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Growth performance of royal purple and white guinea fowl varieties and their crosses under an intensive management system

Patrick Kgwatalala*, Freddy Manyeula and Candy Sefemo

Department of Animal Science and Production, Faculty of Animal and Veterinary Sciences, Botswana University of Agriculture and Natural Resources, P/Bag 0027, Sebele, Gaborone, Botswana.

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Commercialization of guinea fowl production in many countries is growing and the demand for their meat is high. The study evaluated the growth of crossbred royal purple x white variety relative to purebred royal purple and white varieties. Twenty pure-bred white, 20 purebred royal purple and 20 cross-bred keets were housed together in 4 houses resulting in 4 replications. The keets were fed broiler starter crumbs from day old to 4 weeks of age and thereafter broiler grower pellets for 16 weeks. Body weights of individual keets were measured fortnightly from 4 to 16 weeks of age. There were no significant differences between body weights of males and females of the three varieties at all ages. There were also no significant differences in body weights among females of the three varieties from 4 to 16 weeks of age. Males of the three varieties displayed non-significant differences in body weights from 4 to 10 weeks of age. Royal purple males were significantly heavier than their white counterparts from 12 to 16 weeks of age. There were, however, no significant differences in body weights between crossbred males and royal purple males at all ages. Crossbreeding was thus effective in improving growth performance of the white variety of guinea fowl.

Key words: Growth, cross breeding, royal purple guinea fowls, white guinea fowls.

INTRODUCTION

The guinea fowl are a group of birds that make up both domestic and wild birds, and are known to be native to the African continent (Adjetey et al., 2014). The helmeted guinea fowl (*Numidia meagris*) has been commercially widely used, with common varieties that include the pearl gray, lavender, royal purple and white helmeted guinea fowl. There are a major source of animal protein in resource-poor communities and thus play a critical role in ensuring food and nutrition security (Ebegbulem and Asuquo, 2018). However, there are known for their hardiness, low production costs, greater capacity to utilize green feeds, and are generally resistant to most endemic poultry diseases (Moreki and Seabo, 2012).

Strategies that enhance productivity of guinea fowls include improving their nutrition and cross breeding. Cross breeding combine different characteristics of different breeds (Getu and Birhan, 2014). In poultry, the hybrid fowl have been observed to be more uniform than

*Corresponding author. E-mail: pkgwatal@buan.ac.bw.

Table 1. Nutritional composition of feeds given to guinea fowl in g/kg.

Composition	Chicks starter	Grower pellets
Protein	200	180
Moisture	120	120
Fibre	50	60
Calcium	8	7
Fat	25	25
Phosphorus	6	5.5
Lysine	12	10

most standard breeds, except for colour in some crosses, while the vigor and productivity of the hybrid were superior to original breeds or breeds of origin (Egahi et al., 2013). Mohammed and Abdalsalam (2005) showed that cross breeding also improve body weight gain in poultry species. On other hand, Ebegbulem and Asuquo (2018) found no significant difference in growth performance and carcass characteristics between pure and crossbred guinea fowls. These conflicting reports suggest that further studies are necessary to determine growth performance of different guinea fowl varieties and their crosses.

In Botswana the amount of meat produced by guinea fowls is unknown as the production of birds is unregulated and unstructured (Moreki and Seabo, 2012). Enhancing the productivity of these birds is, therefore, imperative if food and nutrition security in Botswana communities are to be guaranteed. However, there is currently limited information on the growth performance of royal purple and white guinea fowl varieties and their crosses under an intensive management system in Botswana. This study was, therefore, conducted to evaluate growth performance of crossbred royal purple x white guinea fowl relative to the purebred royal purple and white varieties under an intensive management system.

MATERIALS AND METHODS

Description of the study site

This study was conducted from October to December 2017 at the Botswana University of Agriculture and Natural Resources (BUAN) Content Farm, Sebele, Gaborone. BUAN is located at 25.94°S, 24.58°E at altitude of 991 m. During this time, the mean ambient temperature was 35°C.

Experimental animals and feeding

Five royal purple guinea fowl (RPGF) males were housed together with 30 White guinea fowl (WGF) females in one deep litter house to produce fertile eggs. Another five royal purple males were housed together with 30 pure-bred royal purple females and five white males were housed together with 30 pure-bred white females in three separate houses to produce fertile eggs. Hundred and fifty eggs were collected from each of the three guinea fowl houses and incubated in an automatic egg incubator at 37.5°C and 65% relative humidity for 28 days to produce cross-bred and pure-bred keets. Upon hatching pure-bred and cross-bred (CBGF) keets were housed separately in brooding units until 3 weeks of age. At four weeks of age, the guinea fowls were individually identified using leg bands. Twenty pure-bred white, 20 pure-bred royal purple and 20 cross-bred guinea fowls were housed together in a guinea fowl house for a total of 4 houses, resulting in 4 replications. The guinea fowls were fed commercial broiler starter crumbs from day old to 4 weeks of age, and thereafter fed commercial broiler grower pellets until the end of the study. Both commercial feeds (Table 1) were bought from Nutri feeds PTY, Ltd, Pilane, Botswana.

Measurement of parameters

The guinea fowl were weighed individually at the beginning of the experiment and thereafter on a fortnightly basis from 4 to 16 weeks, using an Adam 6010 model electronic balance (Adam, Gaborone, Botswana).

Statistical analysis

Growth data were analyzed using General Linear Model procedures of statistical analysis system SAS (2009). The model included fixed effect of variety (royal purple, white and crossbred royal purple x white) and sex (male and female) and the interaction between variety and sex. Results on the effects of variety, sex and the interaction between variety and sex are presented as least squares means±SE. Means separation were by paired t-test with Scheffe's adjustment to account for differences in guinea numbers within sex and differences between means were separated at α-level of 0.05.

RESULTS AND DISCUSSION

There were no significant differences between body weights of males and females of the three varieties at all ages (Table 2). There was, however, an increase in body weight among all the varieties from 4 weeks of age up to 16 weeks of age.

Generally, pure-bred royal purple and cross-bred males were non-significantly heavier than their female counterparts from 8 to 16 weeks of age, while the opposite was true in the white guinea fowl variety. Consistent with the current findings, Nahashon et al. (2006) reported no significant differences in body weights

Table 2. Body weights of males and females of different varieties at different ages in weeks (mean ± SE).

Age	Crossbred		Royal purple		White	
	Female	Male	Female	Male	Female	Male
4	215.67±7.93	195.77±25.69	203.88±10.49	202.43±13.73	217.08±14.83	224.63±18.17
6	426.48±11.55	418.85±37.41	378.83±15.27	406.57±20.00	377.33±21.60	344.68±21.60
8	663.71±15.67	666.00±50.77	614.67±20.72	628.86±27.14	618.67±29.31	559.58±29.31
10	847.29±17.57	878.00±56.92	870.50±23.24	896.86±30.43	822.50±32.86	788.00±32.86
12	1041.41±19.97	1016.00±64.70	1114.50±26.41	1114.29±34.58	1034.67±37.35	925.00±37.35
14	1203.00±20.94	1218.00±67.86	1276.36±28.93	1313.14±36.27	1169.67±39.18	1083.67±39.18
16	1325.57±27.62	1365.00±89.50	1390.36±38.16	1446.86±47.84	1446.86±51.67	1085.67±51.67

Table 3. Main effect of variety (combined sex) at different ages in weeks (mean ± SE).

Age	Varieties		
	Crossbred	Royal purple	White
4	205.70±13.44	203.15±8.64	220.85±11.73
6	422.67±19.57	392.70±12.58	361.00±15.27
8	664.86±26.57	621.76±17.07	589.13±20.73
10	862.64±29.78^{ab}	883.68±19.14^{a}	805.25±23.24^{b}
12	1082.71±35.50^{ab}	1129.39±21.75^{a}	979.83±26.41^{b}
14	1294.75±23.20^{ab}	1345.29±46.83^{a}	1126.67±27.70^{b}
16	1345.29±46.83^{a}	1418.61±30.60^{a}	1176.00±36.54^{b}

at different ages between males and females of the pearl grey guinea fowl, but observed that males were non-significantly heavier than their age-matched female counterparts. Contrary to the current findings, Kokoszynski et al. (2017) reported a significant difference in body weight between males and females in the pearl grey variety. Lack of sex differences in body weight among three varieties of guinea fowl implies that there should be no preference for a particular sex in the production of meat type guinea fowls in Botswana.

Main effect of strain (combined average body weight of both males and females) on body weight in purebred royal purple and white varieties and crossbred royal purple x white varieties at different ages are presented in Table 3. There were no significant body weight differences (P>0.05) among the three guinea fowl varieties from 4 to 8 weeks of age. There were also no significant weight differences between purebred royal purple and cross-bred royal purple x white guinea fowl from 10 to 16 weeks of age. Royal purple guinea fowl were, however, significantly heavier than their age-matched white counterparts from 10 to 16 weeks of age. Cross-bred guinea fowls were significantly heavier than their white counterparts only at 16 weeks of age. Crossbred guinea fowl were, however, heavier than their white counterparts at all ages from 4 to 16 weeks of age. The royal purple guinea fowls were also heavier than their aged-matched crossbred counterparts from 10 to 16 weeks of age. Crossbreeding was thus effective in improving the growth performance of the white guinea fowl variety but crossbred guinea fowls were out-performed by the royal purple variety. This suggests that the royal purple variety should be promoted as the meat type guinea fowl variety in Botswana.

Consistent with the current findings, Oke et al. (2012) reported an improvement in growth performance in crossbred pearl grey and lavender reciprocal crosses relative to the constituent purebred counterparts. Salo-Ojo et al. (2012) also reported significantly higher body weight in a cross between the Dominant Black strain (DB) and the Fulani Ecotype chicken (FE) and their progeny from the reciprocal crosses, (DB X FE and FE X DB) compared to the purebred constituent breeds at 3, 5 and 7 weeks of age. Better growth performance in crossbred guinea relative to the white variety could be attributed to the combining effect of genes (heterosis) brought into the cross by different pure breeds. Farmers rearing the white guinea fowl variety can therefore, be encouraged to cross-breed with the royal purple variety to enhance growth performance of the white variety.

Body weights of different varieties of guinea fowl within sex at different ages are presented in Table 4. There were no significant differences in body weights among females of the three varieties of guinea fowl at all ages from 4 to 16 weeks of age. There was an increase in body weight among females of the three varieties from 4

Table 4. Comparison of body weights of different varieties within sex at different ages in weeks (mean ± SE).

Ages	Female			Male		
	Crossbred	Royal Purple	White	Crossbred	Royal Purple	White
4	215.67±7.93	203.88±10.49	217.08±14.83	195.77±25.69	202.43±13.73	224.63±18.17
6	426.48±11.55	378.83±15.27	377.33±21.59	418.85±37.41	406.57±20.00	344.67±21.59
8	663.71±15.67	614.67±20.72	618.67±29.31	666.00±50.78	628.86±27.14	559.5±29.31
10	847.29±17.57	870.50±23.23	822.50±32.86	878.00±56.92	896.86±30.43	788.00±32.86
12	1041.43±19.97	1114.50±26.4	1034.67±37.35	1016.00±64.70^{ab}	1144.29±34.58^{a}	925.00±37.35^{b}
14	1203.00±20.94	1276.36±28.93	1169.67±39.18	1218.00±67.86^{ab}	1313.14±36.27^{a}	1083.63±39.18^{b}
16	1325.57±27.62	1390.36±3816	1266.33±51.67	1365.00±89.50^{ab}	1446.86±47.84^{a}	1085.67±51.67^{b}

weeks to 16 weeks of age with royal purple females displaying the highest body weights followed by crossbred females, and lastly white females from 10 to 16 weeks of age. Non-significant differences in body weights among females at various ages among the three varieties is consistent with Boitumelo (2018) who also reported similar body weights among females of lavender, pearl grey, royal purple and white varieties from 4 to 18 weeks of age. In chickens, a significant difference in body weight was reported between Australorp x Tswana crossbred females and purebred Tswana females at 16 weeks of age (Kgwatalala and Segokgo, 2013).

Males of the three varieties displayed non-significant differences in body weight from 4 to 10 weeks of age. Royal purple variety were significantly heavier than their age-matched white counterparts from 12 to 16 weeks of age. There were, however, no significant differences in body weight between crossbred and royal purple males at similar ages. Hagan and Adjel (2012) reported a significant difference in body weight between crossbred male cockerels (Naked neck × frizzled) and purebred naked neck, frizzled and normal males at 14 weeks of age with body weights of 1605, 1411, 1410 and 1305 g, respectively. A significant difference in body weight was also reported between crossbred Australorp × Tswana males and purebred Tswana males from 10 to 16 weeks of age (Kgwatalala and Segokgo, 2013). Cross breeding was therefore, beneficiary in enhancing growth performance of males and had no beneficial effect on female guinea fowl. The beneficial effect of cross-breeding on body weight of males suggests that males should be preferred over females for meat production.

Conclusions

Cross-breeding was evaluated as an alternative method of improving growth performance of different varieties of guinea fowls. Cross-breeding was effective in improving growth performance of the white variety but had no beneficial effect on the growth performance of royal purple variety. The royal purple variety proved to be the best variety in terms of growth performance and is therefore the most recommended variety for meat production in guinea fowls.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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