INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 11, No. 1, p. 249-256, 2017

RESEARCH PAPER OPEN ACCESS

Characterization of the ante-mortem transportation, capture chase and waiting time of indigenous chicken reared under traditional system in Benin

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Key words: Chicken welfare, Transportation, Capture chase, Feed withdrawal, Benin

http://dx.doi.org/10.12692/ijb/11.1.249-256 Article published on July 28, 2017

Abstract

Understand animal pre-slaughter conditions, is very important to prevent stress and its subsequent detrimental effects on meat quality. The current study aims to clear up the *ante-mortem* transportation, capture chase and waiting time conditions of local chicken. A survey was carried out on 50 poultry traders or sellers and 50 breeders in the townships of Abomey-Calavi, Allada, Zè, Toffo and Ouidah. Data on the process of these factors and on birds handling were collected. The survey revealed that from a township to the other, conditions are almost similar. Chickens were transported mainly in the morning by car, motorcycle and bicycle or simply by tradesmen walking on a distance of 7.10 to 59.72 km during 33 to 169 minutes. During the transportation, they were put in cages, in baskets or simply attached in clusters and hung up to a support. The two legs of each bird were tied together and they were feed and watered before the transportation or on arrival by some. Cases of accident, disease and mortality occurred. The capture chase took place every time outdoor or in a fence in Abomey-Calavi and outdoor, in a fence or in a house in the other localities and involved 1 to 3 persons. It lasted 8 to 19.1 minutes. Chickens caught were immediately slaughtered or put in cages or under baskets before. During the waiting time, feed withdrawal is not observed. Globally, the *ante-mortem* conditions of local chicken in these localities didn't respect animal welfare and could produce stress.

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Introduction

Animal welfare is a preoccupying condition in the sectors of breeding and of meat production. In several countries in the world, the subject benefits of laws and regulations which are to be respected from production to animal slaughter in order to guarantee first quietude and animal life and second consumers' expectations. For example, the French law called "nature" of July 10, 1976 stipulates that "all animal being a sensitive being must be placed by its owner in compatible conditions with the biological imperatives of its species. Also, according to the articles 214-1 and 214-3 of the French Rural Code, it is prohibited to exercise some "bad treatments towards breeding animal as well as towards tamed wild animals or held in captivity" and necessary to avoid them "some sufferings during handling related to breeding techniques, penning, transportation and slaughter" (Versier *et al*., 2007).

Besides, the factors that compromise animal's welfare in several countries are known and their influences on production parameters and meat quality are determined. For instance, among the *ante-mortem* factors that influence meat quality, are the catching and the loading chickens in cages, the putting them in transportation vehicle, the transportation itself and climate conditions from inside and outside as well as the time of destination (Radu *et al*., 2012). Moreover, research is already focusing on how to control carcass and meat quality changings due to pre-slaughter factors across America, Europe, Asia and North Africa (González *et al*., 2007; Perai *et al*., 2014; Zhang *et al*., 2014). Meanwhile the *ante-mortem* conditions of the breeding animals are unknown in West Africa in general and in Benin particular.

This study aims to clarify the *ante-mortem* transportation, capture chase and the waiting time conditions of the local chicken of traditional system of Benin in order to lunch impacts studies and the local legal dispositions thinking on the welfare of these birds.

Materials and methods

Area of study

The study was carried out in the Department of Atlantic of Benin precisely in the townships of Abomey-Calavi, Allada, Zè, Toffo and Ouidah. This area benefits from climatic conditions of subequatorial type characterized by two rainy seasons with an uneven spatial and temporal repartition of rainfall (the major, from April to July and the minor, from September to November). These seasons are separated by two dry seasons. Average rainfall is close to 1200 mm per year. The monthly average temperatures vary between 27°C and 31°C. The relative air humidity fluctuates between 65% from January to March and 97% from June to July.

Data collecting

Fifty local chicken traders or sellers were interviewed on the transportation and fifty breeders of the traditional breeding system on the capture chase and the waiting time before slaughter conditions. The method used consisted to appeal to their memory to answer questions. Statements are verified by observation when operations were doing and photos are taken in this case.

Statistical analysis

Data collected were analyzed using the software SAS (Statistical Analysis System, 2006). The Proc freq procedure was used to calculate frequencies. They were compared between townships by the Chi-Square test. The bilateral Z test was used to perform pairwise frequencies comparisons. Distance and duration means were calculated with the Proc means procedure. The General Linear Model was used for the variance analysis and the significance of the locality effect was determined by the F-test. Means pairwise comparisons were performed using the t-test.

Results

Techniques for preparation and transportation of local chickens

Birds to be transported are prior restrained 24 hours or 48 hours before in cages, henhouses or simply by "legs attached" technics. Restraining 24 hours before slaughter is more practiced ($p < 0.01$) in Zè, Toffo, Allada and Ouidah than in Abomey-Calavi.

Those of 48 hours before and of the transportation day were reported in similar frequencies. The main technique used to restrain chickens was to tie together the two legs of each one (Fig. 1).

In all the districts, transportation mainly took place in the morning. The transportation means used varied according to the township. Cars (Fig. 2a) are more commonly used in Abomey-Calavi (81.82%) and Allada (50%) than in the other areas (P <0.01). Outside this locality, motorcycles (Fig. 2b) are frequently used in the order of 90% in Allada, Toffo and Zè and of 80% in Ouidah. Apart from these two means, some sellers met in Ouidah were transporting birds by bicycle or simply kept them themselves while walking (Fig. 2c). During transportation, chickens are put in cages, baskets or attached in clusters and hung up to a support (Fig. 2). The use of cages is more frequent in Abomey-Calavi (P <0.001). Baskets were more used in Ouidah, Allada and Zè (P <0.05).

Table 1. Density, distance and duration during local chicken's pre-slaughter transportation, capture chasse and waiting time.

Variable		Abomey-Calavi		Allada		Ouidah		Toffo		Zè		ANOVA
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Transportation	Density in the container	52.50a	19.75	46.25a	20.65	19.55b	5.07	52.50a	21.38	38.33a	8.29	***
	Distance (km)	59.72a	28.01	22.70b	24.55	7.10b	11.42	13.90b	6.78	16.5b	7.30	***
	Duration (minutes)	169.09a	56.16	46.5b	34.24	32.77b	18.04	50.00b	29.24	58.5b	19.30	***
Capture chasse	Duration (minutes)	19.10a	9.15	10abc	6.39	14.8ab	2.25	8.00c	3.84	8.00c	2.19	***
	Waiting time length (hours)	8.37a	7.65	10.5a	6.97	15.00a	10.46	11.21a	4.97	11.25a	4.19	NS

NS : P > 0.05 ; *** : P < 0.001 ; SD : Standard Deviation

Means of the same line followed by different letters differ significantly on the threshold of 5%.

The number of chickens in baskets and cages varied from 19 to 53 depending on their capacity (Table 1). The method of "attached leg" and grouping in clusters is more practiced in Toffo, Tori, Zè and Allada (P <0.001). The disposition of chickens in the "upside down" position during transportation is less practiced in Abomey-Calavi than in the other localities (p <0.01).

Chickens are not mostly protected against wind, sunshine and heat during the way.

However, some assume that their exposure to air during the transit is a means of protecting them from heat stroke. Moreover, transportation distance and duration varied according to the localities.

Table 2. Feeding and watering of local chicken during pre-slaughter transportation.

Variable		Abomey-Calavi		Allada		Ouidah		Toffo		Zè		Chi-Square
		%	CI	%	CI	%	CI	%	CI	%	CI	
Feeding	Yes	100.00a	0.00	90.00ab	18.59	60.00b	30.36	90.00ab	18.59	100.00a	0.00	*
Feeding moment	Before transit	36.36c	28.43	66.67b	30.80	100.00a	0.00	88.90ab	20.52	70.00ab	28.40	*
	During transit	9.09a	16.99	33.33a	30.80	0.00a	0.00	0.00a	0.00	10.00a	18.59	NS
	On arrival	63.34a	28.48	22.22a	27.16	50.00a	40.01	77.78a	27.16	70.00a	28.40	NS
Food	Akassa	72.73a	26.32	66.67a	30.80	16.67b	29.82	88.89a	20.53	90.00a	18.59	*
	Maïze	0.00b	0.00	55.56a	32.46	83.33a	29.82	44.44a	32.46	50.00a	30.99	*
	Kitchen scraps	36.36a	28.43	11.11a	20.53	16.67a	29.82	44.44a	32.46	0.00a	0.00	NS
	Maïze bran	54.55a	29.43	55.56a	32.46	50.00a	40.01	22.22a	27.16	40.00a	30.36	NS
watering	Yes	90.91a	16.99	60.00a	30.36	40.00a	30.36	80.00a	24.79	90.00a	18.59	NS
Watering moment	Before transit	20.00b	24.79	33.33b	37.72	100.00a	0.00	87.50a	22.92	77.78a	27.16	**
	During transit	10.00ab	18.59	50.00a	40.01	0.00b	0.00	0.00b	0.00	0.00b	0.00	*
	On arrival	80.00a	24.79	33.33a	37.72	75.00a	42.44	87.50a	22.92	66.67a	30.80	NS

NS : P > 0.05 ; * : P < 0.05 ; ** : P < 0.01 ; % : Percentage ; CI : Confidence Interval

Frequencies of the same line followed by different letters differ significantly on the threshold of 5%.

The distance varied from 7.10 km to 59.72 km and the duration from 33 minutes to 169 minutes. The greatest distances and durations were reported by traders and sellers of Abomey-Calavi (Table 1).

Feeding, watering and prophylaxis during local chicken's transportation

During the transportation, some people fed and watered birds. Foods distributed were maize, maize bran, kitchen scraps and "akassa".

In Abomey-Calavi, maize was practically not used and in Ouidah, "akassa" was less used (Table 2). Apart from common foods registered, it was noted the maize bran mixed with fishmeal in Ze, rice in Toffo, mill offal and corn grain in Abomey-Calavi. Foods were given before and after transportation and rarely during the process. Some transporters didn't water birds before, during and after transportation while others did it before transportation (20-100%) and on arrival (66-80%).

Table 3. Prophylactic measures, accidents, diseases and death during local chicken's pre-slaughter transportation.

Variable		Abomey-Calavi		Allada		Ouidah		Toffo		Zè		Chi-Square
		%	CI	%	CI	%	CI	%	CI	%	CI	
Medicine		27.27a	26.32	10.00a	18.59	0.00a	0.00	20.00a	24.79	0.00a	0.00	NS
Transportation accidents		100.00a	0.00	90.00ab	18.59	50.00b	30.99	44.44b	32.46	60.00b	30.36	*
Types of accidents	Pecking	9.09a	16.99	0.00a	0.00	0.00a	0.00	0.00a	0.00	0.00a	0.00	NS
	Choking	63.64a	28.43	55.56a	32.46	80.00a	35.06	100.00a	0.00	50.00a	40.01	NS
	Fracture	0.00b	0.00	0.00b	0.00	80.00a	35.06	0.00b	0.00	0.00b	0.00	***
Diseases		27.27a	26.32	55.56a	32.46	0.00a	0.00	25.00a	42.44	0.00a	0.00	NS
Death		45.45b	29.43	100.00a	0.00	80.00ab	35.06	100.00a	0.00	100.00a	0.00	*

Chickens also sometimes benefited from prophylactic measures (Table 3). The oxytetracycline in capsules was the medicine used just before transportation or on arrival. This product was given to chickens just before the trip in Toffo and Allada while administered on arrival in Abomey-Calavi.

Accidents, diseases and deaths during local chicken's transportation

Accidents were sometimes recorded during transportation. They usually occurred with over 90% of transporters in Abomey-Calavi and Allada. The frequencies were relatively lower ($P < 0.05$) in the other areas (60% in Ze, 50% in Ouidah and 44.44% in Toffo). Feather pecking, choking and diseases were similarly reported (Table 3). Mortalities were less evoked in Abomey-Calavi than in the other localities. Fractures were the last type of accident noted. This last one was reported only in Ouidah. The rate of each type of incident (accident, disease or mortality) that occurred during the three months preceding the survey was estimated by the respondents. In Abomey-Calavi, 1% of feather pecking was recorded and 2.5% of fracture was recorded in Ouidah.

Morbidities varied from 0 to 5% and mortalities from 1.25% to 3.66% in the localities. Choking varied from 2 to 6.75% and the highest rates were recorded in Allada and Toffo.

Ante-mortem capture chase process of local chicken

Chickens are chased and captured in the morning, at the evening or at every times of the day. The number of respondents recorded by chase moment was identical for the five townships. The number of people involved in the chase varied from 1 to 3 and was sometimes beyond. It is practiced outdoor or in a fence in Abomey-Calavi and outdoor, in a fence or in a house in the other localities. Its duration varied from 8 minutes to 19.1 minutes ($P < 0.001$). The shortest duration was recorded in Toffo and Ze and the longest in Abomey-Calavi (Table 1).

Preparation of local chickens captured for slaughter

After capture, chickens are often restrained by the technique of "attached legs". Some simply put them in cages or under baskets before the slaughter. All respondents have stated that these waiting places were aerated. They were also protected from sun.

Chickens were more fed in Ouidah and Zè before slaughter than in the other localities (P <0.01). Foods used were mainly maize grains, and kitchen scraps. Sorghum (16.67%) and rice (16.67%) were even sometimes used in Ouidah. Water is also given to them in the waiting places. However, chickens were in any township deprived of food and exclusively provided in water during the waiting period.

Fig. 1. Local chickens restrained by "the legs attached" technics.

Besides, some chickens were immediately slaughtered after capture without a waiting period before by 20% of respondents in Ouidah, 23.08% in Zè, 30% in Allada and Toffo and 60% in Abomey-Calavi. The waiting time duration was similar in the districts and varied from 8.37 hours to 15 hours (Table 1).

Discussion

Conditions of pre-slaughter transportation of local chickens

Animals are often transported legs attached. This technics aims to prevent them from escaping during the transportation or on arrival. The transportation's means used seems to influence animals' disposition. In the most developed townships such as Abomey-Calavi and Allada where, cars were more frequent, cages and large baskets were more used for the disposition. Outside Abomey-Calavi, motorcycles are frequently used. The technics of hanging chickens upside down is more used where motorcycles were more frequent. This type of precarious transportation seems to compromise chickens life because, in Abomey-Calavi where it is less practiced, mortality were less evoked among the incidents recorded. In a study carried out in the Czech Republic, precarious transportation conditions were also reported as a cause of high mortality among hens and roosters transported to the chicken processing plant between 1997 and 2004 (Voslarova *et al.*, 2007). The hanging of broilers upside down is even seen as a very stressful event which increases plasma corticosterone concentration (Kannan *et al.*, 1997; Début *et al.*, 2005).

Moreover, the mortality rates during transportation in Abomey-Calavi could be explained by the longer distances and durations declared. Indeed, distances varied from 7.10 km to 59.72 km and durations from 33 to 169 minutes with the highest values in this locality. Voslarova *et al.*, (2007) similarly reported that the mortality rate among hens and roosters was influenced by the distance of transportation to the chicken processing plant.

They observed that the mortality rate rose from 0.59% for transportation up to 50 km to 1.63% for transportation up to 300 km. As in the current work, it has also been noted in other studies that transportation provokes an average of 0.3% to 0.4% of mortality and this increases with the duration (Petracci *et al.*, 2005, 2009 and 2010).

Besides, some transporters do not feed animals that are exposed to bad weather during the transit. Globally these transportation conditions of local chickens could constitute a stress factor. Transportation has also been reported as a stress factor in other studies (Gigaud *et al.*, 2007; Ali *et al.*, 2008; Hasan, 2012; Radu *et al.*, 2012).

Fig. 2. Modes of transportation of local chickens and their dispositions during the transportation.

Conditions of pre-slaughter capture chase and of waiting time of local chickens

The capture chase took place almost in the same way in the five townships. It is practiced outdoor or in a fence in Abomey-Calavi and outdoor, in a fence or in a house in the other localities. The shortest duration was recorded in Toffo and Ze and the longest in Abomey-Calavi. The variability of the chase place seems to be in relationship with its duration. Smaller the chase place is, better it is to control birds, and then shorter is the chase duration.

Thus, the longer chase duration obtained in Abomey-Calavi could be due to the exclusivity of outdoor chase and of the one in a fence.

The use of houses would have certainly contributed to the reduction of the capture chase duration in the other localities.

Some chickens caught enjoy rest time before slaughter while others are immediately slaughtered. During the rest time, they are fed and watered.

Then, feed withdrawal that consists to deprive animal of foods and exclusively water them for a while is not practiced in the study area. Whatever the condition, the capture chase as revealed, subjects chickens to an important physical activity which causes them anxiety and which would be a source of stress. Close pre-slaughter conditions were similarly reported as stressful. Indeed, according to Debut *et al.* (2005), chickens hanging time on the slaughter line increases plasma corticosterone, a stress indicator hormone. A simple anxiety caused by food restriction or fasting can also cause stress. De Jones *et al.*, (2003) observed an increasing of plasma corticosterone concentration in growing chickens during food restriction. Nijdam *et al.*, (2005) also made a similar observation after the diet before chickens capture.

Conclusion

This study cleared up more the *ante-mortem* conditions of transportation, capture chase and waiting time of local chicken of traditional breeding system of Benin. It revealed that these conditions are often precarious, sources of involuntary physical activities, and anguishing. They violate animal welfare and would be cause of stress. They could also lead to bad meat microbiological quality, especially due to the non-respect of the feed withdrawal before slaughter.

Acknowledgment

The authors thank "Lla Commission de l'Union Economique et Monétaire Ouest Africaine" for its financial support.

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