	2.4	3.8	2.0	8.0	1.8	3.5	1.8		2.5		8.3	16.7		3.1
Enteritis	2.7	1.1	2.5	3.2	4.4	3.2	1.9	2.0	2.3	1.8	1.8	-	2.3	-	-	4.2	-	-	2.3
IB	0.6	2.8	2.5	-	0.7	0.8	3.8	5.1	2.3	1.8	3.5	-	-	2.5	-	-	-	3.6	1.7
Typhoid	1.0	1.4	1.5	0.6	1.5		0.9	-	3.4	1.8	3.5	1.8	-	5.0	-	-	-	3.6	1.3
Heat Stress	0.6	0.3	2.0	-	0.7	-	-	-	1.1	-	-	1.8	2.3	-	7.4	-	-	-	0.7
Parasites	0.4	0.6	0.5	-	-	-	-	-	-	-	1.8	-	-	2.5	-	-	-	3.6	0.4
Vent pasting	0.4	-	-	-	-	-	0.9	-	1.1	-	-	-	6.8	-	-	-	-	-	0.3
Lameness	0.2	0.3	-	-	-	0.8	-	-	1.1	-	-	-	-	-	-	-	-	-	0.2
Pasteurella	0.4	0.3	0.5	-	-	-	-	-	0.0	1.8	-	-	0.0	-	-	-	-	-	0.2
Prolapse	0.6	0.3	-	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-	-	0.2
Brooder pnumonia	0.2	-	-	0.6	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-	0.1
Hepatitis	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aspergillosis	-	-	-	-	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-	-
Leukosis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.7	-	-
Marex	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	517	353	197	156	136	125	106	98	87	57	57	56	44	40	27	24	18	28	2126

[1] % within feed; [2] Letters do not in any case point toward commercial name of the feed except for HM = Home Mix; *Missing values 25.

Table 2. Seasonal prevalence of disease in broilers [1]

Disease	Seasons/Months				N **
	Jan-Mar	Apr-Jun	Jul-Sep*	Oct-Dec	
Coccidiosis	29.3	23.7	22.5	24.6	334
Coryza	23.0	27.9	24.7	24.4	287
E. coli infections	22.0	27.6	26.2	24.3	214
CRD	11.3	51.8	17.4	19.5	195
IBD	18.7	25.3	33.0	23.1	182
HPS	8.3	24.8	45.0	22.0	109
ND	8.5	29.2	48.1	14.1	106
Omphalitis	21.5	27.7	30.8	20.0	65
Mycotoxicosis	9.8	16.4	60.7	13.1	61
Ascites	25.9	13.8	24.1	36.2	58
Enteritis	11.4	14.3	34.3	40.0	35
IB	37.5	29.2	12.5	20.8	24
Fowl Typhoid	28.6	14.3	35.7	21.4	14
Heat Stress	0.0	44.4	55.6	0.0	9
Vent pasting	0.0	25.0	75.0	0.0	4
Pasteurella	0.0	0.0	66.7	33.3	3
Brooder pneumonia	33.3	0.0	33.3	33.3	3
Hepatitis	0.0	100.0	0.0	0.0	1
Aspergillosis	0.0	0.0	0.0	100.0	1
Total	19.8	28.1	29.2	22.9	1705

[1] % within disease; * monsoon season; ** Missing values 4.

Table 3. Seasonal prevalence of diseases in layers[1]

Disease	Seasons/Months				N *
	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	
Coccidiosis	16.3	19.2	41.3	23.1	104
ND	11.7	16.0	47.9	24.5	94
Coryza	15.1	52.8	20.8	11.3	53
E. coli infections	14.3	28.6	21.4	35.7	14
CRD/CCRD	7.7	76.9	7.7	7.7	13
Mycotoxicosis	4.8	19.0	38.1	38.1	21
Fowl Typhoid	15.4	7.7	30.8	46.2	13
Enteritis	7.7	30.8	46.2	15.4	13
IB	9.1	18.2	36.4	36.4	11
IBD	22.2	55.6	11.1	11.1	9
Parasites	25.0	12.5	25.0	37.5	8
Omphalitis	42.9	15.9	14.3	14.3	7
Prolapse	40.0	20.0	20.0	20.0	5
HPS	25.0	50.0	25.0	-	4
Lameness	25.0	50.0	25.0	-	4
Heat Stress	-	50.0	50.0	-	4
Vent pasting	-	-	100.0	-	3
Ascites	0.0	0.0	50.0	50.0	2
Pasteurella	-	-	100.0	-	1
Leukosis	-	-	-	100.0	1
Marex	-	-	-	100.0	1
Total	14.3	26.8	36.1	22.9	385

[1] % within disease; * Missing value 1.

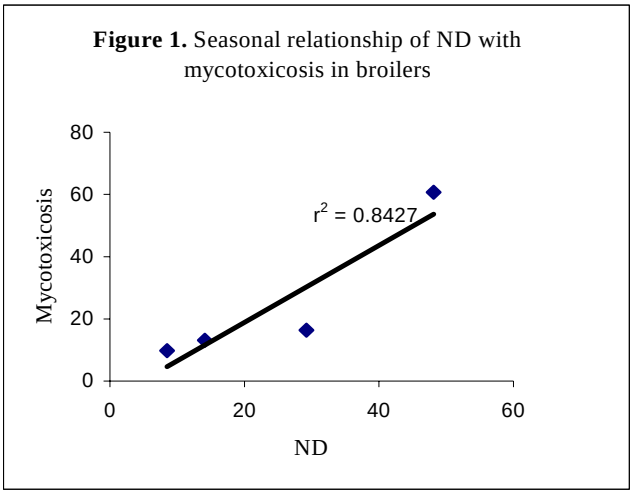

Figure 1. Seasonal relationship of ND with mycotoxicosis in broilers

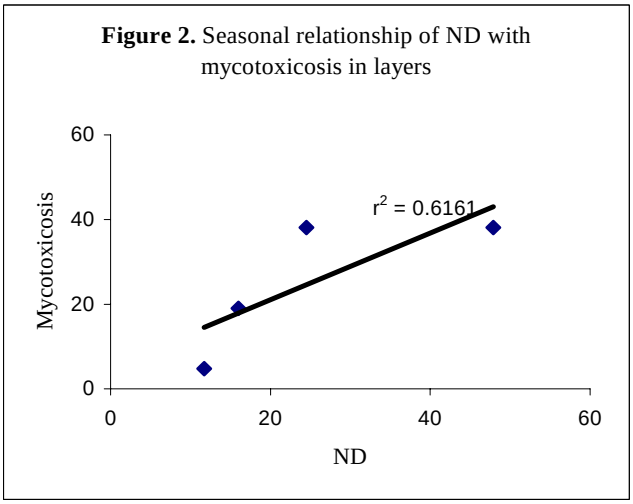

Figure 2. Seasonal relationship of ND with mycotoxicosis in layers

Contrary to broilers, the "percent within season" data (not tabulated here) indicated coccidiosis, ND, and coryza to be the three most frequently diseases during all the four seasons. The incidence of coccidiosis was 30.9, 19.4, 30.9, and 27.3% and that of ND was 19.9, 14.6, 32.4, and 26.1% during the four seasons, respectively, while incidence of coryza was noted to be 14.5, 27.2, 7.9, and 6.7%, respectively during four seasons.

Conclusion: The data presented here indicates coccidiosis, *E. coli* infections, enteritis, and mycotoxicosis as being influenced by feed label. A matter of serious concern for policy makers is that the incidence of these diseases was quite low with the home mix rations. Tabulation of data according our method enabled us to note that higher rain fall and resultant humidity during monsoon can result in higher incidence of mycotoxicosis in both broilers and layers. This in turn may result in incidence of HPS, IB, and ND during monsoon causing high correlation of mycotoxicosis with ND and IB. Though some diseases especially coccidiosis followed approximately same trend throughout the year, the period between April to September was crucial for both broilers and layers notably due to higher incidence of mycotoxicosis and respiratory diseases. However, the six months from October to March appeared to be comparatively safer period for both broilers and layers.

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