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Survivability of pure and cross bred chickens at early and late growth phases in Nigeria humid tropics

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Abstract

Survival is a general measure of an animal's fitness. In commercial poultry production, mortality can result from a range of conditions (disease, physiological stress, environmental condition and aggressive behaviour. This study was aimed at evaluating Yoruba Ecotype Chicken (YEC), Sussex (SS), Goliath (GG), Marshall (MM) and their crossbred offspring for survivability in the Nigeria humid tropical climate. A total of 529chicks were raised from day-old to 8 weeks (early growth phase) and 9 weeks to 20 weeks of age (Late growth phase). Data obtained were subjected to the Kaplan meier survivability test using SPSS (2012) version 21. The findings of the study revealed that at early growth phase, pure bred YEC x YEC had highest survivabilityof 91.20% while crossbred YEC x GG had the least survivability rate of 75.00%. The overall survivability of 86.40% was recorded at this stage. Late growth phase recorded highest survivability (100%) for cross bred YEC x GG while cross bred YEC x MM had the least survivability of 87.50% while the overall survivability was 94.10%. This study concluded that YEC are hardy compared with other genotypes, especially at the early growth phase while cross breeding improved the performance of YEC x GG at the late growth phase. The study recommends that YEC should be used as terminal sire in crosses involving exotic breeds for proper adaptability and performance in the Nigeria humid tropics.

Keywords: Cross bred, Survivability, Early growth phase, late growth phase, Kapler meier

Introduction

Survivability refers to the rate at which an animal survives and reproduce within a define environment (Barker, 2009), the rate of survival of chicken could be dependent on conditions like feeding, disease condition, physiological stress and response to other environmental conditions. Bird's survival recorded as a binary trait i.e. either dead or alive at a given time is a potential indicator for many underlying health traits that could be improved simultaneously. Flock *et al.* (2005) and Havensten *et al*. (2007) stated that selection for general survival has been applied largely in chickens and turkey but with little success. The genetic potential of Yoruba Ecotype chicken is well spelt out in their hardiness and better adaptability to prevailing tropical environmental conditions. However, there are little or no studies on the adaptation of Marshall, Goliath, Sussex and their crossbred in warm humid tropical environment. Crossbreeding is one major tool used in improving desired traits in animals. It utilizes the good adaptive features of the indigenous animals and possibly exploit the phenomenon of heterosis resulting in the greater performance of crossbred compared with the average of the parent. Additionally, crossbreeding can also reduce the mortality of birds especially in two-breed specific crossing because there is general tendency for crossbred to show high survival rate than comparable purebreds. Warren (1996) reported that in a large percentage of comparison where either parents showed a

high percentage of survivability, the crossbred where considerably more viable than the purebred which indicate that in general crossbreeding does reduce chick mortality.

Materials and methods

A total of 529 day-old chicks which belong to four purebred (Yoruba ecotype, Sussex, Goliath and Marshall) and six crossbred strains (Table 1) obtained from hatchability experiments were used for the evaluation survival of the 10 chicken strains. Also, a total of 457 eight-weeks old chickens were used to evaluate survival of grower chicken. Birds were raised in deep litter floored pens at a poultry facility located at Oyan (Osun state, South-West Nigeria). The coordinates of the experimental site is latitude 8.05 and longitude 4.77 and an elevation of 422 meters above sea level. All birds were given unrestricted access to water, and were fed the same diet *ad-libitum.* The time (days) of death for individuals within each strain (mortality) was recorded and plotted against the cumulative probability of survival.

Statistical analysis

Data for survivability was obtained for all the strain from day-old to 8 weeks of age (early growth phase) and 9 to 20 weekss (late growth phase). The incidence of death (mortality) was recorded per bird per day while mortality was scored 1 throughout the experimental period. Data obtained was subjected to the Kapler meier survivability test using SPSS (2012) version 21. The cumulative probability percentage of survivability was calculated for each genotype and the survival function was obtained from the record of mortality and plotted against the cumulative probability of survival. Also, the log rank test of the same statistical package was used to test the probability of equality in survival among the genotypes.

Results

Survivability in early growth phase

Figure 1, shows the Kapler-Meier survival distribution of early growth phase in pure and cross bred chickens. It was noted that about 9% of YEC, 13 % of GG, 11% of SS, 11% of MM, 25 % of YEC x GG, 15% of YEC x SS, 20% of YEC x MM, 17% of GG x YEC, 14 % of SS x YEC and 20% of MM x YEC reached the event (mortality) at different days during the early growth phase. The Log rank test of equality of survival distribution (Table 1) for different breeds was significant ($x^2 = 12.08$, d.f = 9, $p<0.05$). Pure bred YEC had the highest percentage survival (91.2%) while cross bred YEC x GG recorded the lowest percentage survival (75.0 %). Other breeds had percentage survival values that were intermediate between these two values at the same growth phase.

Survivability in late growth phase

The Kaplermeier survival plot for late growth phase is shown in Fig 2. Most of the birds in each strain survived better at this phase. Approximately 5% of YEC, 6 % of GG, 4% of SS, 17% of MM ,0% of YEC x GG, 8% of YEC x SS, 12.5% of YEC x MM, 7% of GG x YEC, 3% of SS x YEC and 4% of MM x YEC died in the growth phase. The log rank test of equality of survival distribution (Table1) for different strains was significant at this stage ($x^2 = 25.41$, d.f = 9, $p<0.05$). This explained inequality in probability of survival among all the strains in the growth phase with cross bred YEC x GG having the highest (100%) while cross bred YEC x MM had the lowest (87.5 %) probability for survival.

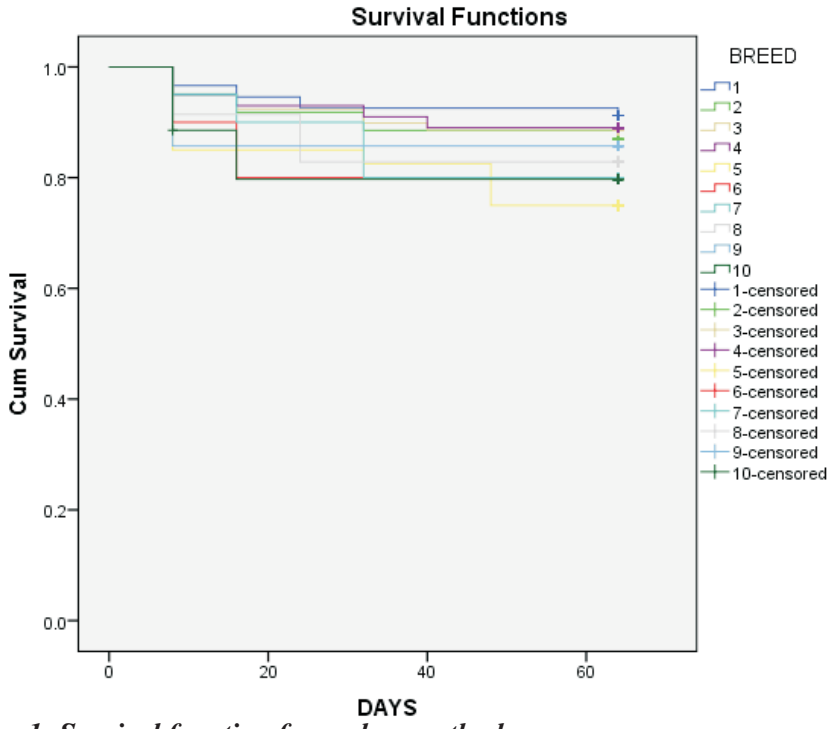

Figure 1: Survival function for early growth phase

Breed 1= YEC, 2= GG, 3 = SS, 4 = MM, 5= YEC x GG, 6 = YEC x SS, 7 = YEC x MM, 8= GG x YEC, 9 = SS x YEC and 10 = MM x YEC

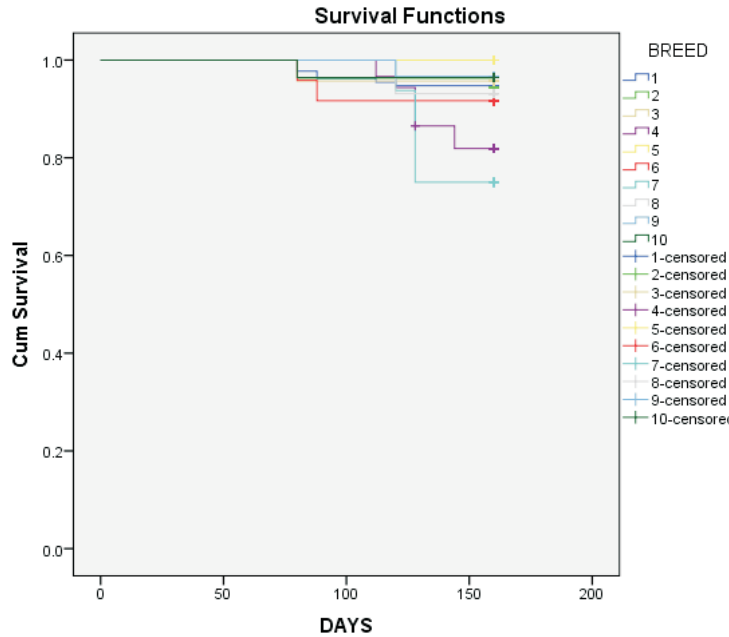

Figure 2: Survival function for late growth phase

Breed 1= YEC, 2= GG, 3 = SS, 4 = MM, 5= YEC x GG, 6 = YEC x SS, 7 = YEC x MM, 8= GG x YEC, 9 = SS x YEC and 10 = MM x YEC

Table 1: Survival distribution of early growth phase (day old - wk8) and late growth phase (wk9 – wk20) in pure and crossbred chickens

	EARLY GROWTH PHASE			LATE GROWTH PHASE		
Strain	**Number**	**Survival**	**Percentage Survival (%)**	**Number**	**Survival**	**Percentage Survival (%)**
YEC x YEC	148	135	91.2	135	126	94.7
GG x GG	61	54	86.9	54	51	94.4
SS x SS	79	70	88.6	70	67	95.7
MM x MM	46	41	89.0	41	37	90.0
YEC x GG	40	30	75.0	30	30	100.0
YEC x SS	30	24	80.0	24	22	91.7
YEC x MM	20	16	80.0	16	14	87.5
GG x YEC	35	29	82.9	29	27	93.1
SS x YEC	35	30	85.7	30	29	96.7
MMx YEC	35	28	80.0	28	27	96.4
Overall	529	457	86.4	457	430	94.1

Log rank ($x^2 = 12.08$ for early growth phase and25.41 for late growth phase: $p<0.05$)YEC, GG, SS, MM represent: Yoruba Ecotype Chicken, Goliath, Sussex, and Marshall Broiler, respectively

Discussion

The variation in probability of survival between strains at the early growth phase could be attributed to genetic makeup of the birds because pure bred YEC had been known for their hardiness in the tropics (Adebambo *et al*., 1999). The high survival rates in the introduced strains (i.e. SS and GG) suggest that they adapt well in the tropics though this was more positive during the late growth phase while the cross bred also survived better at this growth phase which could be attributed to the utilization of the good adaptive features of YEC crossed with exotic strains. This implies that the probability of survival was not equal among all the examined strains. It can be generally explained that survival can display variability depending on differential strain expression, environmental stressor, non-additive genetic factors and environmental factors. Merila and Sheldon (1999) and Ellen *et al*. (2008, 2010) opined that antagonistic relationship and social interactions can also be a reason for survivability in chickens. However, Quinton *et al*. (2011) reported that early survival and late survival were not genetically correlated which indicates that these traits are independent of each other.

Conclusion and recommendation

The study concluded that YEC were hardy while cross breeding improved the performance of YEC x GG at the late growth phase and also that probability of survival was not equal among all the examined strains. The study therefore recommends that YEC should be used as terminal sire in crosses involving exotic breeds for proper adaptability and performance in the Nigeria humid tropics.

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