

Microbiological Quality Of Poultry Food And Water Used In Chicken Breeding Farm In The Peri-Urban Area Of Bamako, Mali

Toure H.¹, Maiga O. S.¹, Samaké M.³, Touré O.¹, Traoré A.¹, Touré I.¹, Traoré A.S.¹, Kéita S.¹, Maiga A.¹, Coulibaly M.¹, Camara M.¹, Babana A.², Traoré M.², Ouattara M.², & Yattara I.I.²

1. Agence Nationale de la Sécurité Sanitaire Des Aliments (ANSSA), Bamako/Mali
2. Faculté des Sciences et Techniques (FST), Laboratoire de microbiologie de sols, Bamako/Mali
3. Centre National de la Recherche Scientifique et Technologique, CNRST

ABSTRACT

The peri-urban area of Bamako contains many chicken breeding production farms. The conditions of these farms can constitute risk factors. The insufficiency of scientific data relating to the environment of those farms and to the various inputs makes it difficult to determine their real impact on the sanitary quality of food. Our study aimed to assess the microbiological quality of the food and water used in 15 farms in the peri-urban area of Bamako. The results showed that all of the analyzed water samples had more or less aflatoxin content with a maximum value of 12.2 ppb observed on the Bamako-Tienfala axis. The presence of mould was also detected in 46.6% of the water samples analyzed with a higher frequency in well water, i.e. 26.66%. Salmonella contamination of water has been observed in samples taken on all axes, with a strong dominance on the Bamako-Kati axis. For poultry foods the samples taken from farms on the Bamako-Kassela and Bamako-Siby axes were positive. Poultry food and water used in chicken breeding production are risk factors identified in the production system.

Keywords: chicken breeding, food source, risk factors, microbiological quality, peri-urban area, Bamako, Mali

INTRODUCTION

Chicken breeding is an increasingly common activity in Mali, especially in peri-urban areas. That of Bamako contains the greatest number. Various sources of poultry feed, water, day-old chicks are used in the broiler production system. Various sources of poultry feed and water are used in the chicken breeding production system. In chicken breeding farming framework, contamination is possible at all levels of the production chain.

A study carried on in 2014 by ANSSA on fresh and grilled poultry meat consumed in the Bamako [1]. highlighted shortcomings in relation to its microbiological quality. Diarra et al. (2017) studying the contamination profile of food intended for animals sold in urban and peri-urban areas of Bamako [2]. have shown contamination associated with both salmonella and mould (mycotoxins). The National Food Safety Agency in Mali does not have sufficient data on the nature, conditions of use and sanitary quality of poultry feed and water used chicken breeding production farms. Hence the need for ANSSA to conduct this study.

MATERIAL AND METHODS

Site

This study was carried out in the peri-urban area of Bamako. It concerned poultry food and water used in the chicken breeding production farms. The number of farms surveyed by axis was established according to the following criteria: the current activity in the poultry at the time of the survey, the availability of chicks from 1 to 15 days, the poultry which number is comprised between 500 to 5000 subjects.

The samples were taken from the 5 road axes which constitute the peri-urban area of Bamako, namely:

- Axis1 : Bamako -Tienfala
- Axis 2 : Bamako -Kassela
- Axis 3: Bamako- Kati
- Axis 4: Bamako - Sanankoroba
- Axis 5: Bamako - Siby



Material

The study focused on poultry food and water used in chicken breeding production farms. A sample of food and water was taken from 15 farms according to the resources available.

Methods Sampling

Thirty samples were taken from each chicken breeding production farm: fifteen samples of poultry food weighing 500g each and fifteen samples of one liter of water. The food samples were taken in sterile bags and sent to the laboratory in coolers, while respecting the standards laid down in the matter. The water samples were taken in sterile bottles and transported in coolers at four degrees Celsius to the laboratory.

Laboratory analyzes

The analyzes focused on water and food for the detection of microorganisms. They focused mainly on the identification of Salmonella in waters according to the NFEN ISO6579 standard [3]. and in poultry feed according to the standard of the French Standardization Agency (AFNOR V 08-052: 1997) [4].

Detection of mycotoxins and determination of the total Aflatoxin content

The total aflatoxin content was determined in the Laboratory of phytopathology of ICRISAT [5]. from the food samples used. The ELISA technique based on the competitive enzyme immunoassay method is used.

RESULTATS

Field investigation

The main focus on the conditions of the chicken breeding production farms consisted in better understanding the extrinsic factors: the state of the henhouses or buildings, vectors and the immediate environment, in which the production system evolves.

The results indicate that 73.3% (11/15) of the henhouses with a closed roof and 66.7% of these henhouses are well maintained. The rest of the henhouses are in a degraded state with unsanitary conditions which can be sources or risk factors for the production of broilers.

Poultry food and water sample test results

Industrial foods made in Mali (Grand Moulin du Mali) and those from Holland and Belgium are generally the most used in chicken breeding production farms. Corn, enriched corn bran (concentrated vitamins, minerals, amino acids) and / or mixed (fish + cake + shellfish) are the main elements of chicken foods.

Table 1: Water supply source in chicken breeding farms

Source of water supply	AXIS 1	AXIS 2	AXIS 3	AXIS 4	AXIS 5	TOTAL
Well	2	1	2	3	0	8
Drilling	1	0	1	0	3	5
Drilling and well	0	1	0	0	0	1
Drilling	0	1	0	0	0	1
Total	3	3	3	3	3	15

Water sources are consisted of wells (53.3%), boreholes (46.7%). However, on Axis 5 they only consist of boreholes.

The water sampled was subjected to physico-chemical and microbiological analyzes.

Table 2: Analysis of the quality of the water used in chicken breeding production farms.

Axe	Chicken farm	Source of water supply	Mould in water	Aflatoxin content
Axis 1 : Bamako-Tienfala	BT1	Wells	Absence	1.0
	BT2	Wells	Presence	3.5
	BT3	Drillings	Presence	1.2
Axis 2 : Bamako-Kassela	Bkas1	Wells	Presence	0.7
	Bkas2	Wells and Drillings	Presence	12.2
	Bkas3	Drillings	Absence	1.5
Axis 3 : Bamako-Kati	Bkat1	Wells	Presence	0.9
	Bkat2	Wells	Presence	5.6
	Bkat3	Wells	Absence	6.1
Axis 4 : Bamako-Sanankoroba	Bsa1	Wells	Absence	0.1
	BSa2	Drillings	Absence	0.3
	Bsa3	Wells	Absence	0.2
Axis 5 : Bamako-Siby	Bsi1	Drillings	Absence	0.5
	Bsi2	Drillings	Presence	0.2
	Bs3	Drillings	Absence	0.3

Table 2 shows that all samples analyzed have more or less aflatoxin content. The highest value of 12.2 ppb is found in the samples taken on the Bamako - Tienfala axis in the BT3 farm. The presence of mould is detected in 46.6% of water samples analyzed with a higher frequency in well water, i.e. 26.66%.

Table 3: Qualitative analysis of the waters used in chicken breeding production farms.

Axis	Chicken farms	Source of water supply	Salmonella in water	Mould in water
Axis 1 : Bamako-Tienfala	BT1	Wells	Absence	Absence
	BT2	Wells	Presence	Presence
	BT3	Drillings	Absence	Presence
Axis 2 : Bamako-Kassela	BKas1	Wells	Presence	Presence
	BKas2	Wells and Drillings	Absence	Presence
	BKas3	Drillings	Absence	Absence
Axis 3 : Bamako-Kati	BKat1	Well	Presence	Presence
	BKat2	Wells	Presence	Presence
	BKat3	Wells	Presence	Absence
Axis 4 : Bamako-Sanankoroba	BSa1	Wells	Absence	Absence
	BSa2	Drillings	Absence	Absence
	BSa3	Wells	Presence	Absence
Axis 5 : Bamako-Siby	BSi1	Drillings	Absence	Absence
	BSi2	Drillings	Presence	Presence
	BS3	Drillings	Absence	Absence

The analysis of the Table 3 shows that contamination of waters by Salmonella is present in samples taken from all axes. It is more accentuated on the Bamako-Kati axis where the waters samples of all chicken breeding production farms were contaminated.

Moulds have been found in six farms and they are dominant in farms that heavily use nipples such as BT2 and BT3. The presence of moulds in some boreholes has also been detected.

Table 4: Bacteriological analysis of poultry foods from chicken breeding production farms

Axis	Chicken farms	Salmonella in poultry food
Axis 1 : Bamako-Tienfala	BT1	Absence
	BT2	Absence
	BT3	Absence
Axis 2 : Bamako-Kassela	BKas1	Absence
	BKas2	Presence
	BKas3	Absence
Axis 3 : Bamako-Kati	BKa1	SA
	BKa2	SA
	BKa3	SA
Axis 4 : Bamako-Sanankoroba	BSa1	Absence
	BSa2	Absence
	BSa3	Absence
Axis 5 : Bamako-Siby	BSi1	Absence
	BSi2	Absence
	BSi3	Presence

SA: samples not yet analyzed

Regarding the detection of Salmonella in poultry foods, the samples taken in chicken breeding production farms on the Bamako-Kassela (BKas2) and Bamako-Siby (BSi3) axes were positive.

DISCUSSION

The condition of the farms, the quality of water sources, the presence of waste, pests, disease vectors and the frequency of moulds are the risk factors in chicken breeding production farms. The insufficiency of scientific data relating to the environment of those farms and to the various inputs makes it difficult to determine their real impact on the sanitary quality of food. The ineffectiveness of the pest control system in chicken breeding production farms, insufficient scientific data on certain factors related to the intrinsic environment of the farm; the ineffectiveness of the management mechanisms for these risk factors can impact the quality of broiler production.

Laboratory analyzes have shown that microorganisms (Salmonella and mould) and mycotoxins (Aflatoxins) due to their presence and content constitute dangers identified in the production system of broilers. Our study showed the presence of mould in 46.6% of the water samples analyzed with a higher frequency in well water, 26.66%. The presence of Salmonella in the poultry feed was established in the samples taken from the farms on the Bamako-Kassela (BKas2) and Bamako-Siby (BSi3) axes. This is confirmed by Danan et al. (2010), in the study on the surveillance of salmonella isolated from the food chain in France [6], which revealed the presence of Salmonella spp in poultry food.

Salmonella contamination in chicken breeding production farms could be explained by various factors:

1. Material introduced from one building to another during backwashing (Van de Giessen et al, 1996; Gregory et al, 1997) [7].
2. Immediate environment of the henhouse and surrounding farms (Jacobs-Reitsma et al, (1997) [8].
3. Vectors (insects, rodents) Van de Giessen et al, (1998);
4. Humans (breeders or other people entering in the buildings) Van de Giessen et al, (1998) [10];

Our study which was carried out under the same conditions showed that contamination in chicken breeding production farms is effective. Regarding the contamination factors in chicken breeding production farms, our study showed that well water is the most incriminated. This is consistent with studies led by {Shane, (1992) and Chaveerach et al, (2002) on the role of drinking water in salmonella contamination [11].

The effects of mycotoxins essentially depend on the doses ingested, the number of toxins present, the duration and the health status of the man or animal considered. The values of the total aflatoxin levels obtained varied between 0.1 to 12.2ppb. Only one sample of food from the Bamako-Tienfala axis contained aflatoxin at the rate of 12.2ppb. This is higher than the European standard which is 4ppb and the standard accepted in the Codex Alimentarius which is 10ppb.

In view of the results obtained in the 15 chicken breeding production farms concerned by the microbiological analyzes of poultry foods and water used in production, it turns out that the conditions of production of broilers are not satisfactory.

CONCLUSION

This study, which focused on the determination of the microbiological quality of poultry food and the water used in chicken breeding production farms, highlighted two determining parameters of the sanitary quality of broilers produced in 15 farms located in Bamako and its outskirts area.

Laboratory analyzes have shown that poultry food and water used in chicken breeding production farms due to the frequency of their contamination and their content of mycotoxins, are risk factors identified in the production system.

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