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Simulated mode of transportation and handling equipment on mortality rate and live weight shrinkage of finished broilers

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Target Audience: Poultry vendors, processors and researchers

Abstract

The aim of this experiment was to examine the effect of the two most used handling equipment (cages and sack bags) and mode of transportation (car, tricycle and motorcycle) in Nigeria on the live weight changes and mortality of finisher broilers. 84 finished broilers were bought from 3 farms in Uyo metropolis and used for the experiment. The birds were assembled and quarantined for 2 weeks. The birds were randomly divided into 2 groups (group A and B) of 42 birds each. Birds in group A were handled in cages and transported while birds in group B were put in sack bags and transported. Birds in both groups A (cage handled) and B (sack bag handled) were further randomly divided into three groups (A1, A2 and A3; B1, B2 and B3) of 14 birds per subgroup. Birds in subgroup A1 and B1 were transported using motor car (closed boot), birds in subgroup A2 and B2 were transported using tricycle, and birds in subgroup A3 and B3 were transported on motorcycle. Each subgroup was replicated twice with 7 birds per replicate before they were transported. The distance that the birds were transported was 32 kilometer. Data were obtained on mortality rate and weight loss. Birds put in sack bags and transported in car, tricycle and motorcycle recorded mortality rate of 0.17, 0.12 and 0% respectively. On the other hand, birds housed in cages and transported either in car, tricycle and motorcycle recorded 0% mortality. In the same vein, the highest average weight shrinkage (1.28 kg) which was significantly ($p<0.05$) different from other handling and transportation methods was recorded by birds put in sack bags and transported in car. Birds handled in cages and transported in motorcycle also recorded the least average weight shrinkage (0.09 kg). Both handling equipment and mode of transportation affected the weight and mortality of finished broilers negatively, resulting in weight shrinkage of 0.49% and mortality rate of 0.29%. However, birds handled in sack bags and transported in car had the highest toll on birds' mortality and weight loss. Thus birds should be put in cages and transported to slaughter houses in a well-ventilated vehicle to enhance adequate airflow, birds' welfare and high economic returns.

Keywords: Handling equipment; mode of transportation; broilers; mortality; weight shrinkage.

Description of Problem

In Nigeria, with a good breed and effective management, broilers are ready for the market in 5 – 8 weeks. Few consumers buy the finished broilers at the farm gate. Some poultry farmers contact eateries, process/dress (slaughtering, de-feathering, removal of offal), weigh and sell the carcasses to them. Most big farms or company dress, package, refrigerate and sell their birds as frozen chicken. In most cases, dealers, butchers and vendors buy from the owners in their farms, put them in cages and sack bags and transport the live birds for sale at local markets stalls/slabs especially

during festive seasons or for further processing. Road side vendors add value to the broiler meat and sell it mostly smoked to the final consumers. The finished broilers are thus transported for considerable distances on roads before they are being slaughtered. Different equipment such as cages and sack bags are also used to handle and transport them. The combined effect of handling equipment as well as transportation has resulted in stress, weight losses and death (dead on arrival) of broilers. The effect of catching (1), handling (2), types of crates (3), crating density (4), transportation (1; 5; 6; 7), season, transportation microclimate (8), thermal stress (9),distances covered and lairage holding time (5) on broilers weight shrinkage, broilers welfare, dead on arrival (DOA), mortality and meat quality (10) have been well documented (11; 10).

As highlighted by (11) in their review, factors affecting bird welfare during transportation include the thermal demands of the transport micro-environment, acceleration, vibration, motion, impacts, fasting, withdrawal of water, social disruption and noise, with thermal challenges and in particular heat stress adversely affecting bird's comfort and meat quality. (12) also reported that the microclimate within the transportation vehicle was the major cause of mortality. Geographical location also affects the season and ambient temperature of the transport vehicle, thus having different impacts on the DOA values. For the temperate climate (summer, spring, winter and autumn seasons), varying DOA rates for different seasons have been reported. DOA values of 0.7% to 1.4% have been reported in winter in Saskatchewan, Western Canada (13). DOA value of 0.47% in summer in Italy has been reported by (14). For the tropical climates such as Brazil, (15) reported DOA rate of 0.42% in summer (hot/dry) season, with DOA rates of 0.39%, 0.28%, and 0.23% reported for the spring, winter and autumn seasons, respectively (15). Other authors have also reported incidences of DOA (0.35%; 16) in the hot summer season (7). The objective of this research therefore was to examine the effect of the two most utilized handling equipment – cages and sack bags - as well as the mostly widely used means of transportation – car, tricycle and motorcycle - on the weight shrinkage and mortality (DOA) rate of finished broilers in the tropics during dry season.

Materials and Methods

Experimental Site

The study was conducted in Uyo metropolis, the capital of Akwa Ibom state, Nigeria. The broilers chicken (6 – 8 weeks old) were sourced from 3 farms in Uyo metropolis. The farms were Precious farms (which lies 5 km from Uyo main town), COJAS Farms (located 4 km from Uyo main town) and Domingo Farms (4 km from Uyo). Uyo is situated 55 km inland from the coastal plain of South Eastern Nigeria. Uyo is located between latitudes 4˚59′ and 5˚04′ N and longitudes 7˚52′ and 8˚00′ E and it covers an area of 35 square kilometers. Uyo lies in the equatorial rain forest which is a tropical zone. Uyo has two distinct seasons – wet (April – December) and dry (January – March), with a short dry spell in August (August break). Meteorologically, Uyo has a temperature range of 23 – 27 ^{0}C. The annual precipitation ranges from 2000 – 3200 mm with relative humidity of 74 – 85 % (Meteorological station, University of Uyo, 2016).

Experimental Birds and Handling Procedures

84 broiler birds were procured from 3 different farms within Uyo metropolis and used for the study. The birds were transported to the central collection point which was the Poultry Unit, Teaching and Research Farms, University of Uyo. The broilers were housed

on cemented floor with 4 cm thick wood shavings of about 4 cm used as litter materials. Water containing anti-stress (vitalyte® and glucose®) was offered. Feed and water were then offered *ad libitum*. The birds were acclimatized for 14 days. The birds were randomly divided into 2 groups (group A and B) of 42 birds each. Birds in group A were put in cages and transported while birds in group B were put in sack bags and transported. The cages used were made of a wire mesh of 2.5 mm thickness, measuring 78.74 cm length, 43.18 cm width and 55.88 cm depth. The sack bags were empty broiler feed mash (25kg) bags. The sack backs were perforated, allowing the head of the birds to be exposed out of the bag. Birds in both groups A and B were further randomly divided into three groups (A1, A2 and A3; B1, B2 and B3) of 14 birds per subgroup. Birds in subgroup A1 (cage handled) and B1 (sack bag handled) were transported using motor car boot (closed boot). Birds in subgroup A2 (cage handled) and B2 (sack bag handled) were transported using tricycle while birds in subgroup A3 (cage handled) and B3 (sack bag handled) were transported using motorcycle. Birds in each subgroup were further replicated twice, with 7 birds per replicate. Thus 7 birds each was put in each sack bag and cage and transported. On the first day after acclimatization (day 15), birds in subgroup A1 (cage handled) were transported using car from and back to the experimental site, covering a distance of 32 kilometer (km). On that same day, birds in subgroup B1 (sack bag handled/car transported) were also transported from and back to the acclimatization site at a distance of 32 km too. The birds were transported between 11.00 a.m. and 2.00 p.m. Nigerian Time. On day 16, birds in subgroup A2 (cage handled) and B2 (sack bag handled) were transported using tricycle from and to the experimental site at a distance of 32 km. On day 17, birds in subgroup A3 (cage handled) and B3 (sack bag handled) were also transported using motorcycle from and to the experimental site, still covering 32 km. The birds were weighed at the beginning and end of each journey to determine weight loss. Data were also collected on mortality (number and percent) as well as on distance covered in kilometers. Data collected were analyzed using the general linear model of SAS computer software package (17). Treatment means were also separated using Least Significant Difference (LSD) of the same package.

Table 1: Effect of mode of transportation (MT), handling equipment (HE) and their interactions (MT x HE) on the mortality rate (MR) of finisher broilers

Handling Equipment	Mode of Transportation				% MT mortality
	Total number Transported	Car MR (number)	Tricycle MR (number)	Motorcycle MR (number)	
Cage	42	0	0	0	0
Sack bag	42	7	5	0	0.29
% HE mortality		0.17	0.12	0	
% MT x HE mortality rate					0.29

SEM =Standard error of mean; HE = Handling equipment; MT = mode of transportation

Table 2: Effect of mode of transportation (car, tricycle, motorcycle) and handling equipment (cages, sack bags) on the average initial and final live weight (kg) of finisher broilers

Parameters	Car	Tricycle	Motorcycle	SEM
Cage (Initial Weight)	2.33	2.24	2.20	0.04
Cage (Final Weight)	2.04	2.00	2.11	0.05
Sack bag (Initial weight)	2.37	2.24	2.26	0.03
Sack bag (Final weight)	1.09	1.35	2.10	0.15

SEM: Standard Error of Mean

Results and Discussion

Table 1 shows the effect of mode of transportation (car, tricycle, and motorcycle) and handling equipment (cages and sack bags) on the mortality rate of finisher broilers. Birds that were put in sack bags and transported in car recorded a mortality rate of 0.17% while birds handled in sack bags and transported using tricycle recorded a mortality rate of 0.12%. The high mortality rate was due to the inadequate ventilation by both the perforated sack bags and the car (closed curtain/closed boot) resulting in thermal stress and death. This corroborates the findings of (18). (12) also reported that the microclimate within the transportation vehicle was the major cause of mortality in finished broilers. No mortality was recorded for birds put in sack bags and transported on motorcycle. Likewise, birds put in cages and transported either by car, tricycle or motorcycle recorded zero (0 %) mortality. The simulated effect of handling equipment and mode of transportation resulted in a 0.29% mortality of finished broilers. The mortality rate obtained in this study (0.29%) was lower than the values 0.35, 0.42 and 0.47 % reported by (14), (16) and (15) for birds transported in the summer.

Table 3: Effect of mode of transportation (MT), handling equipment (HE) and their interactions (MT x HE) on the average live weight shrinkage (kg) of finisher broilers

Parameters	Car	Tricycle	Motorcycle	Mean HE	SEM
Cage	0.29*	0.24*	0.09*	0.21*	0.02
Sack bag	1.28*	0.89*	0.16*	0.78*	0.11
Total	1.57*	1.13*	0.25*		0.13
Mean MT	0.78*	0.56*	0.13*	0.49	
SEM	0.22	0.14	0.02		
HE x MT	0.49				

SEM =Standard error of mean; HE = Handling equipment; MT = mode of transportation;
**Significant at 5 %.*

Table 2 shows the influence of mode of transportation and handling equipment on the average initial and final live weight of finished broilers, while Table 3 shows the effect of mode of transportation (car, tricycle, and motorcycle), handling equipment (cage and sack bag) and their interactions on the average live weight shrinkage of finisher broilers. There were significant differences ($p<0.05$) in the average live weight shrinkage

of finished broilers as influenced by handling equipment (cage and sack bag) as well as mode of transportation (car, tricycle, motorcycle). Birds put in sack bags recorded a significantly ($p<0.05$) higher weight shrinkage of 0.78 kg compared to their counterparts housed in cages which recorded a weight shrinkage of 0.21 kg. Similarly, birds transported in car recorded a significantly ($p<0.05$) higher average weight shrinkage (0.78 kg) compare to their counterparts transported in tricycle (0.56 kg) (semi-open vehicle) and motorcycle (0.13 kg) (open vehicle). For the simulated effect, birds handled in sack bags and transported in car recorded a significantly ($p<0.05$) higher average weight shrinkage (1.28 kg), while birds handled in cages and transported in motorcycle recorded the least (0.09 kg) average weight shrinkage. On the whole, 0.49% weight shrinkage was recorded for all the birds handled and transported in this experiment. The high average weight shrinkage recorded for birds handled in sack bags and transported in car (closed curtain) was due to inadequate ventilation in the birds' microenvironment, resulting in heat stress and high mortality. The rather low weight shrinkage of birds handled in cages and transported in motorcycle (open vehicle) was as a result of adequate ventilation and free air-flow to the birds during transportation. (19) reported that high thermal loads in the transportation of broilers results in weight loss through the bird's demand for evaporative heat loss.

Conclusion and Applications

1. Handling equipment (sack bags and cages) and mode of transportation (car, tricycle, and motorcycle) affected the mortality rate and weight shrinkage of finished broilers.
2. Birds handled in sack bags and transported in car recorded the highest value in mortality and weight shrinkage while those handled in cages and transported in motorcycle recorded 0 % mortality and minimal weight loss.
3. Based on the findings of this study, birds should thus be transported in cages and motorcycle to slaughter houses to reduce weight shrinkage and mortality, and for improved welfare and economic returns.

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