Phenotypic, socio-economic and growth features of Guinea fowls raised under different village systems in West Africa

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In Benin, family poultry farming has become an important activity in economic and social aspects that contribute to food security, poverty reduction and well-being. However, current information about poultry production and consumption is still limited. This information would be useful to improve the sustainable exploitation of agricultural and commercial genetic resources. We aimed to identify and assess the socio-economic and phenotypic features as well as to investigate phenotypic variability and growth performance of guinea fowls raised under different environments. Growth performance and survival rates of local guinea fowl varieties were recorded in three zones of Benin: Collines, Atacora and Borgou. Seven varieties, Gray, Common, Bonaparte, White, Black, Isabelle and Multicolored, were identified in Benin. The farmers choose a variety to be raised based on breeding system, agro-ecological zone, disease resistance, market price and production purpose. Bonaparte, Common and Gray varieties emerged as the most resistant whereas White, Black and Gray outperformed in growth and may be used for breeding purposes. The semi-confinement system could be recommended for startup as a temporary solution to improve production of local guinea fowls in Benin. The existence of several varieties on farms does not encourage genetic conservation and improvement of these resources. Establishing selection or crossbreeding programs in controlled environments would be more appropriate for guinea fowls raised in Benin.

Key words: Survey, agro-ecological zones, confinement systems.

INTRODUCTION

In West Africa, family poultry farming has become an important activity in economic and social aspects. Strategies to develop family poultry production at village level have been reported over the years (Riise et al., 2005). In Benin, family poultry is meat/eggs sources that contribute to food security, poverty reduction and well-being of local people. This activity has potential profitability leading farmers to increase their production (Guèye, 2009; Moreki et al., 2010). However, current information about poultry production and consumption in Benin is still limited. In 2013, poultry population (chicken, duck, guinea fowl, turkeys and pigeons) was about 18.19
million (http://faostat.fao.org). Despite guinea fowl meat/eggs production is the third largest, chicken (1\textsuperscript{st}) and duck (2\textsuperscript{nd}), productivity is still low. This fact might be due to genetic and environmental factors as well as guinea fowl farming issues (Sanfo et al., 2007; Fajemilehin, 2010).

Chrysostome (1995) identified several guinea fowl varieties in Benin, such as Gray, Lilac, Isabelle, Chamoise, Albino, Variegated and Black. However, phenotypic features were not well reported; a fact that still limits any breeding improvement of guinea fowls. Few reports of environmental and genetic variability across varieties can be found in literature (Kayang et al., 2002; Kayang et al., 2010); thus, more efforts need to be done to better describe and evaluate local guinea fowl in terms of phenotypic and genetic diversity. This information would be useful to improve the sustainable exploitation of agricultural and commercial genetic resources.

This study try to address two hypotheses: 1) there are different guinea fowl varieties in Benin raised under different breeding systems and/or agro ecological zones not well reported or even not well established for phenotypic socio-economics aspects, and 2) the growth performance of these guinea fowl varieties might vary significantly across environments. Toward this orientation, we aimed to investigate the phenotypic variability and growth performance of local guinea fowl varieties raised under different environments to further indicate a better scenario to raise these birds. This will guarantee not only the genetic conservation and but also productivity improvement.

MATERIALS AND METHODS
Plumage color investigation and socio-economic importance

A survey was conducted on 131 village farmers in three different agro-ecological zones (Atacora, Borgou and Collines) in Central and North parts of Benin. This survey aimed to identify and assess the socio-economic and phenotypic features of local guinea fowl varieties. The Atacora and Borgou zones are characterized by semi-arid Sudanese climate, with annual rainfall ranging from 900 to 1100 mm, average temperature is 27.5°C, humidity is around 50% and there are from fair to poor grazing areas. In Collines zone, the climate is the Guinean Sudanese with average rainfall of 1200 mm per year. The annual average temperature is 27°C and humidity of 60%. This is an area of transhumance where agricultural residues are abundant and potentially used (Bertrand et al., 2013).

The surveyed farmers were chosen based on their experience in the guinea fowl production, farm accessibility, absence of exotic guinea fowls and availability of local varieties. The surveyed farmers were identified on the guinea fowl producers list made by the project between Belgium and Benin on livestock development in Borgou (FSA5) and snowball survey based on rural development officers in the Departments of Collines and Atacora.

The survey was based on a socio-economic quiz, phenotypic aspects of different guinea fowl varieties as well as on observations and discussions with farmers. Dams (1996) and Fajemilehin (2010) identified different varieties of guinea fowl based on color and presence/absence of spots and/or beads in plumage. Information on egg source, production targets (purpose and market price), disease resistance, reproduction, management and causes of death were also performed. In general, mating within varieties is not well organized and conducted as it is between varieties in border farms. In these farms, the poultry scavenging system is better established.

Survival rates and growth performance

From birth to 12 weeks old, measurements of survival rates and growth performance for six varieties (Gray, Common, Bonaparte, White, Black and Isabelle) were recorded in Collines, whereas only three (Common, Bonaparte and White) were recorded in Atacora and Borgou zones. Guinea fowls were individually identified at birth by numbered rings (tags) on the leg and further weighted every week using a precision scale. These animals were raised in two different systems: extensive with feed additives and semi-confinement. The first system was followed-up in all zones whereas semi-confinement only in Collines.

In the semi-confinement system, farmers use many types of feed additives such as termites and crushed maize kernels; by adding or not toasted soy/sorghum or maize malt/soy beans from homemade cheese. A total of 566 individuals from different varieties, 37 incubations and 13 poultry farms, under extensive system, were recorded from birth to 12 weeks old (Table 1).

Statistical analysis

Frequency data analysis was performed by using Proc FREQ whereas the growth performance data using Proc GLM procedures from SAS software (SAS, 2002).

Sources of variation were evaluated via the following equation:

\[ y_{ijk} = \mu + D_i + R_j + U_k + D_iR_j + e_{ijk}, \]

\( y_{ijk} \) is the observation for dependent variables associated to the overall mean \( \mu \), the fixed effects of variety \( i (D_i) \), of zone \( j (R_j) \) and system management \( k (U_k) \); \( D_iR_j \) is the variety*zone interaction and \( e_{ijk} \) is the corresponding residual error.

RESULTS
Plumage color investigation and socio-economic importance

Based on plumage color, our investigation showed that there was indeed diversity of guinea fowl varieties in Central and North of Benin. Seven varieties were identified: gray beaded (Common; Figure 1a and b), gray
Table 1. Number of animals.

<table>
<thead>
<tr>
<th>Zone/Variety</th>
<th>Black</th>
<th>Bonaparte</th>
<th>Common</th>
<th>Gray</th>
<th>Isabelle</th>
<th>White</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atacora</td>
<td>0</td>
<td>72</td>
<td>111</td>
<td>0</td>
<td>0</td>
<td>69</td>
<td>252</td>
</tr>
<tr>
<td>Borgou</td>
<td>0</td>
<td>36</td>
<td>26</td>
<td>0</td>
<td>0</td>
<td>36</td>
<td>98</td>
</tr>
<tr>
<td>Collines</td>
<td>26</td>
<td>40</td>
<td>64</td>
<td>26</td>
<td>25</td>
<td>35</td>
<td>216</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>148</td>
<td>201</td>
<td>26</td>
<td>25</td>
<td>140</td>
<td>566</td>
</tr>
</tbody>
</table>

Figure 1. Guinea fowls varieties named based on plumage color: Common\(^{a,b}\); Bonaparte\(^{c,d}\); White\(^{e}\); Gray\(^{g,h}\); Isabelle\(^{i,j,k,l}\); Black\(^{m,n,o}\); Multicolored\(^{p}\).

beaded with white chest (Bonaparte; Figure 1c and d), non-beaded white (White; Figure 1e and f), Gray (Figure 1g and h), Isabelle (Figure 1i, j, k and l), Black (Figure 1m, n and o) and Multicolored (Figure 1p).

In Benin, guinea fowls have been mainly raised for dual purpose. Among all surveyed zones, 73% of farmers raise guinea fowls for that purpose, while only 18% and 9% raise them for egg and meat purposes, respectively (Table 2). This production system concerns mainly Atacora and Borgou zones. In Collines zone, 65% of farmers raise dual and 35% egg purposes fowls. The main egg source is border farmers followed up by local market (59% vs. 13% in average), whereas random mating appeared to be the most used breeding system (Table 2). In order to improve production, from all 131 farmers, 72% adopted random and 23% close relatives mating breeding system whereas 5% keep buying eggs outside Benin. The rusticity of guinea fowl varieties raised in Central Benin (Collines) is shown in Table 3.

The Common guinea fowl variety appears to be the most rustic (75.3%), followed by Black (52%) and Bonaparte (47%). The Multicolored, White, Isabelle and Gray varieties are the most sensitive guinea fowl varieties in Benin (Table 3).

The market price of guinea fowls varied between agro-ecological zones and varieties (Table 4). The white variety...
Table 2. Production purpose, eggs source and breeding system in agro ecological zones of Benin.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Agro-ecological zone (Number of farmers)</th>
<th>Atacora (53) (%)</th>
<th>Borgou (42) (%)</th>
<th>Collines (36) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Egg and meat</td>
<td></td>
<td>74</td>
<td>83</td>
<td>65</td>
</tr>
<tr>
<td>Egg</td>
<td></td>
<td>14</td>
<td>9</td>
<td>35</td>
</tr>
<tr>
<td>Meat</td>
<td></td>
<td>12</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Egg source</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Another village</td>
<td></td>
<td>6</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Border country</td>
<td></td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Border farmer</td>
<td></td>
<td>62</td>
<td>42</td>
<td>65</td>
</tr>
<tr>
<td>Local market</td>
<td></td>
<td>11</td>
<td>25</td>
<td>18</td>
</tr>
<tr>
<td>Border farmer and local market</td>
<td></td>
<td>16</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>Own hatching sources</td>
<td></td>
<td>4</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Breeding system</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Random</td>
<td></td>
<td>83</td>
<td>44</td>
<td>60</td>
</tr>
<tr>
<td>Eggs outside Benin</td>
<td></td>
<td>4</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Mating close relatives</td>
<td></td>
<td>13</td>
<td>50</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 3. Guinea Fowl variety resistance according to Benin farmers.

<table>
<thead>
<tr>
<th>Resistance/Variety</th>
<th>Common</th>
<th>Bonaparte</th>
<th>White</th>
<th>Gray</th>
<th>Isabelle</th>
<th>Black</th>
<th>Multicolored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediate (%)</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
<td>23.4</td>
</tr>
<tr>
<td>High (%)</td>
<td>75.3</td>
<td>46.7</td>
<td>22.1</td>
<td>28.6</td>
<td>23.4</td>
<td>51.9</td>
<td>20.8</td>
</tr>
<tr>
<td>Low (%)</td>
<td>1.3</td>
<td>29.9</td>
<td>54.5</td>
<td>48.0</td>
<td>51.9</td>
<td>24.7</td>
<td>55.8</td>
</tr>
</tbody>
</table>

Table 4. Guinea fowl average market prices (standard error) by varieties and zones.

<table>
<thead>
<tr>
<th>Variety/Zone</th>
<th>Average market price (standard error)</th>
<th>Zone</th>
<th>Variety</th>
<th>Zone*Variety</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Atacora b</td>
<td>Borgou b</td>
<td>Collines a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common c</td>
<td>2211 (45.5)</td>
<td>2367 (54.4)</td>
<td>2433 (47.6)</td>
<td>***</td>
<td>NS</td>
</tr>
<tr>
<td>Bonaparte c</td>
<td>2132 (38.8)</td>
<td>2206 (42.0)</td>
<td>2533 (55.1)</td>
<td>***</td>
<td>NS</td>
</tr>
<tr>
<td>White a</td>
<td>2886 (69.6)</td>
<td>3133 (142.3)</td>
<td>3278 (89.6)</td>
<td>***</td>
<td>NS</td>
</tr>
<tr>
<td>Gray a</td>
<td>2275 (49.6)</td>
<td>2256 (28.1)</td>
<td>2400 (53.7)</td>
<td>***</td>
<td>NS</td>
</tr>
<tr>
<td>Isabelle b,c</td>
<td>2328 (60.1)</td>
<td>2356 (29.5)</td>
<td>2450 (61.5)</td>
<td>***</td>
<td>NS</td>
</tr>
<tr>
<td>Black b</td>
<td>2475 (46.6)</td>
<td>2656 (46.0)</td>
<td>2700 (51.5)</td>
<td>***</td>
<td>NS</td>
</tr>
<tr>
<td>Multicolored b,c</td>
<td>2193 (36.3)</td>
<td>2244 (28.1)</td>
<td>2433 (55.1)</td>
<td>***</td>
<td>NS</td>
</tr>
</tbody>
</table>

*: Significant; **: highly significant; ***: very highly significant; NS: non-significant; Zones/varieties followed by same letters (a, b, c) are not statistically different ($P<0.05$).

was the most expensive with average prices of 2886, 3133 and 3278 CFA franc (FCFA) in Atacora, Borgou and Collines zones, respectively. Black and Isabelle market prices were similar between zones; however, these prices differed from Gray, Common, Multicolor and Bonaparte varieties (Table 4). The guinea fowl market price was higher in Collines than Atacora ($P<0.01$) and Borgou ($P<0.04$) zones. Nevertheless, similar prices were observed between Atacora and Borgou ($P>0.05$; Table 4).

Survival rates

The survival rates varied according to bird age (Figure 2). No deaths were observed for Common, Bonaparte and
Black varieties in the first week. At week three, survival rates of four varieties were similar (Common, Bonaparte, Gray and White; around 90%), whereas Isabelle and Black varieties presented smaller rates, 67% and 70%, respectively. From week three to eight, Isabelle and Black continued to be more susceptible, White and Gray had intermediary whereas Bonaparte and Common presented the highest survival rates (Figure 2). Survival rate stability between varieties was observed from week nine to 12, except for Black. This variety showed an abrupt decrease from week 11 to 12 (Figure 2).

**Growth performance**

**Growth performance of Common, Bonaparte and White Guinea fowls in Atacora, Borgou and Collines zones**

In general, guinea fowls growth performances differed between zones (Table 5). These differences were significant for almost all the growth period. Higher growth performances were observed in Borgou (from week 0 to 8) and Collines (from week 9 to 12) zones. In summary,
better growth performances were identified in Collines followed by Borgou and Atacora, respectively. Growth performances between varieties highly differed at birth ($P<0.01$), while there was no statistical differences at week one (Table 5). The Common variety presented higher performances from week two to eight in Atacora and Borgou zones, whereas White guinea fowls outperformed in Collines. At week 12, the White variety had better performances in all zones. Moreover, zone by variety interaction was statistically significant for all tested period (week 0 to 12; $P<0.001$; Table 5).

**Growth performance between Bonaparte and Common varieties raised under two different village systems**

Although both varieties showed similar body weight at birth under extensive and semi-confinement systems, Bonaparte and Common varieties outperformed under semi-confined system from the first to the tenth week (Figure 3). Differences between these varieties were observed at weeks 12 ($P<0.05$) where the heaviest weights were registered for Common variety under extensive system.

In summary, from week one to eight, birds under semi-confinement system outperformed in terms of growth performance compared to those under an extensive raising system (Figure 3). After week 8, when birds under the semi-confinement system were changed from confinement to extensive, growth performance were, in general, similar between systems.

**Comparative growth performances between six Guinea fowl varieties raised under an extensive system in Collines zone**

The Collines zone was previously reported as the best zone in terms of growth performance. Therefore, we further compared varieties raised in this zone under the most common village system (extensive). Growth performances comparisons between all guinea fowls was performed. Figure 4 showed differences in growth performances between varieties along the tested period. Highest body weights at week 12 were observed for White and Gray varieties, whereas the lowest weights were observed for Isabelle and Bonaparte. In general, the Black variety outperformed from the starting phase (weeks 2, 3, 4, 6 and 7) and White in the final period, week eight to 12. Common and Bonaparte varieties showed similar results up to week 9, whereas from weeks 10 to 12, Common outperformed. The Gray variety showed smaller performances in the beginning (weeks 0 to 7), but higher after this period compared to other varieties.

**DISCUSSION**

Seven (7) guinea fowl varieties have been identified in North and Central parts of Benin (Figure 1). The Common (Figure 1a and b), Gray (Figure 1g and h) and Black (Figure 1m, n and o) varieties were also identified in Nigeria by Fajemilehin (2010) and Niger by Singh et al. (2010). The Isabelle (known as Rousse or JAA) and
White varieties were also identified by Singh et al. (2010) with similar plumage color. In addition, the Bonaparte variety has been reported in different studies (Chenevard, 1931; Cauchard, 1971; Dams, 1996). Albino feathers on the chest and secondary flight wings are specific features of Bonaparte distinguishing it from Gray (Figure 1d), Black (Figure 1n) and Isabelle (Figure 1i) varieties. This white color on the chest and secondary wings appeared to be heritable over generations. In the plumage of young Isabelle birds can be observed a change from fawn to gray color (Figure 1i, j, k and l). This change tends to be in different degrees between fowls. Gene features related to the color of Isabelle variety would be recessive and/or related to sex (Dams, 1996), and therefore the explanation about this exchange remains unknown. Globally, some of the identified varieties in our study have already been described by Chrysostome (1995). However, one of the varieties (Chamoise) described by these authors is currently absent in Benin or currently named Isabelle. In addition, the Multicolored variety observed in our study had been described by these authors as Variegated variety and been characterized by several plumage colors unevenly distributed all over the body (Figure 1p).

Our investigations showed that most guinea fowl eggs/meat production in the agro ecological zones is under extensive system with or without feed additives. Feed additives are cooked by using termites and cereals. This food is further offer to young birds, and the amount and frequency varied depending upon farmer and zone. These results and the uniform farming system in West African corroborated with literature (Sanfo et al., 2007; Boko et al., 2013; Konlan and Avornyo, 2013; Avornyo et al., 2016). In general, farmers choose a variety to be raised based on production purpose, diseases resistance and market price. This information agreed with those reported by Sanfo et al. (2012) who stated that White guinea fowl are not seen by farmers as one of the best to be raised. This is due to its plumage color (predator attraction), lightweight body shape and low laying performance.

The largest proportions of farmers (73%) raising dual-purpose guinea fowls are known by the higher egg production and consumer acceptance compared to local chickens. This is in agreement with literature (Sanfo et al., 2007). Some farmers (18%) prefer to have limited laying center sheds, due to limited available space in crowded areas or even robbery likelihood. These eggs are used for consumption to increase profit or both. The higher percentage of farmers under egg purpose system in Collines compared to Atacora and Borgou might be explained by the smaller odds to be stolen and number of predators. Meat purpose farmers (9% in average) usually buy eggs, incubates them, and after hatching, the fowls are raised until sold out. The main reason for this is to not face transportation costs and risks buy selling eggs as well as robbery and predators.

The main egg source was eggs incubation from border farmers (59.49% in total). This value was higher than the 44% reported by Avornyo et al. (2016) in Ghana. This egg source is performed in order to ensure the eggs quality and fertility. This statement is consistent with

![Figure 4. Growth performance means for varieties raised under an extensive system in Collines zone.](image-url)
Chrysostome (1993) who believed that reproduction is ensured by incubation under hen and eggs fertility by high sex ratio.

Unlike our study where random mating is the most used breeding system by farmers (72%), Avornyo et al. (2016) reported high mating rates of close relatives. Despite random mating may lead to lower genetic improvement, close relatives mating might be carefully used in order to avoid inbreeding. Some farmers are aware from this fact and already appeal to eggs acquiring from other cities or even border countries. However, these sources remain limited due to several risks as transportation that may affect egg quality and fertility.

In Benin, guinea fowl selection by farmers is made based on mass selection guided by farmer’s practices and interests. Therefore, by verifying different guinea fowl production systems in Benin, we may infer that farmers will have harsh time to achieve animal breeding improvement. This is due to the absence of controlled production and reproduction systems. It would be hard to establish animal breeding programs since there is no quality in phenotype recording as well as reliable pedigree. This observation is in agreement with Sanfo et al. (2007), who reported that some farmers randomly practice mass selection based on criteria as eggs hardness and shape, and bird body shape.

Another interesting selection criterion is disease resistance. This can guarantee fewer losses in the production system. The resistance diversity between varieties reported in this study corroborates with those results reported by Sanfo et al. (2012). According to farmers, these differences might be due to the raise condition and animal care. However, farmers appear to not take into account the frequency of each variety in their system. According to our findings, the Bonaparte variety presented a more stable survival rates testifying their adaptability to different husbandry conditions. On the other hand, the Gray variety was characterized as susceptible in the starting phase but stable after this period. This might be due to the viability of young Gray guinea fowl to outbreaks than to husbandry conditions and/or care. At last, White, Black and Isabelle were most susceptible varieties due to their survival rate instability, especially after week four. This survival rate instability may be characterized by the influence of husbandry conditions and susceptibility to parasites, bacteria and virus (Boko et al., 2013).

In general, the prices were relatively higher in Collines. Collines is a less known agro-ecological zone in Benin. The market prices of guinea fowls were significantly higher compared to those reported by Boko et al. (2011) and Dahouda et al. (2008) who reported market prices values of 1500 and 1630 FCFA, respectively. Market prices increase with demand increasing of guinea fowls or production decrease. The unexpected second reason may happen due to diseases and even outbreaks, the main responsible for a large number of deaths (Boko et al., 2013).

Growth performances of Gray, Bonaparte and White varieties varied between zones (Atacora, Borgou and Collines). It happened due to different food availability and care providing to young birds by farmers (Table 4). These results agreed with those reported by Singh et al. (2010) who have reported different performance (range 780-925g) in different environments, for the same variety at week 12.

In Benin, the Atacora and Borgou are considered the most important zones for guinea fowl livestock. In these zones, farmers provide efficient care, whereas in Collines they are less experienced. This explained higher growth performances in Atacora and Borgou (Table 4). Care and food supplement provided by farmers enable faster growth of young guinea fowls (Sanfo et al., 2012). From eight weeks old (after critical period), farmers from Atacora and Borgou have been reduced care, and animals have been faced hard periods to adapt to the new condition of life. On the other hand, the animals from Collines are usually adapted to this condition at this point since care is minimal from the beginning. In addition, the availability of food in these zones is different and this has influenced growth performance. The Collines zone outperformed Atacora and Borgou due to its high grain production covered vegetation (http://faostat.fao.org). The Atacora is under desert influence and presents low soil fertility, therefore, is the least fortunate zone.

Mortality rates of young guinea fowls under semi-confinement system tended to decreased in our study. Similar results have been reported in literature (Laurenson, 2002; Dahouda et al., 2008; Boko et al., 2013). Significant improvements on growth performance were achieved compared to the extensive system, especially in the starting phase. Similar results after week eight (Figure 3) may be due to the adaptation time for birds under the semi-confinement system, i.e., fowls might had smaller gains, none or even lost weight. Nevertheless, the semi-confinement system still appeared to be most efficient to improve farms profitability. In addition, animals under this type of system are also less stressed and, therefore, to improve feed supplies in this system could be very beneficial for farmers (Laurenson, 2002; Dahouda et al., 2008).

Growth performance differences observed between varieties under extensive system in Collines (Figure 3) were in agreement with Sanfo et al. (2007) and Fajemilehin (2010). However, Sanfo et al. (2007) and Fajemilehin (2010) observed that Black and Common varieties outperformed, whereas, in our study, the White variety presented the best performance. Genetic diversity of varieties may explain differences in weight and offer an opportunity to improve growth performance of guinea fowls through selection (Sanfo et al., 2012).

However, guinea fowl growth curves can be very different. Some varieties such as Common, Gray and Black had faster growth at beginning and lower by the
end. Fajemilehin (2010) reported similar results for the same varieties. Differences in growth might be also explained by the adopted husbandry system, parasitism, bacterial diseases or even supply of feed additives (Dahouda et al., 2008; Boko et al., 2013). In summary, White, Gray and Black guinea fowls appeared to have faster growth compared to Common, Bonaparte and Isabelle varieties in North and Central parts of Benin.

Although our study was designed to cover regions known for their raising guinea fowl potential in Benin, the survey- and measurement-based data still depends upon concerns of farmers regarding production history, that is, absence of valuable recording systems at national level as well as data recording at farmer level. In this context, the guinea fowls varieties identification was mostly based on plumage color and farmers’ knowledge. In general, it appears that main interests of farmers were linked to economic rather than technical issues.

To overcome these limitations, data recording in a controlled station should be encouraged towards better identification of “pure” individuals of those studied varieties. Advanced genetics/genomics techniques and novel reproduction biotechnologies should also be prioritized.

Conclusion

Seven varieties of guinea fowls were identified in Benin and farmers choose a variety to be raised based on breeding system, agro-ecological zone, disease resistance, market price and production purpose.

Bonaparte, Common, and Gray varieties emerged as most resistant whereas White, Black and Gray outperformed in growth and may be used for breeding purposes.

The semi-confinement system could be recommended for startup as a temporary solution to improve production of local guinea fowls in Benin.

The existence of several varieties on farms does not encourage genetic conservation and improvement of these resources. However, establishing selection or crossbreeding programs in controlled environments would be more appropriate for guinea fowl raised in Benin.

CONFLICT OF INTERESTS

The authors declare that there are no conflicts of interest arising from intellectual, personal, or financial circumstances of our research.

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