EFFECTS OF SEX AND STRAIN ON DOCILITY AND SOME PERFORMANCE TRAITS OF LOCAL GUINEA FOWL (*NUMIDA MELEAGRIS*) IN GHANA

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ABSTRACT
The objective of this study was to evaluate the effect of sex and strain of bird on cage docility score and Heterophil/Lymphocyte (H/L) index score of local guinea fowl strain in Ghana and to evaluate the relationship between docility and performance traits (weight gain, feed intake). Seventy-nine (79) guinea fowls comprising Pearl (37 males and 20 females), Lavendar (6 males and 5 females) and White (5 males and 6 females) local guinea fowls at age 10 months were used. The birds were tested for cage docility and H/L index scores (an index for temperament/docility) in a Completely Randomised Design experiment. The data were analysed and significant differences among means were separated using the LSD procedures of SAS. Average cage docility score was 2.13, meaning birds studied were generally flighty (non-docile). Males and females' docility score were 2.2 and 2.1 respectively indicating both sexes were flighty. Sex and strain of bird had no significant effect ($p>0.05$) on docility score of birds. According to H/L index scores of docility, sex had no significant effect on docility ($p>0.05$). However, the strain of bird had significant ($p = 0.0002$) effect on H/L index scores. The cumulative effect of sex and strain had significant effect ($p<0.05$) on docility. The study revealed 64.6%, 19.9%, 14.2% and 1.3% of the birds were flighty, restless, docile and aggressive respectively. Among the three strains, the Lavendar had the lowest H/L index score of docility (0.09±0.003). The H/L index score positively correlated with the cage docility score ($p=0.023$). There was no significant effect ($p>0.05$) of docility on feed intake and weight gain of the guinea fowls. In conclusion, local guinea fowl strains in Ghana are still non-docile and therefore the docility traits must be given a consideration in developing the breeding objective for breed improvement of the bird.

Keywords: *Temperament, Heterophyl/Lymphocyte (H/L) index score, flighty*

INTRODUCTION
Temperament is the difference between individual animals in their behavioural response to alarming or challenging situations where individuals are often consistent in the way they respond when the challenge is repeated. Such differences between animals are of most importance to humans in situations that involve human interaction, like handling or moving them. Some animals are calm and docile, while others are distressed and struggle to escape (Haskell *et al*., 2014).

The question of whether the degree of stress

response activation correlates with temperament or not has been the bane of researches in recent years. That is, are stressful animals more temperamental? Recent researches suggested that stress responsiveness is associated with animal behaviour, specifically temperament (Burdick *et al.*, 2011). In connection with this, Burdick *et al.* (2011) found that more excitable temperamental cattle, exhibit greater basal concentrations of stress related hormones (especially glucocorticoids and catecholamines). They concluded that, understanding the interrelationship of stress and temperament can help in the development of selection and management practices that reduce the negative influence of temperament on growth and productivity.

In addition, heterophils as primary phagocytic leukocyte proliferate in circulation in response to infections, inflammation and stress (Jain, 1993; Campbell, 1995; Rupley, 1997; Harmon, 1998; Thrall, 2004; Cīrule *et al.*, 2012). These scientists have already established that there is a relationship between blood parameters (Heterophyl and lymphocytes and H/L index) and stress levels in animals. Hence, it is now preferred to be used in indexing stress in vertebrates. Vleck *et al*. (2000) reiterated the use of H/L ratio as index of stress in birds while Scoppe *et al.* (2002) confirmed the H/L ratio has been used as a reliable index of stress in birds.

Based on the premise that stress has a link with certain behaviours and conditions such as fear, anxiety, and depression (Tyrka *et al.,* 2008), the H/L index parameter is based on the stress levels of the bird which associates with heterophils and lymphocytes counts in the white blood cells (WBCs). The higher the H/L index, the higher the stress levels and then the more hostile and aggressive is the bird.

Guinea fowl production in Ghana is on the increase and is attracting more attention from both researchers and farmers. This is due to its acceptability, no cultural and religious barriers against its consumption as well as its comparative advantage over the chicken (Ayorinde, 1999). Despite these important traits in these birds, they have some behavioural problem that has to do with poor temperament (also known as docility). Technically, docility is defined as the ability of an animal to be calm in human presence (Annor *et al.*, 2011) or accordingly to Sutherland *et al*., (2012), the constant behavioural as well as physiological variations observed between individual animals in response to a stressor or environmental challenge. The term docility is used interchangeably as animal docility or simply as temperament (Norris *et al.,* 2014). Docility has been recognized as an important trait in livestock and could potentially be used as an indicator for economically important traits that are difficult to measure (Norris *et al.,* 2014). It is related to many production traits such as body weight, growth rates in cattle (Fell *et al.,* 1999; Cathy *et al.*, 2012) and mortality as reported in lambs (Neindre *et al.*, 1998; Jinying *et al.*, 2021). Docility is important for animal welfare reasons, the farmer's and veterinarian's safety as well as for economic reasons (Geburt *et al.*, 2015).

It has been postulated that an intense selection towards an increase in production performance in animals without considering temperament trait has resulted in increased problems with temperament such as increased aggressiveness during handling (Grandin, 1998). Unfortunately, docility is more often overlooked in many countries, especially, developing countries.

The techniques for measuring docility are continually being refined and improved, making it possible to accurately measure docility. This important trait, can either be measured on objective or the subjective scales based on the systems of scoring.

A more objective technique which is a physiological determinant is available whereby a measure of stress related hormone levels is made, as stress is reported to be linked to behaviour and by extension docility. More recently, as an alternative, the ratio of Heterophils (or neutrophils in mammals) to lymphocytes in blood (H/L index) has been proposed and very much reliable in assessing stress levels of avian species (Davis *et*

al., 2008; Muller *et al*., 2011). Moreover, the current methods developed and used in livestock are especially meant for the docility assessment of cattle, sheep and pigs and are not friendly in application in avian docility studies. Therefore, this study was conducted to evaluate the effects of sex and strain on docility and the relationship between docility (i.e. cage docility and H/L index scores) and performance traits of local guinea fowl (*Numida meleagris*) strains in Ghana.

MATERIALS AND METHODS

Location of Study

The study was conducted at the guinea fowl Section of the Department of Animal Science Education, University of Education Winneba, Mampong-Ashanti Campus, Ghana.

Experimental Birds and Their Management

The experimental birds used were Pearl, Lavendar and White guinea fowl females and males selected at 8 weeks of age. A total of 79 birds comprising of Pearl (37 females and 20 males), Lavendar (6 males and 5 females) and White (5 males and 6 females) local strains were used. The birds were obtained as day-old keets from a local commercial hatchery (Akate Farms Ltd) in the Ashanti Region of Ghana and raised to 10 months of age for the experiment. All the birds were housed in three-tier wooden cages with each bird housed singly in a cage of size 60 cm x 50 cm x 40cm. The cages were partitioned with wire mesh. The sides and floor of the wooden cages were also covered with wire mesh. Boards of packing cases were used to bar the birds within a single three-unit tier from seeing each other. In order to ensure that birds in adjacent tiers do not see birds in other tiers, the tiers were sealed at the fore and rear with packing cases. The down and middle tiers were decked with wood and lined with floor carpet to enable collection of droplets of birds and liquid from the top-tiers and also to aid in cleaning and drainage of liquid from stacks above. Cages were housed in a sandcrete house roofed with corrugated iron sheets. The birds were identified using cage numbers plus sex and strain notations.

The birds were vaccinated at 10 days of age against Infectious Bursal Disease via their drinking water. At 4 weeks of age, the keets were also vaccinated against Newcastle Disease and Infectious Bronchitis through the same route. All birds were vaccinated against second and third Newcastle Disease. Birds were de-wormed with Albendazole, 2.5% (Mobedco-Vet, Jordan), two weeks prior to the experiment.

The keets were fed starter mash containing 2,950 kcal ME/kg and 21% crude protein from 10 to 20 days of age. From 21 days of age the diets were changed to a grower diet containing 3,200 kcal ME/kg and 19% crude protein followed by a layer diet containing 3,100 kcal ME/kg and 19% crude protein during the experiment.

Data Collection

Heterophil/Lymphocyte index score

The Heterophil and Lymphocyte counts (percentages) were recorded on each bird with which the H/L index scores were computed. In the morning after cage docility scoring, all the birds were bled to obtain blood samples of about 1-2 ml from the left cutanea ulnae using a heparinized syringe and a 20 gauge needle. This was immediately transferred into EDTA-K3 coated vacutainer tubes (1-4ml, IVD Sterile A; serial number LOT: 1406202 from SG Biotech). The blood samples were analysed for lymphocyte and heterophil cell counts in a Blood Cell Counts Analyser (Cell Dyn 18200, USA). Heterophilic-lymphocyte index, an indicator of stress (Gross and Siegel, 1983) and temperament/docility in birds were computed by dividing the percentage of heterophils in 1 ml of peripheral blood by the percentage of lymphocytes in order to establish H/L index score for each bird.

Cage docility score

Under this test, docility was defined as the reaction of the bird to human presence, novel object, human contact/touching and handling and scored on a scale of 1 to 4 (Annor *et al*., 2011).

To distinguish and classify the birds in terms of

cage docility scores, the birds in the cages were systematically exposed to the novel object test, human presence test, handling test and touch test by two evaluators one test after another at short time intervals. The docility test was systematically carried out twice every week over a period of four weeks. The cage docility score experiment recorded eight (8) average cage docility scores on each bird. The cage docility test was carried out in the morning at about 8:00 hours

Table 1: Description of the tests methods used to assess the temperament/cage docility score of the guinea fowls

Test	Description	Test Objective
Human presence/Moving person Test (HPT)	Person walks up to the cage;	To ascertain the bird's reaction to a moving person and/ or human presence.
Touch/Contact Test (CT)	Person try to make a physical contact with the bird	To test the capability of the bird to accept person making contact or touching
Novel Object Test (NOT)	Person throw a novel object in the cage of the bird	To test the ability of the bird to react to an unknown (novel) object
Handling Test (HT)	Person physically handles the bird for 5 seconds	To test the ability of the bird to accept handling

Table 2: Docility Scoring codes and descriptions representing the docility traits of the bird

Scale/ Score	Code	Test	Reactions (behaviour) of Bird
1	*Docile* (the bird is quiet, compliant, submissive, obedient, tame)	• HPT	• The bird does not react to observer. Allow observer to approach. The bird maintains its proximity
		• NOT	• Bird is quiet, calm and moves away slowly
		• CT	• Undisturbed and stands or moves slowly
		• HT	• Allow to be picked up and handled easily
2	*Flighty* (the bird is changeable, undependable, inconsistent, unreliable)	• HPT	• Aware of an observer, the bird stands away from the observer in a corner
		• NOT	• The bird runs/moves away from the object
		• CT	• Constant and moderate movements
		• HT	• Tries to escape. Struggles little and stop
3	*Restless* (the bird is impatient, agitated, unrelaxed)	• HPT	• Frighten and moves away on sighting an observer and persistently looking for escape holes along the cage. The bird hardly stands at one point.
		• NOT	• The bird runs/moves away from the object, continuously moving in the cage during the time of assessment
		• CT	• The bird jumps and makes sharp cry(s)
		• HT	• Whiles in hand, struggles and wing flapping
4	*Aggressive* (violent, hostile, destructive)	• HPT	• The bird begins to move vigorously and continuously along cage and attempts to escape and sometimes with sharp cry
		• NOT	• Bird jumps and raises its feet off the cage floor and making persistent cries
		• CT	• Difficult touching the bird
		• HT	• Whiles in hand, continuously struggles throughout

HPT – Human Presence Test, NOT – Novel Object Test, CT – Contact/Touch Test, HT – Handling Test.

GMT on each bird before feeding it by two evaluators using the criteria detailed in Table 1 and Table 2.

Performance traits

For the weight gain, this was obtained by first taking an initial weight of each bird at the beginning of the cage docility scores recording and the final weight for each bird was again recorded at the point of taking the last temperament scores. Then the weight gain was computed by subtracting the initial weight from the final weight for each bird.

The amount of feed intake for each bird for a day was obtained by subtracting the leftover feed from the amount of feed offered to the bird the previous day. This was repeated for each bird for 30 days. Other relevant data points recorded on each bird within the experimental period were sex and strain of bird. Feed and water were provided in empty metal containers.

Statistical Analysis

The MS Excel (2007) was used to summarize and organize the data for the data analysis with SAS (2008) software. The effects of sex and strain on docility scores were analysed using Generalized Linear Mixed Models (GLMM) with GLIMMIX procedure of SAS (2008) to detect significant effects with a confidence level of 95%.

$$Y_{ijk} = \mu + S_i + V_j + (SV)_{ij} + \varepsilon_{ijk} \quad (1)$$

The model used for the analysis were:

Where,

Y_{ijk} = observations (docility status) of bird;
μ = General mean (population mean);
S_i = Effect of i^{th} sex of bird on docility,
i = 1, and 2; (1 = male, 2 = female)
V_j = Effect of j^{th} strain of bird on docility,
j = 1, 2, and 3; (Pearl = 1, White = 2 and Lavendar = 3);
$(SV)_{ij}$ = interaction between sex and strain of bird
ε_{ijk} = residual effect.

The effect of docility on production trait (feed intake) was analysed using Generalized Linear

$$F_{ij} = \mu + D_i + \varepsilon_{ij} \quad (2)$$

Mixed Models (GLMM) with GLIMMIX procedure of SAS (2008). The model used for the analysis was:

The effect of docility on production trait (weight gain) was analysed using Generalized Linear

$$W_{jk} = \mu + D_j + \varepsilon_{jk} \quad (3)$$

Definitions of variables in models 2 and 3 were:

F_i = feed intake of the bird; W_j = weight gain of the bird;
μ = General mean (population mean);
D_i = Effect of docility on feed intake,
i = 1…3 (1= 0 – 50g, 2 = 51 – 100g and 3 = >100g)
D_j = Effect of docility on weight gain, j = 1- 4; (1 = 0 – 1g/day; 2 = 1.1 – 2g/day; 3 = 2.1 – 3g/day; and 4 = >3g/day)
ε = residual effect

RESULTS AND DISCUSSION

Sex, strain and the docility status of birds

The birds were predominantly flighty in behaviour (64.6%) whereas those with the aggressive behaviour constituted the least (1.3%) (Table 3). This observation is confirmed on Table 4 where the average cage docility score of 2.13±0.027 was recorded. Such birds (flighty birds) accept human presence and touching but will try to escape and/or will jump when startled by the presence of a human being or a novel object. On handling, the bird will struggle a little in an attempt to escape which agrees with Annor *et al.* (2011).

This observation goes against the popular view that, the local guinea fowls are mostly aggressive birds. This character of aggressiveness could possibly have been replaced by the more friendly characters on the temperament scale (i.e. flighty, restless and docile) through the effect of domestication and selective breeding.

Table 3: Proportions of the observations for sex, strain of bird and the docility status of the birds

Criterion	Category	No. of Observations	Percent (%)
Docility Status	Docile	45	14.2
	Flighty	204	64.6
	Restless	63	19.9
	Aggressive	4	1.3
	Total	**316**	**100**
Sex	Female	120	38.0
	Male	196	62.0
	Total	**316**	**100**
Strain	Pearl	228	72.2
	White	40	12.7
	Lavendar	48	15.2
	Total	**316**	**100**

The results showed there were still a significant proportion of those birds with the wild nature (non-docile) since only 14.2% of them were docile (Table 3). This finding is pointing to the fact that, the 'aggressive' guinea fowls now are truly not so but are either of the flighty or restless type. The average docility score of 2.13 was obtained in this experiment (Table 4).

There were three strains of the birds, which were Pearl, Lavendar and White.

Effect of sex and strain on docility score

The effects of sex and strain of bird on weekly docility scores are presented in Table 4. Both males and females were observed to be flighty (2.16±0.025 and 2.10±0.028 respectively) without significant difference ($p = 0.097$). It must be noted that, the effect of sex on temperament is debatable, as different authors find no effect of sex on temperament whiles others do. In a study, utilizing different breeds of cattle, Hoppe *et al.* (2010) and Voisinet *et al*. (1997) found effect of sex on temperament score in which females had a greater temperament score than males. This current result agrees with Annor *et al*. (2011) who did not find any effect of sex on docility of grasscutter. Similarly, Burdick *et al*. (2009) and Burdick *et al*. (2011) did not also find the effect of sex on docility in cattle in their studies. Moreover, Pajor *et al*. (2008) and Pajor (2011) reported no difference ($p>0.05$) between temperament scores and sex in sheep. The results of this study is contrary to that of Hoppe *et al.* (2010) who indicated in their study in different breeds of cattle, that females cattle were more docile than male cattle. Among the three strains, there were no significant ($p>0.05$) differences in behavioural response to docility tests.

Table 4: Least square means (±se) for the effect of sex and strain on docility score

Variable	No.	Cage Docility Score				Average Docility score
		Week 1	Week 2	Week 3	Week 4	
Sex						
Male	49	2.54±0.040	2.19±0.036	1.95±0.033	1.94±0.031	2.16±0.025
Female	30	2.51±0.045	2.13±0.041	1.90±0.037	1.86±0.035	2.10±0.028
Mean Doc.		2.53±0.043	2.16±0.039	1.93±0.035	1.90±0.033	2.13±0.027
P Value		0.569	0.217	0.294	0.047	0.097
Strain						
Pearl	57	2.56±0.031	2.21±0.028	1.92±0.025	1.92±0.023	2.15±0.019
White	10	2.45±0.070	2.08±0.064	1.90±0.058	1.90±0.055	2.08±0.044
Lavendar	12	2.56±0.065	2.19±0.059	1.96±0.053	1.88±0.050	2.15±0.040
Mean Doc.		2.52±0.055	2.16±0.050	1.93±0.045	1.90±0.043	2.13±0.034
p Value		0.338	0.192	0.705	0.797	0.334

No. = number, p Value = Probability Value, Doc = Docility, se = Standard Error

Table 5: Least square means (±se) for the effects of docility on production traits and H/L index score

Docility	Feed Intake (g/day)	Weight Gain (g/day)	H/L index score
Docile	83.22±2.51	- 1.24±0.76	2.01±0.07
Flighty	83.85±1.18	- 1.43±0.35	2.04±0.03
Restless	85.00±2.12	- 1.95±0.64	2.02±0.06
Aggressive	78.18±8.43	- 2.00±2.53	2.38±0.23
Mean	83.92±16.87	-1.32±5.07	2.037±0.47
p value	*0.8480*	*0.9162*	*0.5093*

se = Standard Error, H/L index score = Heterophil/Lymphocyte index score; p Value = Probability value

Effect of docility on production traits

Docility did not influence feed intake ($p > 0.05$) of guinea fowls in this study (Table 5). Even though this research did not find any statistically significant influence of docility on this phenotypic trait (feed intake) but was able to record some marginal increment in the level of feed intake from the docile to the aggressive. This finding disagrees with the works of Café *et al*. (2011), Cathy *et al*. (2012) and Geburt *et al*. (2015) that the docility character negatively influences production traits. This difference in findings can be attributed to the short duration of the test. Perhaps if the test was repeated for a much longer period instead of the four (4) weeks, the influence of docility trait on feed intake will show due to gain in accuracy expected from multiple measurements. Statistically, by repeating the measurement on the same individual, the variance due to temporary environmental differences is reduced.

There was no significant ($p > 0.05$) effect of docility on weight gain in the guinea fowls. All the birds lost weight numerically, though not statistically sufficient to make comparisons. This could possibly be due to the nature of the test method used, which perhaps was so stressful causing them to feed less. However, the birds showed some resilience in the weight loss from the docile to the aggressive (Table 5). The reasons scientists like Post *et al*. (2003), Agarwal *et al*. (2009) and others assigned to this phenomenon of the loss in weight is that, birds with calm temperament (docile) have relatively reduced corticosterone compared to the temperamental ones (the non-docile). A high corticosterone level has been shown to retard growth. Agarwal *et al*. (2009) in particular explained that, glucocorticoids (e.g. corticosterone) negatively affect growth by increasing the production of leptin which reduce feed intake while Pugh *et al*. (2011) explained that, corticosterone break down protein, glycogen and fat to increase the amount of circulating glucose.

Effect of docility on H/L index score

There was no significant influence ($p > 0.05$) of docility on heterophil-lymphocyte index score of the guinea fowls (Table 5). Though this H/L index score of docility could not confirm significant differences among the birds in respect of docile, flighty, restless and aggressive, it goes on to confirm that 37% difference exist between the H/L index (2.01) of docile and that of the aggressive (2.38) as shown in Table 5. This maximum difference between the docile and the non-docile bird (aggressive type) indicates the degree to which a bird could easily be stressed as H/L index score is used as a reliable biomarker of stress levels. This indicates that, the birds were generally flighty which corroborate with what the behavioural docility score found out.

According to the concept of H/L index score as biomarker of resistance to stress (Burdick *et al.,* 2011), the birds with low H/L index score are

less aggressive and supposed to respond well to behavioural/temperamental tests better than birds with high H/L index score (Krams *et al*., 2012).

Effect of sex and strain on heterophils, lymphocytes counts and H/L index score of guinea fowls

The results in Table 6 showed that sex had no significant effect (*p>0.05*) on H/L index score just as it had no effect on cage docility score as indicated earlier. These results agree with Burdick *et al.* (2011) and Vleck *et al*. (2000), that there is no significant effect of sex on H/L index score.

The strain factor had significant effect on H/L index score (*p = 0.0002*) and heterophil (*p = 0.0002*) and lymphocytes counts (*p = 0.0345*) of the guinea fowls. The heterophil and H/L index score of the Lavendar was lower than both the Pearl and White strains. In both cases, the Pearl and White strains were similar. The Lavendar was however superior than the Pearl in terms of lymphocytes but similar to the White strain (Table 6).

The above results mean the Lavendar had the greatest capacity to resist stress and by extension were less aggressive in nature. The Pearl and White guinea fowls recorded similar results meaning they were similar in the ability to withstand stress. As at the time of this analysis, there was no available literature to support or deny this result.

Table 7: Phenotypic means (±St Dev.) and correlations between docility and heterophils, lymphocytes and H/L index score

Trait	Mean (±St Dev.)	Docility	*p-value*
Heterophil	7.59±0.78	0.042	*0.72*
Lymphocytes	68.68±1.63	0.072	*0.53*
H/L index score	0.11±0.01	0.023	*0.84*

Note: p Values are for Pearson Correlation Coefficients between Docility and phenotypic traits

The strain factor had significant effect on H/L index score (*p = 0.0002*) and heterophil (*p = 0.0002*) and lymphocytes counts (*p = 0.0345*) of the guinea fowls. The heterophil and H/L index

Table 6: Least square means (±se) for the effect of sex and strain on heterophils, lymphocytes counts, and H/L index score of guinea fowls

Variable	Heterophil (%)	Lymphocyte (%)	H/L index score
Sex			
Male	7.42±0.13	68.88±0.28	0.108±0.002
Female	7.33± 0.14	69.39±0.31	0.106±0.002
p Value	*0.5899*	*0.1666*	*0.4398*
Strain			
Lavendar	6.76±0.20^{b}	69.60±0.45^{a}	0.09±0.003^{b}
Pearl	7.74±0.09^{a}	68.45±0.21^{b}	0.11±0.002^{a}
White	7.61±0.22^{a}	69.35±0.49^{ab}	0.11±0.004^{a}
p Value	*0.0002*	*0.0345*	*0.0002*
Grand mean	7.59±0.71	68.67±1.57	0.11±0.011

se = Standard Error, p Value = Probability value, Means having common superscript in the same column are not significantly different (p > 0.05)

score of the Lavendar was lower than both the Pearl and White strains. In both cases, the Pearl and White strains were similar. The Lavendar was however superior than the Pearl in terms of lymphocytes but similar to the White strain (Table 6).

The above results mean the Lavendar had the greatest capacity to resist stress and by extension were less aggressive in nature. The Pearl and White guinea fowls recorded similar results meaning they were similar in the ability to withstand stress. As at the time of this analysis, there was no available literature to support or deny this result.

Phenotypic means and correlations between docility and heterophils, lymphocytes and H/L index score

Phenotypic means and correlations between docility and blood parameters are presented in Table 7. Correlation between H/L index score and docility was low (0.023). The mean counts of the heterophils (7.59) showed comparatively low variability as compared to the mean counts of the lymphocytes (68.68) as indicated by their standard deviations (Table 7). The mean H/L index score (0.11) rather showed less variability among the birds as indicated by its standard deviation (0.01). This observation is in conformity with the findings of Gross and Siegel, (1983) and Davis *et al*. (2008).

Scientists such as Banbura *et al*. (2013), rather found the H/L index score as a reliable indicator of inherent stress condition and hence docility. In other words, the H/L index score was a biomarker of the capacity of the bird to withstand stress. The association between docility and H/L index score was a positive one. That is an increment in the H/L index score level might lead to higher score for stress and the relationship was such that, the more stressed a bird was, the more aggressive it would become. The relationship meant that less stressed individuals were less aggressive. Thus, the higher levels of H/L index score also meant relatively high levels of docility score.

CONCLUSIONS AND RECOMMENDATION

Sex as a fixed factor had no influence on docility of guinea fowls. The docility trait for guinea fowls was that of flighty. The Lavendar strain had the greatest capacity to withstand stress and by extension was less aggressive. The H/L index score was less variable hence making it very suitable to be used in determining docility of the birds. It has been confirmed that an increment in the H/L index score level might lead to higher score for docility.

The docility trait should be included in the breeding objectives of the guinea fowls in order to produce docile birds. The economic value of docility in guinea fowls should be assessed (in terms of mortality, number of eggs laid, egg weight, carcass quality, growth rates, feed conversion, treatment cost, net returns per herd). Consideration should be given to strain of the bird in selecting guinea fowls for breeding for better docility trait. Moreover, the H/L ratio parameter as index of docility could be used in the future instead of cage docility score to test birds for their docility status in their selection for breeding, as it is less stressful to birds and less laborious.

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