



The Behavioral Aggressiveness, Social Stress and Physiological Parameters Screening in Local Egyptian Chicken Strains

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Abstract

THIS study aimed to evaluate the behavioral aggressiveness, social stress and physiological parameters between same strain or toward other strains of male Fayoumi, Dandarawi and Gimmizah (local Egyptian chicken strains) during breeding period. A total of 96 male chicks (35 d of age) of these strains (3 strains × 8 replicates × 4 chicks), were used in the current study during a four-week experimental period. Various behavioral tests were studied, including social status, social tension, resident-intruder test (R-I) and social stress test (intra-line and inter-line aggression test) between the same or different strains to determine the most aggressive, submissive acts, total agonistic frequencies (TAF) plus the percentage and frequencies of agonistic displays (such as pecking and fighting). Moreover, blood samples were collected and analyzed for serum metabolites and hormones. Fayoumi rooster showed the most aggressive behavior, a higher social tension index, testosterone, heterophile and lymphocytes percentages in blood than the other strains. Also, it had significantly ($P \leq 0.0001$) longer fight duration than Gimmizah and higher TAF ($P \leq 0.05$) than Dandarawi and Gimmizah. On the other side, Gimmizah strain had less TAF, social rank, peck number and peck duration than other strains. In conclusion, male Fayoumi roosters are more aggressive toward Dandarawi and Gimmizah chickens. Thus, it is recommended to exclusively use the Gimmizah strain, or to combine it with Dandarawi or Fayoumi, when creating a male herd from Egyptian chicken strains for meat production.

Keywords: Aggressiveness, Agonistic behavior, Chicken strain, Resident-intruder, Physiology.

Introduction

More protein is required by the increasing human population, Poultry considers the second largest industry between the world's various industries [1]. Because poultry meat and eggs are one of the cheapest sources that can satisfy this requirement. In order to produce poultry products profitably and without harming the environment given the rising trend in consumer demand for poultry products, sustainable procedures must be adopted. Recently,

many countries have increased the utilization of local chicken breeds to cover the market demand for high-quality animal protein. The best approach appears to be to investigate the use of local breeds to urge farmers to maintain them because preserving live animals is highly expensive and sustaining small flocks' results in inbreeding depression and loss of genetic variety [2].

Egyptian local chicken strains are considered one of the very important agricultural resources in Egypt [3] it can serve as a source of high-quality

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animal protein, show good performance in poor nutritional and environmental conditions, and high resistance to diseases than the imported exotic strains. It was reported that the indigenous chicken ecotypes are desirable in Africa due to their productive adaptability under harsh environmental conditions [4].

We examined the behavior of three chicken strains: Fayoumi, Gimmizah and Dandarawi, (Figure 1) in this study. Fayoumi is one of the Egyptian chicken strains called commercial and rural chicken [5] that displayed genetic diversity [6] and High reproductive qualities characterize Fayoumi chickens as they cross with other exotic strains to get more productive rates than pure strains [7]. Male Fayoumi has a silver neck and saddle hackles with silver and black barring all over the body [8].

Gimmizah chicken strain is a locally crossbred types developed Egyptian strain produced by breeding between Dakki- 4 × Plymouth Rock, Gimmizah type was auto-sexing and are similar to Plymouth Rock chickens in terms of feather type [9], Dakki- 4 coming from a cross mating of Fayoumi × Plymouth Rock [7]

Dandarawi chickens considered as an indigenous local breed which raised for meat production, Dandarawi males had no marks on head and back. At 8 weeks of age, progeny could be easily sexed by feather color, which was black and white for males and brown for females [10]. However, Dandarawi body conformation at 12 and 16 weeks is better than Fayoumi chickens. In general, chickens are gregarious birds that live in flocks and have well-defined social structures and the Gallus Gallus domesticities males are socially dominant and copulations with females can be forced [11].

The aggressiveness in chickens is complex behavioral expression, including genetic and hormonal metabolism differences between individuals and strains [12]. Male aggression is common during the reproductive season due to increased testosterone levels and competition between males for mating opportunities [13]. Chickens' welfare, performance and susceptibility to pathogens are affected by social stress [14].

Mixing unfamiliar individuals from different cages or strains causes social stress in chickens [4] causing agonistic behavior due to the competition for a dominant position and other factors such as exposure to intruders and changes in group membership [15].

Chickens' agonistic behaviors are increased due to increase in hostile behaviors, such as feather pecking, cannibalism, increased chickens' injury, and aggression that are used as stress indicators to

examine behavior management interaction [16].

On the other hand, aggressive behavior evaluation requires several behavioral tests, such as the resident- intruder (R-I) test, to monitor the chickens' agonistic behavior and territorial aggression [17-18]. Besides, social status and social tension tests were used to determine aggressive and submissive acts.

Male-male interactions in the intra-line aggression test (internal) and inter-line aggression test between genetic lines (external) were used as a social stressor pairing with roosters of the same line or among different lines [19]. This may be associated with differences in disease resistance. As well as, the broiler performance can be influenced by optimizing the in-house environment [20]. It is necessary to provide information that can be helpful for farming and management strategies to enhance the local chicken meat farm industry. Therefore, the purpose of this study was to identify less aggressive male local chicken strains based on physiological criteria and agonistic behavioral tests, as well as to identify a means of reducing excessive aggression between local chickens raised using either the same kind of system or different type of technique (mixing way management).

Material and Methods

Animal Ethics

The animal care and the experiments have been according to Sohag University Ethical Guidelines for animal care and use in scientific research having protocol number (Sohag 6/13/2022/2) approved by Sohag-IACUC.

Experimental Design, Birds and Housing

In total, 96 healthy male chicks of Fayoumi, Dandarawi and Gimmizah strains were purchased from a local farm at 30 days of age. The birds were reared for 5 days to get adapted to the experimental location. At 35 days of age, chicks were divided into three groups; each group contained 32 male birds of each strain (i.e., eight replicates x 4 male birds per replicate). The birds were housed in a room (15 m length × 8 m width × 3 m height) in Veterinary Medicine, New Valley University in pen groups (4 chicks per pen). The pen size was (80 cm/length × 80 cm width × 2 m height), distributed uniformly and sawdust was used for bedding. One feeder and one water were used for each pen. The birds were daily exposed to 16 light hours and the room temperature was 28-30°C. All chicks were fed ad-libitum a commercial diet pellets contained 18 per cent crude protein and 2750 Kcal metabolisable energy per kg of feed and fresh tap water was available freely during the experimental period. The experiment lasted for 4 weeks.

Experimental Procedures

Figures 2 and 3 describe the experimental procedures performed on 32 healthy male chicks aged 35 days from each strain for the purposes of conducting various tests either within the same strain as shown in Figure 2 or among the various strains as shown in Figure (3).

For the behavioral test within the same strain or among the different strains, the birds were forced to fast by taking down the feeder in front of them to deny them access to food., and after that, they were observed for a quarter of an hour in each pen that had four roosters of the same breed to determine which one was the fiercest and which was the least fierce. This was done in eight pens for each strain.

We obtained 12 highly aggressive birds that were reared in isolated cages for one day (Aggressors) and then acted as residents for the same or another strain in the Resident-intruder (R-I) test based on high Total agonistic acts, aggressive acts, social rank index, social tension index, and low submissive acts.

The remaining 20 birds that displayed less aggressive behavior (opponent remained in the home cage) were divided into Groups A (12 birds = 4 replicates x 3 birds) and B (8 birds = 4 replicates X 2 birds) for the Resident-Intruder (R-I) test and the Intra-Line Aggression test, respectively.

The other two birds in each replication are then placed in a new pen that is comparable to their home pen to perform an intra-line aggressiveness test, which results in the selection of four losers and four winners among the roosters based on aggressive act. In order to achieve social rank and social tension between various strains, the four losers of various three stains cause four replications. To get an interline aggressiveness test, however, four winner roosters from the Gimmizah and Dandarawi strains were coupled, and the winner was then paired with winners from the Fayoumi strain.

Behavioral Observations and Welfare Assessments

All chicks were carefully managed and reared during optimal weather conditions in addition to ensuring a low-stress environment to maximize welfare. The agonistic interactions behavior of each group pen was Video Camera recorded for 15 minutes. Depending on the test type performed, different times were chosen and then analyzed using a scanning technique described by Dawkins, [21]. According to behavioral ethogram showed in (Table 1)

Determination of Social status and social tension between the same strains (5-6 Weeks)

This test was done according to method previously mentioned by [2] and it's done at 36, 38, and 40 days of age depending on the reference that reported that social hierarchy develops at 5 or 6 weeks of age in domestic fowls [12].

Agonistic interactions recorded and classified to the behavior ethogram presented in Table 1. Agonistic interactions of birds in every pen for 15 minutes of feeding competitions were recorded for three non-sequential mornings.

Thus, every pen was observed for 45 minutes and 6 hours for each strain.

A wing band determined each bird's identity from a distance. The feeder was removed from the pen in the evening of the day before the observations (about 12 PM till 7 AM). Then, the scattered feed was introduced to each pen before the 15 min observation.

Social status and social tension of a bird were calculated by social rank index (SRI) = $(D-S + N+1)/2$, {where, "D" was the number of birds dominated by the individual, "S" was the number of birds that dominated the individual and "N" was the number of birds in the pen}. Moreover, Social tension index (STI) = the frequency of aggressive acts - submissive acts. The 41th day was a rest day to all birds. (i.e no test done at this day).

Then, 36 birds (12 birds from each strain that exhibit more aggressive behaviors) were moved to 36 isolated cages (4 batteries 9 cages) for one day. This process was known as isolated-raising (one bird per cage, acting as aggressors), and the birds were reared in these conditions until the start of the trials.

Determination of Resident-intruder (R-I) test (6-7 weeks)

R-I test is an index for estimating aggression in animals, and it is a good method for monitoring the agonistic behavior of layers [17, 18]. The R-I test was performed on 12 male chicks, one from aggressors (isolated-raising) and the other from opponents (pen grouped raising birds) at 42 days of age [18]. The R-I test was conducted in the same breed (4 pairs) and of the different strains, using a total of 12 males from pen-reared with cage-reared of each strain (4 pairs x 3 strains) (8 pairs).

One male chick from a group-raised (opponent) was moved to the nest, where an aggressor chick was raised, after the body weight was measured. Moreover, a meter separated the observation from the cage. For 15 minutes in each cage and 60 minutes for each strain, the aggressor and the opponent's aggressive behaviors were recorded. Agonistic behavior of the chicks; total agonistic frequency (TAF) = the sum of the frequencies of pecking, kicking, threatening, biting, and leaping. Agonistic display percentage = frequency of each agonistic display / total agonistic displays [18]. All the experiments were conducted between 9 AM and 1 PM.

Determination of Intra-Line or Internal Aggression test (6-7 weeks)

For 24 roosters, this test was conducted concurrently with the R-I test in a pen (2 roosters per 4 replicate pens per each strain). To reduce the panic

response to a new environment and give both roosters a neutral space to be examined, a pair of male roosters of the same strain was placed in a novel pen that was comparable to their home pen at the age of six weeks [15] When roosters were concurrently placed in the new pen, aggressive behavior was seen for 15 minutes per pair for a total of 135 minutes for each strain [22]. The tail feathers of roosters were marked for distinguishing. This test resulted in 4 winners and 4 losers in each strain.

Social status and social tension between different strains (6-7 weeks)

It was assessed in 12 loser birds that were raised in 12 pens and were of different breeds at age's 52, 54, and 56 (4 replicates roosters for each strain). During a 15-minute feeding competition on three separate mornings, agonistic interactions amongst the birds in each enclosure were observed. In total, 3 hours were spent monitoring each strain throughout all pens, or 45 minutes each pen.

Determination of inter-line aggression test between different strains (8-9 weeks)

This test was done on the 12 aggressor birds (4 replicates \times 1 rooster \times 3 strains), at eight weeks of age after one week of being paired based on the intra-line aggression test results, roosters from each strain were divided into two groups. The winners from Gimmizah and Dandarawi strains were paired, then the winners were paired finally with winners from Fayoumi strain, and their behavior were observed as described for Intra-line aggression test.

Determination of Blood Parameters

Ninety-six blood samples were collected at nine weeks of age into heparinized and non-heparinized tubes. Blood samples were centrifuged to separate serum and then were deep-frozen for analysis. The granular and non-granular WBCs were estimated according to [23] in heparinized blood and total serum protein, albumin and globulin levels were estimated, serum corticosterone and testosterone hormone concentrations were determined by commercial kits (Bio Tina GmbH, Bugweg 53, 58119 Hagen, Germany). Individually weighed birds were humanely sacrificed, allowed to bleed, and then harvested. The rest of the body was weighed after the neck, head, viscera, shanks, spleen, digestive tract, heart, gizzard, and belly fat were removed. Moreover, immune organs: the weight of the spleen and bursa were determined by 0.1-gram scales and expressed as percentages related to the carcass weight of five roosters for each strain

Statistical analysis

The data were tested for normal distribution (Anderson—Darling test for normality). All results are mentioned in the Tables as mean \pm standard deviation (SD). The obtained findings were

statistically analyzed by one-way repeated-measures analysis of variance (ANOVA) using SPSS 2001. The Duncan test was used to determine the significant difference between groups at $P < 0.05$ level.

Results

Behavioral frequencies

The aggressive behavior of roosters varied among the Fayoumi, Dandarawi, and Gimmizah populations, as evidenced by a variety of aggressive and submissive behaviors. According to the results shown in Table 2, Fayoumi displayed the most aggressive behavior and the highest social tension index when compared to other strains (between the same or different species).

Table 2 demonstrated that there was a substantial difference in TAF when an aggressor was matched to an opponent from the same species or one of a different species. Gimmizah had a lower TAF than Fayoumi roosters. On the other hand, the Gimmizah strain shows significant variations in resident pecking, biting, kicking, threatening, and leaping incidents as well as increased leaping in intruders. In the R-I test, Dandarawi did not show any agonistic displays from either the attacker or the opponent.

Furthermore, Figure 4 showed that the total agonistic frequency was significantly different from the aggressor to opponents in the same or between other species as it was more in Fayoumi roosters than Dandarawi, while Gimmizah had less TAF. A significant effect of strain was found on pecking, aggressive acts, biting, kicking, threatening and leaping.

Different Strains Response to Social Stress

The intra-line test revealed no differences in aggressive pecks or duration between Dandarawi and Gimmizah roosters (Table 3). The Fayoumi strain had a significant rise in social tension, a higher social rank index, and more aggressive behavior towards intruders.

Additionally, when compared to roosters from other species (including Dandarawi and Gimmizah), Fayoumi roosters displayed the highest numbers and the longest average duration of peck and fight. These results demonstrated that Gimmizah roosters displayed a considerably shorter overall peck time than Dandarawi roosters in an inter-line test.

Biochemical, Hormonal and Hematological Changes

Biochemical, hormonal, and hematological changes in Fayoumi, Dandarawi and Gimmizah chicken strains are presented in Table 4.

When compared to Gimmizah, the results showed that Fayoumi, Dandarawi had the lowest levels of albumin and the lowest albumin to globulin ratio,

although neither factor had any significant impact on total protein or globulin. In contrast to Dandarawi and Gimmizah, the levels of corticosterone and testosterone is significantly higher in Fayoumi roosters.

In comparison to Dandarawi and Gimmizah, Heterophil were higher and Lymphocyte were lower in Fayoumi, which also had the lowest immune organ weight %, including the spleen and bursa.

Discussion

In modern farming systems, birds are mostly housed in large groups, sometimes of the same sex, and most often of the same age. These conditions may favor the expression of deleterious behaviors such as aggression, feather pecking and cannibalism in the most serious cases, which can affect both bird welfare and productivity [24]. The selection of domestic animals on production traits indirectly induces changes in behavioral traits and the productivity based on genetic selection of the bird had role in change of aggression as behavioral repertoire [25]

Studying the genetic basis of these behavioral traits is an important step in understanding the propensity of each individual to express certain behavioral patterns and can lead to improvements in the animals' housing environment or in the adaptability of animals to husbandry conditions.

Chickens are territorial animals and aggressive behavior between individuals is classified into territorial behavior and hierarchic dominance [12] when paired kind hens with aggressive counter partners were maintained in groups, the kind hens had fewer stress reaction, less cannibalism and fewer aggressive pecks [15] and mixed species in unfamiliar cage, which increased the male 'chick's aggressiveness through stimulating their territoriality. The resident established a territory in their home cage and does offensive aggression. The intruder did a defensive behavior in the 'resident's home cage [18]. Moreover, chickens' agonistic behavior is the threat and fights between individuals of the same species, and it is a better indicator of the 'flock's situation [26]. The 'flock' situation gives the dominant animal more access to feed, water, and territory on the other side, the subordinate animal had the injury risk and unmet needs [25]

Chicken social tension and social rank tests are submissive posture evidence of aggression by another individual of the same strain or different strains. This submission posture effectively avoids conflicts [12]. From our obtained data, Fayoumi strain showed significant difference in aggressive act, social tension and submissive act in the 3 days of under-feeding competition test when rearing with the same strains this data may be due to the social

hierarchy don't easily establish between males which give more agonistic and submissive action as reported by Väisänen et al. [27] who mentioned the dynamic changes in aggressive interactions followed a different pattern in unstable Leghorn groups, suggesting a weaker ability to cope with group disruptions compared to the ancestral breed. Moreover, Fayoumi strain showed higher TAF in isolated or resident animals (aggressors) compared to grouped or intruders (opponents) between the same or different species; separated chicks show more agonistic behavior than the grouped ones [18]. It may be due to isolation lowered responsiveness to γ -aminobutyric acid (GABA)-A receptor agonists [28]. GABA synthesizing enzyme and mRNA of glutamic acid decarboxylase-65 (GAD65), which localized in the chick hypothalamus particularly play a significant role in the stopping of isolation-induced aggressive behavior in mice [29]. Gimmizah strain show highly significant difference in case of resident in pecking, biting, kicking, threatening and leaping and more leaping in introducer than other strain may be due to selection could have reduced social inhibitions or decreased fearfulness towards aggressive pen mates, which could prolong the hierarchy establishment [27] and the finding revealed that attacking leaps by Fayoumi chicks toward Gimmizah or Dandarawi in the R-I test reflects its social hierarchy toward other strains. This data is based on previous work Queiroz and Cromberg [12] who stated that leaping count was used to measure social hierarchy in chickens and leap seems to be a useful measurement of the birds' social hierarchy.

- In case of rearing different species with each other in the present study showed that, Fayoumi had a higher social tension, social rank index, kicking and biting in case of intruder and higher fight duration, peck number, peck duration (Aggression test and social stress as intra and inter aggression test). This data agreed with Siegel [30], who reported that aggressive behaviors strongly depend on the evidence of additive genetic control of the aggressiveness of birds. The blood parameters data showed that the Fayoumi testosterone levels are significantly higher than other strains. This correlated with Fayoumi's aggressiveness toward other strains.
- In birds, testosterone facilitates aggressive behavior, increases muscle growth, decreases fat deposition, and inhibits molt and behaviors connected to parental care [13]. It was reported that high testosterone further contributes to the expression of courting activity [30] and castration in male chicks caused the failure to show agonistic behavior and greater sex hormone concentrations as testosterone which used as genetic selection for rapid growth resulting in aggressive behavior induction [25]. Moreover, the behavioral stressors control animal behavior and immunity interactions,

which induce immune depression and are reflected in animal disease resistance. Therefore, bad animal behavioral stressors response strategies show a high risk for susceptibility to disease [31]

Another reason was, if this were so, small multi-breed flocks should be characterized by the complete dominance of one breed over the other. Eventually the breed with the one most aggressive member would be expected to achieve complete dominance.

Fayoumi strain had more pecking number and duration when reared with same or different species may be due to the aggressive pecking that may have affected by a variety of environmental factors, appearance factors such as comb type, plumage pattern, and plumage color [32]. Moreover, Fayoumi strain had significantly higher testosterone levels, Heterophils and lower lymphocyte levels. This follows the finding of Quan *et al.* [33] who illustrated a positive correlation between stress response and susceptibility to disease and the data obtained by Maekawa *et al.*, [34] who find that, as higher level endogenous testosterone were found in quails performing more aggressive behaviors

Indigenous / local chicken are preferred by many consumers in different counters [35] moreover its type more active and aggressive than the commercial type [36] thus aggressive behavior is challenge in behavior manage for the indigenous or local chicken producer[25] for that, Choice of male Gimmizah strain (low aggressiveness levels) is desirable from flock management for meat production.

It may be beneficial in avoiding harmful damage in fighting and developing peck order or social system, resulting in a calmer environment within a group due to a stable social group formation providing a less stressful environment.

Based on present and previous data, the selection

must be based on inheritance or phenotypic variation associated with behavioral, physiological, and neuroendocrine characteristics

Conclusions

The present investigation concluded that aggressive behavior strain differences in response to the social-environmental challenge might be associated with chicken biochemistry and welfare alteration. Finally, these findings could be applied in managing the local Egyptian chicken farms used for meat production for formation of single strain flock or Gimmizah and Fayoumi flock.

Author Contributions

All Authors have made substantial contributions to (1) the conception and design of the study or acquisition of data or analysis and interpretation of data, (2) drafting the article or revising it critically for important intellectual content, and (3) final approval of the version to be submitted.

Institutional Review Board Statement

The procedures used were approved by Sohag-IACUC Sohag University, Egypt (approval code: Sohag 6/13/2022/2)

Data Availability Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Conflicts of Interest

The authors declare no conflict of interest.

TABLE 1. Behavioral ethogram performed in the research study.

Aggressive acts	
Kick	The bird uses its legs to kick other birds.
Peck	The bird uses its beak to peck other birds.
Chase	The bird runs away to the other bird.
Threat	The bird does an intention to inflict pain, injury, damage to other bird.
Submissive behavior	
Being attacked, chased, fights.	
Submissive bird ran away from the other bird that attacked, chased, or fights.	
Attack avoidance, threat avoidance and threatened Submissive birds show lower positions to get away from attack or threat.	

TABLE 2. The percentage of each agonistic display of aggressor and opponent in the R-I test which determined as the frequency of each display per those of the total agonistic displays.

Behavioral frequencies (%)		Resident (aggressors) against			Intruder (opponent) against		
		Fayoumi	Dandarawi	Gimmizah	Fayoumi	Dandarawi	Gimmizah
Pecking	Fayoumi	79.0 ^a ±3.0	85.0 ^a ±3.0	88.0 ^b ±3.0	77.0 ^a ±1.2	79.0 ^b ±4.2	80.0 ^a ±4.2
	Dandarawi	80.0 ^a ±2.0	89.0 ^a ±2.0	93.0 ^a ±1.6	67.0 ^b ±2.6	84.0 ^a ±1.0	79.0 ^b ±1.0
	Gimmizah	69.0 ^b ±2.0	76.0 ^b ±3.0	87.0 ^b ±3.2	58.0 ^c ±2.0	82.0 ^a ±1.0	83.0 ^a ±1.8
Biting	Fayoumi	14.0 ^a ±0.1	10.0 ^a ±0.2	10.0 ^a ±0.1	11.0±1.4	12.0 ^a ±1.4	16.0 ^a ±1.4
	Dandarawi	10.0 ^b ±0.9	7.0 ^c ±0.9	5.0 ^b ±0.9	12.0±0.9	10.0 ^b ±1.3	9.0 ^c ±0.8
	Gimmizah	10.0 ^b ±0.9	9.0 ^a ±0.5	9.0 ^a ±1.3	12.0±0.8	8.0 ^c ±0.8	11.0 ^b ±2.0
Kicking	Fayoumi	7.0 ^b ±0.3	5.0 ^b ±0.2	2.0 ^b ±0.3	8.0 ^b ±0.1	9.0 ^b ±0.3	4.0 ^c ±0.3
	Dandarawi	7.0 ^b ±0.1	4.0 ^b ±0.1	2.0 ^b ±0.4	10.0 ^{ab} ±0.4	6.0 ^c ±0.6	12.0 ^a ±0.4
	Gimmizah	11.0 ^a ±0.1	8.0 ^a ±0.5	4.0 ^a ±0.4	12.0 ^a ±0.4	12.0 ^a ±1.1	6.0 ^b ±0.6
Threatening	Fayoumi	0.0	0.0	0.0	2.0 ^b ±0.9	0.0	0.0
	Dandarawi	2.0 ^b ±0.4	0.0	0.0	8.0 ^a ±0.4	0.0	0.0
	Gimmizah	6.0 ^a ±0.2	4.0±0.8	0.0	9.0 ^a ±0.3	1.0±0.6	0.0
Leaping	Fayoumi	0.0	0.0	0.0	2.0 ^b ±0.7	0.0	0.0
	Dandarawi	1.0 ^b ±0.6	0.0	0.0	3.0 ^b ±0.4	0.0	0.0
	Gimmizah	7.0 ^a ±0.4	3.0±0.3	0.0	9.0 ^a ±0.1	1.0±0.1	0.0

^{a, b, c} Means ± SD within the same column carrying different superscripts are significantly different (P<0.05).

Average duration = total time spent on observed behavior/number of behavior observed.

TABLE 3. Different strains response to social stress

Breed	Behavior	Fight (with kicking)		Pecks (toward head or body)	
		Numbers	Duration (s)	Numbers	Duration(s)
Intra-line Aggression test					
	Fayoumi×Fayoumi	6.0 ^b ±0.3	22.0 ^a ±4.1	7.0 ^b ±0.9	14.0 ^{ab} ±3.1
	Gimmizah×Gimmizah	2.0 ^c ±0.1	7.0 ^{bc} ±2.2	4.0 ^c ±0.1	7.0 ^b ±1.2
	Dandarawi×Dandarawi	3.0 ^c ±0.2	9.0 ^b ±1.6	3.0 ^c ±0.5	5.0 ^c ±0.6
Inter-line Aggression test					
	Fayoumi×Gimmizah	8.0 ^a ±0.5	18.0 ^b ±3.2	11.0 ^{ab} ±0.9	15.0 ^{ab} ±0.8
	Fayoumi×Dandarawi	10.0 ^a ±0.6	25.0 ^a ±1.2	16.0 ^a ±0.5	17.0 ^a ±0.3
	Fayoumi×Gimmizah	1.0 ^c ±0.3	4.0 ^c ±0.3	3.0 ^c ±0.1	5.0 ^c ±0.7
	Fayoumi×Dandarawi	5.0 ^b ±0.4	10.0 ^b ±0.6	9.0 ^b ±0.4	7.0 ^b ±0.4
	Dandarawi×Gimmizah	4.0 ^b ±0.1	5.0 ^c ±1.2	5.0 ^c ±0.5	4.0 ^b ±0.6
	Dandarawi×Gimmizah	2.0 ^c ±0.3	3.0 ^c ±0.9	2.0 ^c ±0.2	2.0 ^c ±0.2

^{a, b, c} Means ±SD within the same row carrying different superscripts are significantly different (P<0.05).

Average duration = total time spent on observed behavior/number of behavior observed

TABLE 4. Biochemical, hormonal, and hematological changes in Fayoumi, Dandarawi and Gimmizah chicken strains

Parameters		Fayoumi	Dandarawi	Gimmizah
Blood proteins	Total protein (mg/dl)	5.32±0.32	5.66±0.43	5.77±0.64
	Albumin (mg/dl)	3.13 ^b ±0.32	3.28 ^b ±0.34	3.61 ^a ±0.50
	Globulin (mg/dl)	2.19±0.44	2.38±0.78	2.16±0.33
	A/G ratio	1.40 ^b ±0.32	1.37 ^b ±0.56	1.67 ^a ±0.69
Hormone concentrations	Corticosterone (ng/ml)	504.0 ^a ±6.30	487.0 ^b ±3.13	469.8 ^c ±4.90
	Testosterone (ng/ml)	419.4 ^a ±4.76	394.0 ^b ±6.11	389.7 ^b ±3.23
Differential leucocytic count	Heterophil (%)	57.0 ^a ±6.0	49.0 ^b ±4.0	47.0 ^b ±3.0
	Lymphocyte (%)	43.0 ^b ±4.0	51.0 ^a ±5.0	53.0 ^a ±4.0
	H/L ratio	1.33 ^a	0.96 ^b	0.89 ^c
Immuno-organs weight (%)	Spleen	0.29 ^b ±0.02	0.31 ^b ±0.03	0.36 ^a ±0.04
	Bursa	0.18 ^b ±0.07	0.21 ^a ±0.02	0.23 ^a ±0.03

a, b, c Means ±SD within the same row carrying different superscripts are significantly different (P<0.05).



Fig. 1. Egyptian local chicken strains

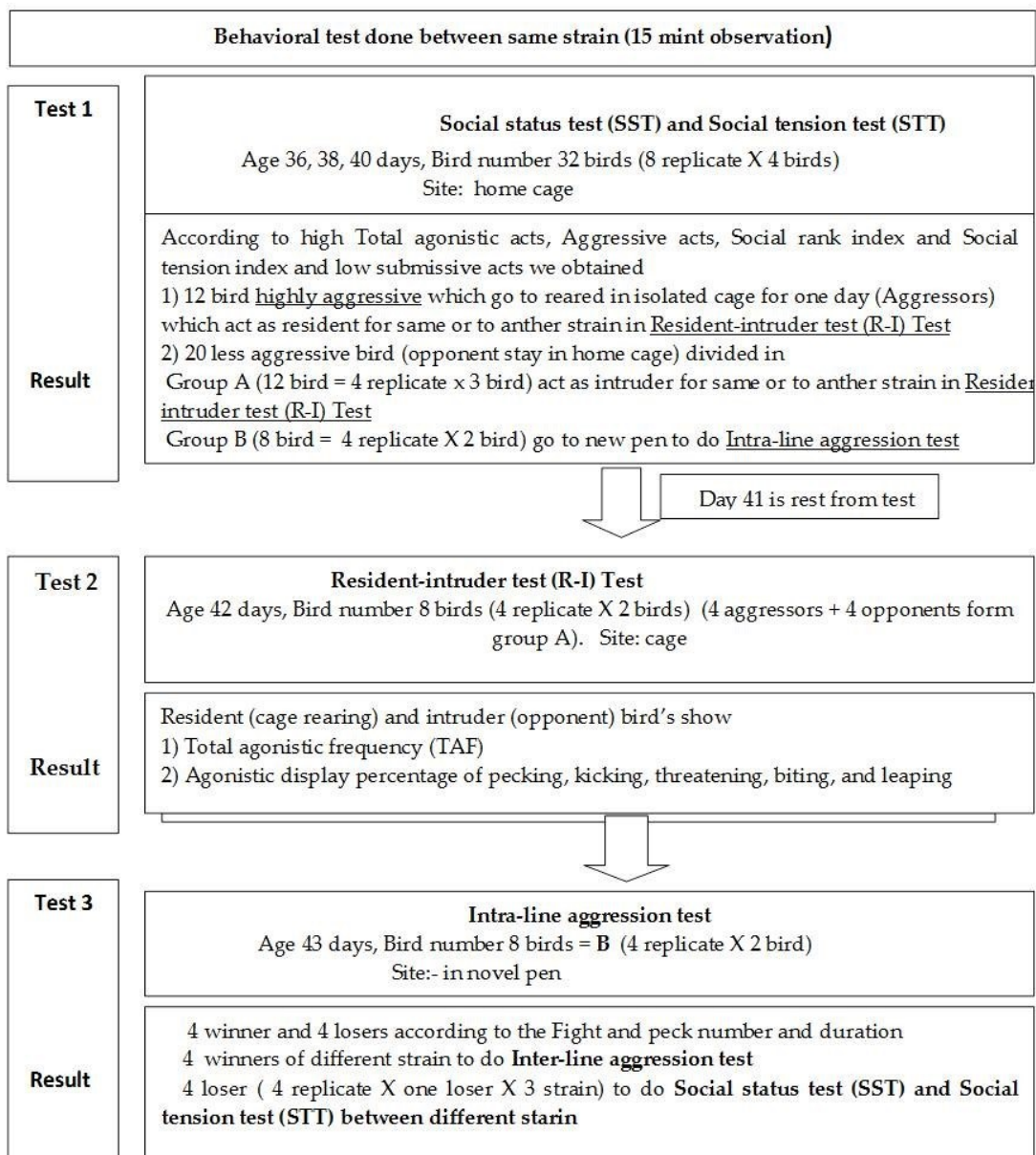


Fig. 2. A schematic representing the experimental procedure within the same strain.

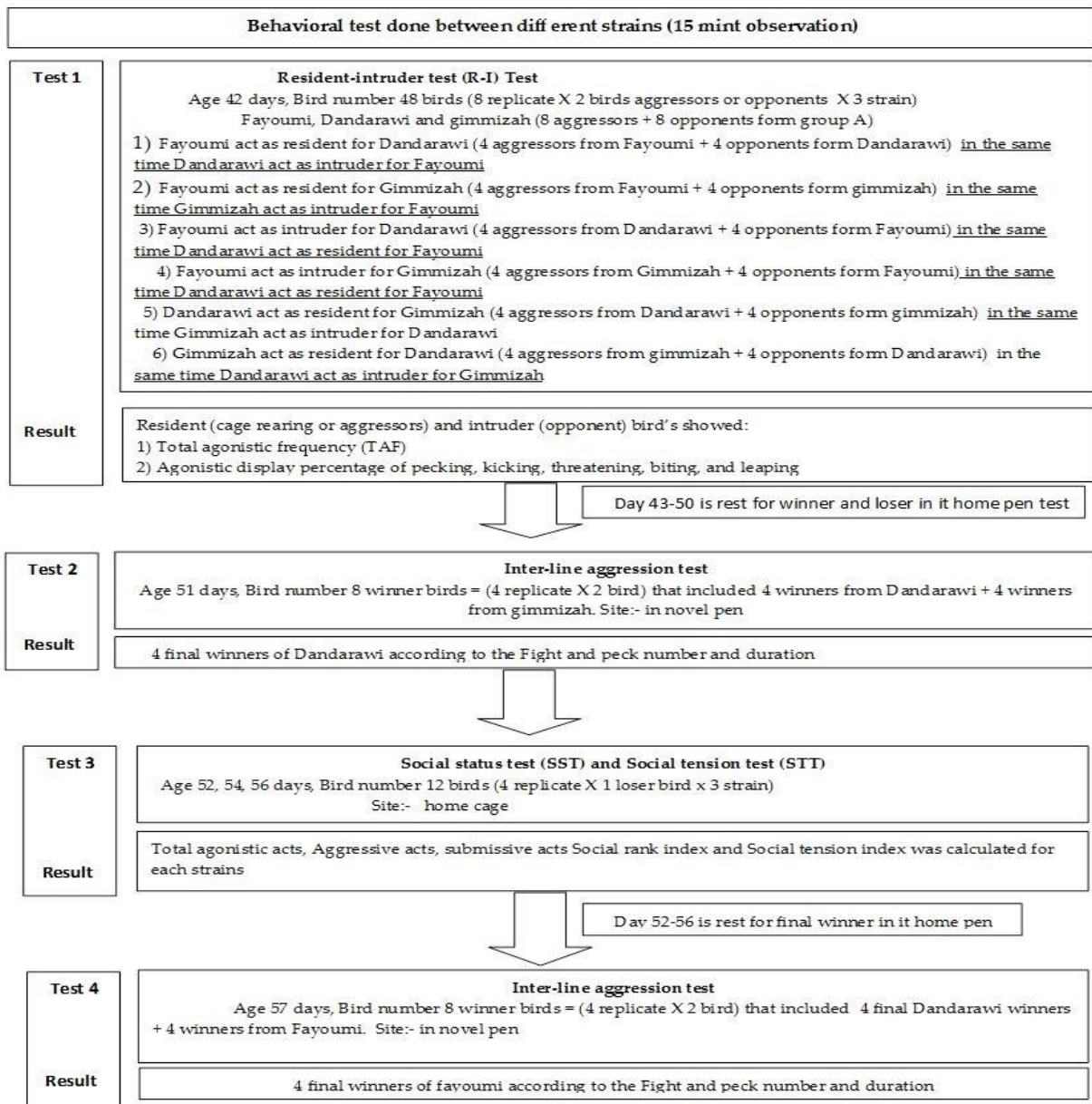


Fig. 3. A schematic representing the experimental procedure among different strains

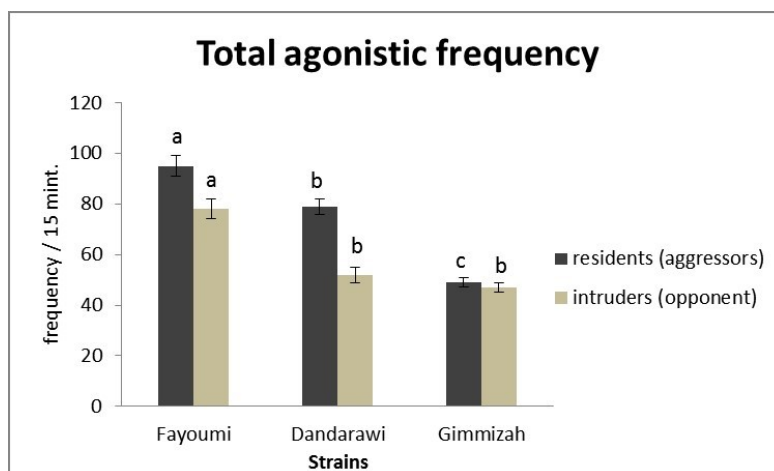


Fig. 4. Total agonistic frequency (TAF) (sum of frequencies of pecking, biting, kicking, threatening and leaping /15 min) between the same strains in the resident intruder test.

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فحص العدوانية السلوكية والضغوط الاجتماعية والعوامل الفسيولوجية في سلالات الدجاج المصري المحلي

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المستخلص

هدفت هذه الدراسة إلى تقييم العدوانية السلوكية والضغوط الاجتماعي والعوامل الفسيولوجية بين نفس السلالة أو تجاه سلالات أخرى من ذكور الفيومي والندراوي والجميزة (سلالات الدجاج المصرية المحلية) خلال فترة التكاثر. تم استخدام إجمالي 96 ككتوتاً ذكراً (عمرها 35 يوماً) من هذه السلالات (3 سلالات × 8 مكررات × 4 ككتوت)، في الدراسة الحالية خلال فترة تجريبية مدتها أربعة أسابيع. تمت دراسة اختبارات سلوكية مختلفة، بما في ذلك الحالة الاجتماعية والتوتر الاجتماعي واختبار الدخيل المقيم (RI) واختبار الضغط الاجتماعي (اختبار العدوان داخل الخط وبين الخطوط) بين نفس السلالات أو سلالات مختلفة لتحديد الأفعال الأكثر عدوانية وخنوعاً، إجمالي الترددات الناهضة (TAF) بالإضافة إلى النسبة المئوية وترددات العروض الناهضة (مثل النقر والقتال). علاوة على ذلك، تم جمع عينات الدم وتحليلها لمعرفة مستقبلات المصل والهرمونات. أظهر الديك الفيومي السلوك الأكثر عدوانية، وارتفاع مؤشر التوتر الاجتماعي، ونسبة هرمون التستوستيرون، والهيستامينات، والخلايا الليمفاوية في الدم مقارنة بالسلالات الأخرى. كما أن مدة القتال أطول بكثير ($P < 0.0001$) من الجميزة وأعلى من ($P < 0.05$) من الندراوي والجميزة. على الجانب الآخر، كانت سلالة الجميزة أقل من معدل تكرار العدائيه، والرتبة الاجتماعية، وعدد النقرات ومدة النقر مقارنة بالسلالات الأخرى. في الختام، فإن ذكور الديوك الفيومي أكثر عدوانية تجاه الدجاج الندراوي والجميزة. ولذلك ينصح باستخدام سلالة الجميزة حصراً، أو دمجها مع الندراوي أو الفيومي، عند تكوين قطيع ذكور من سلالات الدجاج المصرية لإنتاج اللحوم.

الكلمات الدالة: العدوانية، السلوك العدواني، سلالة الدجاج، الدخيل المقيم، علم وظائف الأعضاء.