



Evaluation of Biosecurity Measures in Layer Farms in Khartoum State, Sudan

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ABSTRACT

The high susceptibility of poultry to disease outbreaks makes a comprehensive biosecurity technology a necessary practice in poultry farms to protect the farms from both intentional and unintentional threats from biological agents. Therefore this study evaluated the biosecurity measures in layer farms in Khartoum State, make comparison between the biosecurity practices carried in close system and open system followed in those and measures the cost of implementing biosecurity on layer farms. A total of 45 layer farms (33 closed and 12 open systems) were chosen from Khartoum, Khartoum North and Omdurman. Data were collected by using structured questionnaire. The data were analyzed using descriptive statistics method. The Results from the survey showed that open system farms tend to have a less secure boundary than that of the close system farms. The results was found that 45(100%) of the farms surveyed have a fence, and 37(82.2%) of the farms have disinfectants in gate, only 16(35.6%) of the farms have a routine pest control, The study show only (8.9%) of the farms share equipments, and 9(20%) of the farms surveyed no cleaning the water system 4(12.1%) of the farms were close system compared with 5(41.7%) of the farms were open system. The results, also, showed that 40(88.9%) of the farms isolation of diseased birds. All 45 (100%) of the surveyed farms had record keeping, and 31(68.9%) of the farms surveyed had no training programs.

Keywords : Biosecurity measures, Layer Farms, Khartoum State, Sudan

INTRODUCTION

Poultry represents an important sector in animal production, with small commercial and backyard systems which are often extensive dominating the industry especially in the developing countries (Conan *et al.*, 2012).

The Sudanese poultry industry is located principally in Khartoum State which is the source for 90% of the country's production. The total poultry population in Sudan is estimated at 45 million. The commercial sector comprises 30 million chickens of which 20 million are layer hens. It contributes 45% of the agricultural income of the State, whilst the latter (agricultural income) contributes 7% of the total income (Anon, 2005).

Common infectious diseases of poultry such as coccidiosis, infectious laryngotracheitis and Marek's disease pose constant challenges to poultry producers and can chronically lower flock performance.

In September 2006, Sudan joined the list of nations seeing a resurgence of bird deaths due to H5N1. The disease had severe impacts on the poultry industry and campaigns for awareness promotion and improvement of the biosecurity and restructuring of poultry production was launched (Ali *et al.*, 2007).

Biosecurity is a set of preventive measures designed to reduce the risk of transmission of infectious diseases especially in organized poultry sector throughout the world (Newell *et al.*, 2011). Biosecurity practices designed to minimize the transmission of infectious diseases between and within farms are an important component of modern flock health programs (Dorea *et al.*, 2010). Biosecurity is simply described to consist of three fundamental principles: Segregation Cleaning and Disinfection (FAO, 2008). Abdelqader *et al.*, (2007) stated that poor disease control strategies and low or inadequate biosecurity measures result in high levels of baseline mortality due to infectious diseases. The movement of farm personnel was positively associated with the probability of farm infection as highlighted by McQuiston *et al.*, (2005). Better farm biosecurity can improve overall flock health, cut the costs of disease treatment, reduce losses and improve farm profitability. A good biosecurity status requires investments in prevention. Recently a study conducted in a broiler farms in Sudan to evaluate the biosecurity measures (Mahmoud *et al.*, 2013).

Therefore the objectives of the present study are:

- To evaluate the Biosecurity measures in layer farms In Khartoum State.
- To compare the biosecurity practices between the close system and open system farms.

MATERIAL AND METHODS

Study area

The study was conducted in Khartoum State because it has the largest poultry population in the country. Khartoum is the capital of Sudan, composed of seven localities. It extended between latitudes 15.08 and 16.45 North and longitudes 31.36 and 34, 25 East. The study was carried out in Khartoum State namely: Khartoum, Khartoum north and Omdurman

Questionnaire survey

Data was collected by means of a questionnaire; respondents were farm owners, farm managers and veterinarians. The questionnaire designed with different types of actions related to biosecurity at the farm level. A total of 45 layer farms (33 close system and 12 open system) in 16 different production areas were surveyed.

RESULT AND DISCUSSION

Location and distance to nearest farms

Results showed that out of 45 farms 27(60%) of the surveyed farms far from main road. The distance between farms less than 500 m in 23(51.1%) farms out of the 45 surveyed farms (Table, 1).

Level of biosecurity at farm gate

All farms (100%) had a fence, out of 45 farms 12(26.7%) have parking area and 37(82.2%) farms had disinfectants in gate. But only 7(15.6%) farms used warning signs (Table, 2)

Level of biosecurity between the farm gate and the shed

Out of 45 farms 24(53.3%) the distance between houses less than 20 m. Only 16(35.6%) farms have

a routine pest control, 36(80%) disposal litter and manure by selling (Table, 3).

Level of biosecurity at the shed

Out of 45 farms, 6(13.3%) had no foot path, Only 4 (8.9%) farms share equipments, 39(86.7%) of the surveyed farms did collection of the dead birds once daily. While, dead bird disposal method by burning was found in 45(100%) (Table, 4).

Biosecurity measures related to isolation

Fourty (88.9%) of the farms were isolated the diseased birds. There was no quarantine area in 17 (37.8%) farms (Table, 5).

Water sanitation and water system cleaning

Nine (20%) of the farms did not clean the water system. Absence of treating the source of water was found in only 12(26.7%) farms(Table, 6).

Chicken origin

The results showed different sources of the chicken, Out of 45 farms 40(88.9%) from commercial farms (Table, 7).

Veterinary supervision and training of staff

All farms (100%) had records, and only 2(4.4%) farms had veterinary supervision. Moreover, 31(68.9%) farms had no training program.(Table, 8).

Source of feeding and protection feed stores

Only 16 (35.6%) farms, the feed obtained from companies, and 36(80%) farms had protection feed stores (Table, 9).

Vaccination program

Out of 45 farms 40(88.9%) had appropriate vaccination program, Table, 10).

Table 1: Location and distance of farm to the nearest farms

Item	Frequency	Percentage (%)	Closed (%)	Open (%)
location of farm				
Near main road	18	40	11(33.3)	7(58.3)
Far from main road	27	60	22(66.7)	5(41.7)
Distance to nearest farm				
Less than 500 m	23	51.1	14(42.4)	9(75)
More than 500 m	22	48.9	19(57.6)	3(25)

Table 2: Level of biosecurity at farm gate

Item	Frequency	Percentage (%)	Closed (%)	Open (%)
Presence of fence				

Yes	45	100	33(100)	12(100)
No	0	0	0(0)	0(0)
Presence of parking area				
Yes	12	26.7	11(33.3)	1(8.33)
No	33	73.3	22(66.7)	11(91.67)
Water washing in gate				
Yes	37	82.2	29(87.8)	8(66.7)
No	8	17.8	4(12.2)	4(33.3)
Warning signs				
Yes	7	15.6	7(21.2)	0(0)
No	38	84.4	26(78.8)	12(100)
Provide visitors with protective clothing and boots				
Yes	8	17.8	8(24.2)	0(0)
No	37	82.2	25(75.8)	12(100)

Table 3: Level of biosecurity between the farm gate and the shed

Item	Frequency	Percentage (%)	Closed (%)	Open (%)
Distance between houses				
Less than 20 m	24	53.3	17(51.5)	7(58.3)
More than 20 m	21	46.7	16(48.5)	5(41.7)
Pest control				
As routine	16	35.6	14(42.4)	2(16.7)
After out break	29	64.4	19(57.6)	10(83.3)
Litter and manure disposal				
Burning				
Use as fertilizer	4	8.9	2(6.00)	2(16.7)
Accumulate at back yard	5	11.1	4(12.2)	1(8.3)
Sale	36	80	27(81.8)	9(75)
Structure of farm design				
Well	37	82.2	29(87.8)	8(66.7)
Not well	8	17.8	4(12.2)	4(33.3)

Table 4: Level of biosecurity at the shed

Item	Frequency	Percentage (%)	Closed (%)	Open (%)
Using of disinfectants in foot path				
Yes	39	86.7	30(90.9)	9(75)
No	6	13.3	3(9.1)	3(25)
Decontamination of equipments				
As routine	45	100	33(100)	12(100)
After out break	0	0	0(0)	0(0)
Equipments share				
Yes	4	8.9	3(9.1)	1(8.3)
No	41	91.1	33(90.9)	11(91.7)
Collection of dead birds				
Once daily	39	86.7	28(84.8)	11(91.7)
Twice daily	6	13.3	5(15.2)	1(8.3)
Dead bird disposal method				
Burning	45	100	33(100)	12(100)
Left thrown away	0	0	0(0)	0(0)
Production personnel wearing protective clothing				
Yes	27	60	23(69.7)	4(33.3)
No	18	40	10(30.3)	8(66.7)

Table 5: Biosecurity measures related to isolation

Item	Frequency	Percentage (%)	Closed (%)	Open (%)
Isolation of diseased birds				
Yes	40	88.9	29(87.9)	11(91.7)
No	5	11.1	4(12.1)	1(8.3)
Have different species				
Yes	23	51.1	16(48.5)	7(58.3)
No	22	48.9	17(51.5)	5(41.7)
Presence of quarantine area				
Yes	28	62.2	21(63.6)	7(58.3)
No	17	37.8	12(36.4)	5(41.7)

Table 6: Water sanitation and water system cleaning.

Item	Frequency	Percentage (%)	Closed (%)	Open (%)
The origin of chicks				
Commercial farms	40	88.9	30(90.9)	10(83.3)
Hatcheries within farms	5	11.1	3(9.1)	2(16.7)
Disease affected the farm				
IB	4	8.9	3(9.1)	1(8.3)
ND	10	22.2	7(21.2)	3(25)
Others	20	44.5	12(36.4)	8(66.7)
None	11	24.4	11(33.3)	0(0)

Table 7: Chicken origin.

Item	Frequency	Percentage (%)	Closed (%)	Open (%)
Cleaning of water system after				
1-7 day	2	4.5	0(0)	2(16.7)
1-4 weeks	20	44.4	19(57.6)	1(8.3)
Above	14	31.1	10(30.3)	4(33.3)
No Cleaning	9	20	4(12.1)	5(41.7)
Source of water treating				
Yes	33	73.3	25(75.8)	8(66.7)
No	12	26.7	8(24.2)	4(33.3)

Table 8: Veterinary supervision and training of staff on biosecurity and record keeping.

Item	Frequency	Percentage (%)	Closed (%)	Open (%)
Veterinary Supervision				
Yes	43	95.6	33(100)	10(83.3)
No	2	4.4	0(0)	2(16.7)
Record keeping				
Yes	45	100	33(100)	12(100)
No	0	0(0)	0(0)	0(0)
Training of staff on biosecurity				
Yes	14	31.1	13(39.4)	1(8.3)
No	31	68.9	20(60.6)	11(91.7)

Table 9: Source of feeding and protection feed stores

Item	Frequency	Percentage (%)	Closed (%)	Open (%)
Source of feeding:				
Within farm	29	64.4	26(78.8)	3(25)
From companies	16	35.6	7(21.2)	9(75)
Protection of feed stores:				
Yes	36	80	32(97)	4(33.3)
No	9	20	1(3)	8(66.7)

Table 10: Vaccination program

Item	Frequency	Percentage (%)	Closed (%)	Open (%)
Vaccination program:				
Yes	40	88.9	31(93.9)	9(75)
No	5	11.1	2(6.1)	3(25)

Results from the survey showed that open system farms tend to have a less secure boundary than that of the close system farms, Similar findings were also obtained by (Mahmoud *et al.*, 2013) who evaluated biosecurity measures on broiler farms in Khartoum and stated that closed system has a high level of biosecurity measures than that found in open system.

The results showed that farm fence was available for all farms in both close and open systems. This results were in disagreement with (Wang *et al.*, 2015) who reported most farms in poultry production clusters do not have fences, gates, or barriers. In (40%) of the farms did not use protective clothing for workers and just (17.8%) farms provide visitors with protective clothing and boots.

According to (Ambarawati *et al.*, 2011) 50% of layer farms do not have a designated parking area outside the farm, The study revealed that there was a foot bath at the farm entrance which was higher than that found by (Ambarawati *et al.*, 2011). Ajewole *et al.*, (2014) the survey results showed (77.5%) burning the dead bird, (100%) isolation disease birds, (80%) cleaning the feeder and the water trough and (75%) have a good vaccinated program; this was similar to our observations. Our result was also in agreement with Maduka *et al.*, (2016) who recorded good feed storage in (94%) farms and all farms have veterinary supervision.

As seen from the results, (80%) of the farms disposal litter and manure by selling which is disagree with Muiru, (2010) who found that most of the farmers (65%) used manure for crop production and for feeding own dairy cattle while (15%) and (20%) sold manure.

Marcelo (2010) stated that the first step for setting up an efficient biosecurity program is the proper location of the poultry farm. Knowing that air borne transmission of pathogens is limited by distance, the farm should to be located in an isolated area, as far as possible from any other poultry

operation. It also should be away from the major roads that are used for transportation of poultry and from water ways used by migratory birds. The result showed that (60%) of the farms far from main road and the distance between layer farm less than 500 m in (51.1%) farms.

Only (35.6%) of the farms had a routine pest control, Marcelo (2010) stated that the design of the poultry houses should be, to the extent possible, without access points for rodents, wild birds, insects and stray animals. As rodents are the major vectors and reservoirs of *Salmonella* spp. for poultry, consequently the biosecurity program must involve their control.

Record keeping is very important to assist early detection of poultry health issues and the response to any biosecurity breach (Anon, 2010). The same observation was obtained from this study.

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