Phenotypic Correlations between External and Internal Egg Quality Traits in Three Varieties of Helmeted Guinea Fowl from 28 to 46 Weeks of Age

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Abstract
This study investigated the correlation in internal egg quality traits and external egg quality of three varieties of guinea fowls. The experimental varieties were Pearl (Sake), Lavender (Hurudu) and Black (Angulu). Base populations of 180 guinea fowls were used to generate 144 $F_1$ females comprising 48 birds per variety. Each variety was divided into three randomized replicates containing 16 birds per replicate. Data were collected fortnightly on external egg quality traits including egg weight, egg length, egg width, egg index, shell thickness, shell weight, and on internal egg quality traits including albumen height, albumen weight, albumen diameter, yolk length, yolk height, yolk weight, yolk diameter, yolk index and Haugh unit. Data collected were subjected to Pearson Product Moment Correlation using SPSS. The correlation result showed strong relationship among the three varieties with some variations which may be due to non-genetic and/or genetic reasons. The three varieties showed great similarities in the following association between egg weight vs. albumen weight, egg weight vs. yolk weight, egg length vs. yolk weight and egg width vs. albumen weight. The differences that exist in certain association in the three helmeted varieties suggest possible genetic polymorphic differences in the three varieties. This result necessitates separately planned improvement programs in the three helmeted varieties.

Key words: Phenotypic Correlation, Egg Quality, Traits, Guinea Fowl

Introduction
In Nigeria several species of poultry abound and they include chickens, guinea fowls, turkeys, ducks and pigeons. Guinea fowl is commonly found in the Western, Central and Southern parts of Africa (Ikani and Dafwang, 2004). However, in most African countries including Nigeria, Malawi and Zimbabwe, guinea fowl production is in its infancy (Dondofema, 2000; Ligomela, 2000; Smith, 2000). Among domestic types which the peasant farmers have long identified and given local names based on their coloration are Pearl (Sake), Lavender (Hurudu), Black (Angulu) and White (Faren Zabi). The Pearl is the most common and probably the first developed from the Wild West African birds (Ikani and Dafwang, 2004).
Although there is a ready market for guinea fowl and its product in Africa (Nahashon et al., 2006), yet improvement studies for guinea fowl are still very scant in the region. As a result, guinea fowl production in Africa including Nigeria is still limited by the poor performance traits of the native genotypes, and lack of information regarding the genetic and phenotypic differences of important economic traits which aid selection and consequently improvement of such traits. Ubani et al. (2010) reported that a pre-requisite of an appropriate breeding plan for genetic improvement of any stock is the knowledge of genetic parameters (heritability, genetic and phenotypic correlations). Apart from environmental factors which have been reported to greatly affect egg quality traits, evidence of genetic influence including breed effect have also been noted (Yasmeen et al., 2008). These traits, therefore, can be improved through knowledge of their genetic and phenotypic differences. This corroborates the report of Kosum et al. (2004) that the potential for genetic improvement of traits is largely dependent on the genetic as well as phenotypic relationships between traits of economic importance. A knowledge of the phenotypic association between external and internal egg quality traits will assist in further deducing the relationship between the helmeted varieties of guinea fowl as well as useful in improving them.

**Materials and Methods**

**Location of Study**

This study was carried out at the Poultry Unit of Teaching and Research Farm, College of Animal Science and Animal Production, Michael Okpara University of Agriculture, Umudike, located at about ten kilometers from Umuahia, the Abia State capital. Umudike bears the coordinate of 5°28’ North and 7°32’ East, and lies at an altitude of 122 meters above sea level. The environment of study was situated within the Tropical Rainforest zone and is characterized by an annual rainfall of about 2177 mm. The relative humidity during the rainy season is well over 72 %. Temperature ranged from 22 °C - 36 °C with March being the warmest month, while July to October represents the coolest period with a temperature range of 22 °C – 30 °C (Nwachukwu, 2006).

**Acquisition and Mating of Base Population**

One hundred and eighty adult guinea fowls of three varieties were procured from several markets in Zaria. The base population consisted of 36 adult males, and 144 adult females. Each variety had 12 males and 46 females each. These adults were quarantined for two weeks. A mating ratio of 1 male: 3 females were maintained and the mating scheme adopted was as shown below:

- Pearl male X Pearl female - Homozygous Pearl variant main cross
- Lavender male X Lavender female - Homozygous Lavender variant main cross.
- Black male X Black female - Homozygous Black variant main cross.
Experimental Animals and Management

The eggs laid by the base population were set and hatched at Kanem Hatcheries off Aba-Owerri Road, Aba. A total of two hatches which were one week apart resulted in 350 F₁ keets. The keets were sexed by visualizing the vent and listening to the cry of the birds. The testicles of a male protrude when viewed via the vent whereas none is found in the vent of the females. More so, the males made “kee ke kee ke” sound whereas the females made “buck-wheat buck-wheat” or “put-rock put-rock” sound. All F₁ male keets hatched were culled leaving only 165 F₁ female keets which were used for the experiment. The keets were brooded for six weeks and subsequently reared until the 28th week when they started laying eggs. At the 28th week, 144 adult females were randomly selected out of the 165 females and wing-banded. The 144 adult females consisted of 48 females of Pearl, Lavender and Black each. Each variety was replicated three times, which gave a total of 9 replicates (B1, B2, B3, P1, P2, P3, L1, L2, and L3) for all the varieties, with 16 females per replicate.

The guinea fowl varieties were raised in deep litter pens under natural daylight. Feed and water was provided ad-libitum. During the laying phase, layers mash containing 2900 kcal/kgME and 20.5 % CP according to Oguntona (1983) was introduced to the guinea fowl varieties. The nutrient composition of the layers diet is shown in table 1 below:

Table 1: The Nutrient Composition of the Layers Diet

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>% Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>54.90</td>
</tr>
<tr>
<td>Groundnut Cake</td>
<td>21.40</td>
</tr>
<tr>
<td>Wheat offal</td>
<td>8.60</td>
</tr>
<tr>
<td>Fish meal</td>
<td>1.73</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>3.40</td>
</tr>
<tr>
<td>Limestone</td>
<td>2.40</td>
</tr>
<tr>
<td>Bone meal</td>
<td>7.00</td>
</tr>
<tr>
<td>Salt</td>
<td>0.50</td>
</tr>
<tr>
<td>Vitamin premix*</td>
<td>0.27</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

*Vitamin/mineral premix composition: Vit A – 10,000,000 IU, Vit D3 – 2,200,000 IU, Vit.E – 10,000 mg, Vit.K3 – 2,000 mg Vit.B2 – 5,000 mg, Folic acid – 500 mg, Niacin – 15,000 mg, Calpan – 5,000 mg, Vit.B12 – 1,500 mg, Vit.B1 – 1,500 mg, Vit.B6 – 1,500 mg, Biotin – 20 mg, Antioxidant – 125,000 mg; Selenium – 200 mg, Iodine – 1,000 mg, Iron – 40,000 mg, Cobalt – 200 mg, Manganese – 7,000 mg, Copper – 4,000 mg, Zinc – 50,000 mg, Choline chloride – 150,000 mg. Calculated composition: Ca – 3.50, P – 1.11. Energy level 2900 kcal/g; Protein level (20.5 %CP).

Data Collection and Analysis

Data collection started in April when the birds were at the 28th week of age and lasted for 18 weeks. The following egg quality parameters were measured for each variety according to Oke et al. (2004) and Obike et al. (2011):

- **Egg Weight (EW):** This was measured using an electronic sensitive scale.
- **Egg Length (EL):** This was determined using Vernier Caliper.
- **Egg Width (EWD):** This was determined using Vernier Caliper.
- **Egg Index (EI):** This was computed from the ratio:
  \[ EI = \frac{\text{Mean Egg Width}}{\text{Mean Egg Length}} \]
- **Shell Thickness (ST):** This was determined using a micrometer screw gauge. The average of the three readings at the broad, narrow and mid sections was taken as the shell thickness for each bird in the group.
- **Shell Weight (SW):** This was measured using electronic scale.
- **Albumen Height (AH):** This was measured with a Spherometer.
- **Albumen Weight (AW):** The albumen was placed in a Petri-dish on an electronic scale and the weight of the albumen was determined by difference.
- **Albumen Diameter (AD):** This was computed as follows:
  \[ AD = \frac{\text{Long diameter} + \text{short diameter}}{2} \]
- **Yolk Length (YL):** This was determined using Vernier Caliper.
- **Yolk Height (YH):** This was measured with a Spherometer.
- **Yolk Weight (YW):** The yolk was separated from the albumen and then placed in a weighed Petri-dish on an electronic scale and the weight of the yolk was determined by difference.
- **Yolk Diameter (YD):** This was measured using a vernier caliper as the width of the yolk.
- **Yolk Index (YI):** This was computed from the ratio:
  \[ YI = \frac{\text{Yolk height}}{\text{Yolk diameter}} \]

**Haugh Unit (HU):** This was estimated using the equation according to Haugh (1937):
\[ HU = 100\log (H+7.57-1.7 \ W^{0.37}) \]
Where, \( H \) = Observed Albumen Height (mm)
\( W \) = Observed Weight of Egg (g).

**Statistical Analysis**
Data collected for the internal and external egg quality parameters were subjected to Pearson’s Product Moment correlation test for the three varieties.
Results and Discussion

Correlation between Internal Egg Quality and External Egg Quality Traits in Three Varieties of Guinea Fowls from Week 28 to Week 46 of Age

The correlation between internal and external egg quality traits in three varieties of helmeted guinea fowl from week 28 to week 46 of age is shown in Table 2.

Significant positive correlation (p<0.05) was observed between SW and AW in Pearl and Lavender whereas it was positive but non-significant in Black. Nowaczewski et al. (2008) obtained a significant positive association between SW and AW in guinea fowls which agrees with the result obtained in Pearl and Lavender in this study, whereas, Sezai et al. (2013) obtained a non-significant positive correlation in guinea fowls which agrees with the result obtained in Black. This positive association implies that increases or decreases in AW was associated with increases or decreases in SW. Significant positive association (p<0.05) was observed between SW and AD in Lavender which was positive but non-significant in Black but significantly negative in Pearl. The positive association implies that AD increased as SW increased. The negative association implies that AD decreased as SW increased which may be considered for selection. These differences in the three varieties may be due to genetic or non-genetic factors (Chineke, 2001). Significant positive correlation (p<0.05) was observed between SW and YW in Black and Pearl whereas it was non-significantly negative in Lavender. The positive association implies that SW increased with increased YW. The result obtained for Black and Pearl are consistent with the significant positive correlation obtained between SW and YW in Pearl variety of guinea fowl (Oke et al. (2004), Nowaczewski et al. (2008) and Sezai et al. (2013) in guinea fowls. Significant positive correlation (p<0.05) was observed between SW and YH, and between SW and YI in Pearl whereas these were positive but non-significant in Black and Lavender. Oke et al. (2004) and Sezai et al. (2013) obtained a low positive association between SW and YH in guinea fowls which is consistent with the result obtained in Black and Lavender. Sezai et al. (2013) also obtained a non-significant positive association between SW and YI which again, concurs with the result obtained in Black and Lavender.

Significant negative association (p<0.05) was observed between ST and AH in Black, which was negative but non-significant in Pearl and positive but non-significant in Lavender. Oke et al. (2004) obtained a negative correlation in Pearl guinea fowl which is consistent with the findings for Pearl in this study whereas, Sezai et al. (2013) obtained a non-significant positive correlation in guinea fowl which concurs with the result obtained for Lavender. Significant positive association was observed between ST and YW in Black and Pearl; whereas, it was non-significantly positive in Lavender. Oke et al. (2004), Nowaczewski et al. (2008) and Sezai et al. (2013) reported positive correlation between ST and YW in guinea fowls which concurs with the result of this study. Nowaczewski et al. (2008) and Sezai et al.
(2013) also reported a positive association between ST and AW which concurs with the low positive correlation observed in Pearl and Lavender but contrasts the negative association in Black, which however, concurs with the negative report of Oke et al. (2004). Significant positive correlation (p<0.05) was observed between ST and YH in Black and Lavender, whereas it was positive but non-significant in Pearl. Results agree with the positive association obtained by Oke et al. (2004) and Sezai et al. (2013) in guinea fowls. A significant positive association (p<0.05) was observed between ST and YL in Black whereas it was positive but non-significant in Pearl and Lavender. This association shows that YL increases as ST increases. Sezai et al. (2013) reported a significant positive correlation between ST and YD in guinea fowls which concurs with the result obtained in Black. Oke et al. (2004) reported a non-significant positive association between ST and YD in Pearl guinea fowl which agrees with the result obtained for Pearl and Lavender.

Table 2: Correlation between External and Internal Egg Quality Traits in Three Helmeted Varieties of Guinea Fowl at 46 Weeks of Age

<table>
<thead>
<tr>
<th>VAR</th>
<th>TRAIT</th>
<th>AW</th>
<th>AH</th>
<th>AD</th>
<th>YW</th>
<th>YH</th>
<th>YD</th>
<th>YI</th>
<th>YL</th>
<th>HU</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLK</td>
<td>SW</td>
<td>0.289</td>
<td>0.274</td>
<td>0.101</td>
<td>0.502**</td>
<td>0.211</td>
<td>0.049</td>
<td>0.126</td>
<td>0.153</td>
<td>0.145</td>
</tr>
<tr>
<td></td>
<td>ST</td>
<td>-0.263</td>
<td>-0.412*</td>
<td>0.065</td>
<td>0.439*</td>
<td>0.490**</td>
<td>0.271</td>
<td>0.197</td>
<td>0.408*</td>
<td>-0.476**</td>
</tr>
<tr>
<td></td>
<td>EW</td>
<td>0.739**</td>
<td>0.316</td>
<td>0.148</td>
<td>0.763**</td>
<td>0.384*</td>
<td>0.165</td>
<td>0.202</td>
<td>0.296</td>
<td>0.085</td>
</tr>
<tr>
<td></td>
<td>EL</td>
<td>0.662**</td>
<td>0.498**</td>
<td>0.188</td>
<td>0.643**</td>
<td>-0.043</td>
<td>0.148</td>
<td>-0.089</td>
<td>0.203</td>
<td>0.319</td>
</tr>
<tr>
<td></td>
<td>EWD</td>
<td>0.634**</td>
<td>0.379*</td>
<td>0.086</td>
<td>0.651**</td>
<td>0.456**</td>
<td>0.251</td>
<td>0.194</td>
<td>0.452**</td>
<td>0.209</td>
</tr>
<tr>
<td></td>
<td>EI</td>
<td>-0.338*</td>
<td>-0.310</td>
<td>-0.141</td>
<td>-0.285</td>
<td>0.335*</td>
<td>0.018</td>
<td>0.208</td>
<td>0.086</td>
<td>-0.221</td>
</tr>
<tr>
<td>LAV</td>
<td>SW</td>
<td>0.641**</td>
<td>-0.110</td>
<td>0.555**</td>
<td>-0.025</td>
<td>0.144</td>
<td>0.004</td>
<td>0.111</td>
<td>0.026</td>
<td>-0.287</td>
</tr>
<tr>
<td></td>
<td>ST</td>
<td>0.138</td>
<td>0.032</td>
<td>0.071</td>
<td>0.009</td>
<td>0.431*</td>
<td>0.051</td>
<td>0.315</td>
<td>0.054</td>
<td>-0.083</td>
</tr>
<tr>
<td></td>
<td>EW</td>
<td>0.458**</td>
<td>-0.132</td>
<td>0.276</td>
<td>0.452**</td>
<td>0.217</td>
<td>-0.231</td>
<td>0.265</td>
<td>-0.091</td>
<td>-0.429**</td>
</tr>
<tr>
<td></td>
<td>EL</td>
<td>0.108</td>
<td>-0.350*</td>
<td>0.134</td>
<td>0.802**</td>
<td>0.153</td>
<td>-0.147</td>
<td>0.176</td>
<td>0.061</td>
<td>-0.573**</td>
</tr>
<tr>
<td></td>
<td>EWD</td>
<td>0.572**</td>
<td>-0.042</td>
<td>0.348*</td>
<td>0.063</td>
<td>0.017</td>
<td>-0.177</td>
<td>0.089</td>
<td>-0.166</td>
<td>-0.288</td>
</tr>
<tr>
<td></td>
<td>EI</td>
<td>0.306</td>
<td>0.332*</td>
<td>0.121</td>
<td>-0.772**</td>
<td>-0.144</td>
<td>0.028</td>
<td>-0.119</td>
<td>-0.175</td>
<td>0.379*</td>
</tr>
<tr>
<td>PRL</td>
<td>SW</td>
<td>0.430*</td>
<td>0.185</td>
<td>-0.408*</td>
<td>0.793**</td>
<td>0.379*</td>
<td>-0.251</td>
<td>0.390*</td>
<td>-0.031</td>
<td>-0.098</td>
</tr>
<tr>
<td></td>
<td>ST</td>
<td>0.165</td>
<td>-0.050</td>
<td>-0.079</td>
<td>0.327*</td>
<td>0.098</td>
<td>0.189</td>
<td>-0.013</td>
<td>0.245</td>
<td>-0.094</td>
</tr>
<tr>
<td></td>
<td>EW</td>
<td>0.657**</td>
<td>0.366*</td>
<td>-0.355*</td>
<td>0.828**</td>
<td>0.430*</td>
<td>-0.309</td>
<td>0.460**</td>
<td>-0.144</td>
<td>-0.019</td>
</tr>
<tr>
<td></td>
<td>EL</td>
<td>0.512**</td>
<td>0.169</td>
<td>-0.304</td>
<td>0.567**</td>
<td>0.281</td>
<td>-0.474**</td>
<td>0.420*</td>
<td>-0.363*</td>
<td>-0.166</td>
</tr>
<tr>
<td></td>
<td>EWD</td>
<td>0.679**</td>
<td>0.353*</td>
<td>-0.116</td>
<td>0.649**</td>
<td>0.244</td>
<td>-0.039</td>
<td>0.193</td>
<td>0.089</td>
<td>0.096</td>
</tr>
<tr>
<td></td>
<td>EI</td>
<td>-0.131</td>
<td>0.021</td>
<td>0.274</td>
<td>-0.229</td>
<td>-0.160</td>
<td>0.505**</td>
<td>-0.347*</td>
<td>0.455**</td>
<td>0.236</td>
</tr>
</tbody>
</table>

*Significant at 0.01 probability level; ** Significant at 0.05 probability level; SW- Shell weight, ST- Shell thickness, EW- Egg weight, EL- Egg length, EWD- Egg width, EI- Egg index; AW- Albumen weight, AH-Albumen height, AD- Albumen diameter, YW- Yolk weight, YH- Yolk height, YD- Yolk diameter, YI- Yolk index, YL- Yolk length, HU- Haugh unit; Blk-Black, Lav-Lavender, Prl-Pearl

Significant positive correlation (p<0.05) was observed between EW and AW in the three varieties which is consistent with the positive reports by Oke et al. (2004) (r= 0.85) Nowaczewski et al. (2008) (r= 0.974)
and Sezai et al. (2013) \((r = 0.201)\) in guinea fowls; Nwachukwu (2006) also reported a positive association \((r = 0.22 \text{ to } 0.99)\) in his \(F_1\) hybrid chickens. Significant positive correlation \((p<0.05)\) was observed between EW and AH in Pearl, which was non-significantly positive in Black and non-significantly negative in Lavender. Oke et al. (2004) reported a low positive association in Pearl guinea fowl \((r = 0.23)\) between EW and AH which is consistent with the findings for Black; whereas, Sezai et al. (2013) obtained a significant positive association which is consistent with the report in Pearl. Significant negative correlation \((p<0.05)\) was observed between EW and AD in Pearl whereas it was non-significantly positive in Black and Lavender. This implies that an increase in EW was associated with decreases in AD in Pearl which is characteristic of high quality eggs. Very strong positive association was observed between EW and YW in the three varieties. This result is consistent with the positive report obtained by Nwachukwu (2006) \((r = 0.46 \text{ to } 0.99)\) in Naked neck and Frizzle crosses, Sezai et al. (2013), Nowaczewski et al. (2008), Singh et al. (2009) and Oke et al. (2004) in guinea fowls. Significant positive association \((p<0.05)\) was observed between EW and YH in Pearl and Black whereas it was positive but non-significant in Lavender. Sezai et al. (2013) obtained a significant positive association between EW and YH in guinea fowl which concurs with the report obtained for Pearl and Black. Oke et al. (2004) reported a negative correlation \((r = -0.15)\) between EW and YH in Pearl guinea fowl which contradicts the present findings. Significant positive correlation was observed between EW and YI in Pearl which is consistent with the significant positive correlation reported by Sezai et al. (2013) and Nwachukwu (2006). In guinea fowls and hybrid chicken cross \((E \times Na)\) respectively. The association was non-significantly positive in Black and Lavender. Singh et al. (2009) obtained a negative association between EW and YI which contradicts the result of this study. A negative association \((p<0.05)\) was observed between EW and HU in Lavender which was negative but none significant in Pearl and positive but non-significant in Black. The negative association implies that HU decreased as EW increased in Lavender and fairly in Pearl or vice versa. Sezai et al. (2013) and Singh et al. (2009) obtained positive associations between EW and HU in guinea fowls which is consistent with the result obtained in Black. Nwachukwu (2006) reported positive associations in all his \(F_1\) hybrid chicken crosses \((r = 0.12 \text{ to } 0.900)\) between EW and HU. According to Nwachukwu (2006), positive association indicates that reasonable improvement can be made in HU through selection for egg weight. However, the decreases in Lavender and Pearl did not compromise the high quality of their eggs as revealed in their average HU values in table 3 which surpassed the 70% benchmark for high quality eggs. Such decline may be due to transient environmental factors.

Significant positive association \((p<0.05)\) was observed between EL and AW in Black and Pearl whereas a positive but non-significant association was observed in Lavender. Oke et al. (2004) reported a low
positive association between EL and AW (r= 0.21) which agrees with the positive correlations obtained in this study. Significant positive association (p<0.05) was observed between EL and AH in Black which was positive but non-significant in Pearl, and negative but non-significant in Lavender. Sezai et al. (2013) similarly obtained a significant positive association which concurs with the observation in Black in this study. The positive association implies that AH increases with an increase in EL or vice versa. Increasing AH is seldom characteristic of high quality eggs. These reports keep pointing out the fact that the Black and the Pearl varieties had better egg quality characteristics than the Lavender. The negative association in Lavender implies that AH decreases as EL increases or vice versa. Oke et al. (2004) reported a low positive association between AH and EL (r= 0.06) in Pearl guinea fowl which agrees with the present report for Pearl. For selection purposes, an association that can increase EWD alongside with the EL and an associated increase in AH noted for high quality eggs will be desired. Very strong positive correlations (p<0.05) were observed between EL and YW in the three varieties. This implies that an increase in EL was associated with an increase in YW. Therefore any attempt to increase the EL through selection will automatically increase the YW. Sezai et al. (2013) and Oke et al. (2004) also reported a positive correlation between EL and YW in Pearl guinea fowl. Significant negative correlation (p<0.05) was observed between EL and YD in Pearl whereas it was positive but non-significant in Black, and negative but non-significant in Lavender. The significant negative association implies that YD decreased as EL increased. A decreasing YD associated with increasing AH is characteristic of good quality eggs. Sezai et al. (2013) and Oke et al. (2004) obtained a non-significant negative association between EL and YD in guinea fowl which agrees with the present findings for Lavender. Significant positive association (p<0.05) was observed between EL and YI in Pearl which was positive but non-significant in Lavender and none significantly negative in Black. Sezai et al. (2013) obtained significant positive association between EL and YI which is in consonance with the result obtained in Pearl. This implies that YI increased with increases in EL in Pearl. An increase in YI is a function of increasing YH and decreasing YD which is characteristic of good quality eggs. Significant negative correlation (p<0.05) was observed between EL and HU in Lavender, which was negative but non-significant in Pearl and positive but non-significant in Black. Sezai et al. (2013) obtained a non-significant positive association between EL and HU which concurs with the present result obtained in Black. This again points out that HU either decreased with increases in EL which is undesired for selection purposes or increased with decreases in EL. The low positive association shows that fair increases in EL were associated with fair increases in HU which is desirable in selection. However, the decline in HU in Lavender and Pearl is very appreciable and not enough to compromise their egg quality considering their average HU values.
Significant positive correlation (p<0.05) was observed between EWD and AW in the three varieties. This report is consistent with the significant positive correlation obtained by Oke et al. (2004) and Sezai et al. (2013) in guinea fowls. Significant positive correlation (p<0.05) was observed between EWD and AH in Black and Pearl, whereas it was non-significantly negative in Lavender. Oke et al. (2004) and Sezai et al. (2013) reported positive correlation between EWD and AH in guinea fowl which agrees with the present findings for Pearl and Black. The association implies that an increase in EWD was associated with an increase in AH which is vital for selection purposes. Significant positive association (p<0.05) was observed between EWD and YW in Pearl and Black, whereas a low positive correlation was observed in Lavender. Oke et al. (2004) and Sezai et al. (2013) also reported a significant positive correlation between EWD and YW which is consistent with the reports of this study for Pearl and Black. Significant positive correlation (p<0.05) was observed between EWD and YH in Black which was non-significantly positive in Pearl and Lavender. Sezai et al. (2013) reported a significant positive correlation which agrees with the result obtained for Black. A significant positive correlation (p<0.05) was observed between EWD and YL in Black which was positive but non-significant in Pearl and negative but non-significant in Lavender. This significant association shows that YL increases or decreases with an increase or decrease in EWD in Black.

Conclusion

The correlation result showed strong relationships among the three varieties with some variations which may be due to non-genetic and/or genetic reasons. The three varieties showed great similarities in the following associations between egg weight vs. albumen weight, egg weight vs. yolk weight, egg length vs. yolk weight and egg width vs. albumen weight. The differences that exist in certain associations in the three helmeted varieties suggest possible genetic polymorphic differences in the three varieties. This result necessitates separately planned improvement programs in the three helmeted varieties.

References


