Scientific Works. Series C. Veterinary Medicine. Vol. LXXI (1), 2025
ISSN 2065-1295; ISSN 2343-9394 (CD-ROM); ISSN 2067-3663 (Online); ISSN-L 2065-1295

THE RELATIONSHIP BETWEEN MATING BEHAVIOUR, INCIDENCE OF TRAUMATIC INJURIES, AND PRODUCTIVITY IN A REPRODUCTIVE POULTRY POPULATION

Mihnea LUPU[1*], Elena MITRĂNESCU[1], Manuella MILITARU[1]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Veterinary Medicine, 105 Splaiul Independentei, 5th District, 050097, Bucharest, Romania

*Corresponding author email: mihnea.l96@gmail.com

Abstract

This study was conducted in a poultry breeding farm, aiming to analyse the mating behaviour of birds from a population consisting of parental lines used for slow-growing coloured broiler production. The research focused on direct observations made in the growing hall, assessing the causal relationship between reproductive activity and the incidence of traumatic injuries due to sexual aggression, as well as their impact on final productivity. Following the analysis of reproductive behaviour, based on the examination of 1000 mating attempts, a detailed ethogram was developed. Data collected included details on courtship behaviour, the hen's response, and the outcome of each attempt. A total of 166 cases of aggressive trauma in hens were identified, with descriptions of each injury location and size. Productivity was evaluated based on the hatching rate obtained. The results revealed a significant correlation between mating behaviour, traumatic injury incidence, and productivity. The intensity of aggression peaked early in the laying period, within the first 5 weeks, when the population was still young and inexperienced.

Key words*: mating aggression, poultry behaviour, slow-growing coloured broiler, traumatic injuries.*

INTRODUCTION

Aggressive behaviour in chickens is not merely an expression of social hierarchy but also a response to factors such as stress and diet, serving as a key indicator of their welfare (Ndagimba et al., 2024). Physiological stress, reflected in elevated corticosterone levels and alterations in gut microbiota, has been associated with increased aggression, indicating that biological factors significantly influence social interactions in chickens (Gao et al., 2025). However, aggression levels vary between breeds, with some genetic lines displaying stronger dominance and conflict-driven behaviours, while others exhibit greater social tolerance (El-Shoukary et al., 2025).

In natural conditions, aggressive behaviour of roosters towards hens is uncommon, as the two genders maintain distinct social hierarchies, with male dominance typically exerted through passive means (Wood-Gush, 1958; Rushen, 1983; Kjaer & Mench, 2003). However, aggression of breeding roosters towards hens has been documented in the scientific literature, particularly in the context of industrial poultry farming (Jones & Prescott, 2000; Millman et al., 2000; Millman & Duncan, 2000a; 2000b; 2000c; Kjaer & Mench, 2003; De Jong, 2009). This type of behaviour, along with other deviant manifestations such as aggressive feather pecking, which can escalate to extreme forms of cannibalism, has a significant negative impact on the well-being and health of birds (Mitrănescu & Furnaris, 2012).

Previous studies suggest that behavioural manifestation has a genetic basis, potentially influenced by intensive selection aimed at improving productivity, often at the expense of optimizing social behaviour in poultry (Kjaer & Mench, 2003; Cheng & Jiang, 2020).

The present study provides a novel perspective by investigating this phenomenon in a population belonging to the parental line of slow-growing-coloured broilers. Unlike controlled experimental studies, this research was conducted in an industrial farming facility, allowing for an analysis of natural behavioural patterns in intensive rearing systems. The study establishes correlations between behavioural traits, lesions characteristic of sexual aggression, and productivity, offering an integrated understanding of this phenomenon.

MATERIALS AND METHODS

The present study was conducted on a poultry breeding farm equipped with its own hatchery. The research focused on direct observations carried out in the rearing hall, targeting a flock of breeding hens from parental lines used for producing slow-growing, coloured broilers.

The primary objective of the study was to collect data and observations directly from the rearing hall during observation sessions conducted according to a predefined schedule.

An essential aspect of the study was maintaining the specific conditions of industrial poultry farming technology, ensuring that observations did not interfere with the routine of the birds. No experimental conditions were introduced; the birds being engaged in activities characteristic of any intensive rearing hall.

Based on observations from previous rearing cycles, a hypothesis was formulated that the phenomenon of sexual aggression occurs during the early stages of sexual maturity in the studied birds (Lupu & Militaru, 2022). Consequently, the study period was defined as starting from the laying of the first egg, which marks the onset of sexual maturity (considering the sexual nature of aggression), and ending when no new cases exhibiting specific injuries were identified among the studied breeding hens.

Within this study, three distinct yet interdependent analyses were proposed to investigate the correlations between bird behaviour and final productivity, the latter being reflected in the hatching rate. The proposed studies are as follows:

- Study I: *"Observation, recording, and description of wounds identified in breeding hens as a result of sexual aggression."*
- Study II: *"Monitoring mating activities of roosters and breeding hens."*
- Study III: *"Calculation of the hatching rate corresponding to the period during studies I and II."*

The first two studies were conducted simultaneously, while the third study followed with three-week delay, corresponding to the incubation period of the collected eggs.

Study I: Observation, recording, and description of wounds identified in breeding hens as a result of sexual aggression

Five control visits were conducted daily to monitor and record any new cases of injuries observed in hens. During each visit, the entire rearing hall was thoroughly inspected to ensure the comprehensive identification of every affected bird.

Upon identification, each case was photographically documented, and the size of the wound was measured. Subsequently, the affected hens were marked with a coloured spray containing an antibiotic, providing also localized therapeutic effect. During subsequent visits, previously marked specimens were not recounted, allowing for the exclusive monitoring of newly emerged cases and avoiding duplication of records.

At the end of each day, the number of new cases was recorded in a database, new entry of information being consolidated weekly for each phase of the study. Additionally, wound measurements were recorded separately to facilitate the analysis of correlations between various variables.

To evaluate wound severity in a standardized manner, a scoring system based on wound size was applied. Each hen was assigned a single score corresponding to the largest or most visible lesion observed. The wounds were classified into three size-based categories:

- Score 1: wound smaller than 0.5 cm;
- Score 2: wound between 0.5 cm and 1 cm;
- Score 3: wound larger than 1 cm.

Only one wound per bird was recorded, based on its prominence, to ensure data consistency under field conditions.

Another point of interest was the localization of the wounds, which could be situated on the comb, the back of the head, the earlobes, as well as on the trunk and the lateral aspects of the thighs. The method used to assess wounds on the trunk and the lateral aspects of the thighs differed from the approach applied to identify wounds in the head region. Due to the dense feathering of the wings, which covers the lateral areas of the trunk, it was not feasible to consistently detect hens with trunk wounds during live observations.

As a result, an alternative strategy was implemented: during **manual depopulation**, all hens exhibiting visible trunk wounds were **identified and separated.** While post-mortem carcass examination may be considered a potential method for evaluating such wounds, it does **not allow for accurate quantification of live hens affected**. Therefore, **manual depopulation provided the most reliable opportunity** to record the presence of trunk wounds.

Study II: Monitoring mating activities of roosters and breeding hens

The mating behaviour was studied in the second part of the day, when its intensity is at its peak. It was proposed to observe 200 mating attempts each week of the study, analysing the behaviour of both roosters and hens, as well as the outcome of each mating attempt. A clear distinction is essential between the terms "mating attempt" and "mating". A "mating attempt" includes any behaviour reflecting the male's intention to initiate the act, whereas "mating" refers to the successful completion of the sexual act.

The observation of behaviour was conducted every Wednesday during each week of the study, as this day is approximately in the middle of the week. A behavioural analysis scheme was developed for this activity, which includes three main categories: ***Courtship behaviour***, ***Hen behaviour***, and ***Outcome of the mating attempt***.

Courtship behaviour includes:

"Absent courtship behaviour": the rooster does not display any courtship behaviour.

"Complete courtship behaviour present": the rooster displays the entire sequence of courtship behaviours as described in the scientific literature.

"Incomplete courtship behaviour present": the rooster displays partially or fully one or more elements of courtship. In this study, three basic courtship elements were selected, with the focus being on their expression frequency. These are: waltzing, vocalizations and food calling.

Based on these definitions, a three-level scoring system was applied to categorize the observed courtship behaviours: Score 0 (absent), Score 1 (incomplete), and Score 2 (complete).

The ***Hen behaviour*** category includes:

"Hen adopts the specific position voluntarily": this category refers to the female's behaviour. The hen voluntarily assumes the specific position (squatting) in response to the rooster's courtship behaviour or simply to his proximity (without the rooster displaying courtship behaviour). The hen does not need to be touched by the rooster to adopt this position.

"Hen adopts the specific position forcibly": This category refers to the female's behaviour. The hen adopts the specific position as a result of being forced by the rooster through his direct rush or approach.

"Hen flees": As a result of the rooster's rush towards the hen with the intent to mount, the hen does not adopt the specific position forcibly. Instead, she chooses to flee and move away from the rooster.

The mating behaviour can be concluded through four scenarios:

“Complete mating”: The hen willingly adopts the squatting position, and the rooster successfully achieves full cloacal contact. The presence of courtship behaviour (complete/incomplete) by the rooster is not mandatory. The essential elements of this category are the voluntary posture of the hen and the rooster's ability to establish cloacal contact.

"Forced complete mating": The hen adopts the squatting position forcibly, and the rooster successfully achieves full cloacal contact. The presence of courtship behaviour (complete/incomplete) by the rooster is not mandatory. The essential elements of this category are the forced posture of the hen and the rooster's ability to establish cloacal contact.

"Complete mounting without cloacal contact": In this case, the rooster successfully mounts the hen but does not achieve cloacal contact.

"No mounting occurred": This category includes cases where the hen flees or cases where the hen adopts the specific position (voluntarily/forcibly), but the rooster either deliberately stops attempting to mount or is driven away by a dominant individual.

Study III: Calculation of the hatching rate corresponding to the period during Studies I and II

Simultaneously, weekly hatchability percentages were recorded and compared with expected values provided by the commercial supplier.

Statistical analysis

To evaluate relationships between behavioural variables and experimental outcomes, two non-parametric statistical methods were applied: Spearman's rank correlation coefficient (ρ) and the Chi-square test of independence.

Spearman's correlation was used to examine monotonic associations between:

- The weekly percentages of rooster courtship behaviour and female responses during mating.
- The incidence of traumatic injuries and female behavioural responses.
- Female responses and mating outcomes.
- Female behaviour and hatchability, as well as the relationship between the total percentage of completed matings and hatch rate.

Analyses were performed on weekly percentage data collected over a five-week period. Spearman's method was chosen due to the ordinal nature of the data and the small sample size ($n = 5$). A p-value of < 0.05 was considered statistically significant.

To determine whether rooster courtship behaviour distribution changed significantly over time, a Chi-square test of independence was conducted using weekly observed frequencies for each courtship category.

RESULTS AND DISCUSSIONS

At the time of the first egg laying, the entire flock consisted of 5,078 females and 451 males (approximately 9 males per 100 females), raised together from day-old to depopulation in the same rearing hall. The study was conducted over a period of 5 weeks.

Study I: Observation, recording, and description of wounds identified in breeding hens as a result of sexual aggression

Study Period - Age of the birds - Number of cases with traumatic lesions

Over the course of the five-week study, a total of 166 cases of traumatic injuries specific to sexual aggression were observed and recorded. The first egg was laid when the hens were 21 weeks of age, this being considered as week one of the study. In week 1 of the study, only one case was recorded. In comparison to week 1, in week 2 of the study, when the birds were 22 weeks of age, 46 new cases were identified. There is a clear trend of increasing new cases, with a peak recorded in week 3 of the study, when the birds were 23 weeks of age. Starting from week 4 of the study, the number of cases decreases, reaching no new cases by week 6 (Figure 1).

These cases, in which injuries specific to sexual aggression are observed, occur within the first 5 weeks after the onset of egg laying, when the birds' age ranged between 21 and 25 weeks (Table 1).

Table 1. The number of new cases corresponding to each week of the study

Study week number	Age of the birds (weeks)	New cases-number/(%)
1	21	1 (0.6)
2	22	46 (28)
3	23	71 (43)
4	24	39 (23)
5	25	9 (5.4)
6	26	0 (0)
		TOTAL: 166 (100)

Percentage-wise, approximately half of the cases (43%) were recorded in week 3, when the birds were 23-week-old (Table 1).

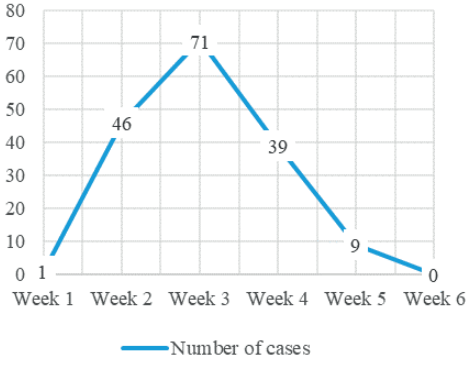

Figure 1. The curve of the number of cases with traumatic lesions recorded in the rearing hall

Injury size

Of the 166 cases identified during the 5 weeks of study, 58 cases involved injuries smaller than 0.5 cm (score 1), 64 cases had injuries ranging from 0.5 to 1 cm in length (score 2), and 44 cases involved injuries larger than 1 cm in length (score 3) (Table 2).

Thus, the majority of injuries throughout the observation period were classified as being between 0.5 and 1 cm in size (score 2). However, the highest value recorded in a single week (week 3) was 28 cases where the injury measured less than 0.5 cm in length (score 1).

Table 2. Number of cases per week according to the size of lesions

Study week no.	Total number of cases	< 0.5 cm	0.5 cm – 1 cm	> 1cm
1	1	1	0	0
2	46	18	17	11
3	71	28	26	17
4	39	8	17	14
5	9	3	4	2
TOTAL	166	**58**	**64**	**44**

Injury localization

In terms of localization, injuries were identified in 3 main areas: comb, head, and earlobes. Cases in which injuries were localized to the comb were recorded in weeks 1 and 2, while cases with injuries localized to the earlobes were only recorded in week 2. Cases in which injuries were localized to the head were recorded in all weeks except week 1. There is no significant difference regarding the location of wounds on comb and earlobes (Table 3);

The highest recorded value in the dataset is **149,** representing the total number of cases with lesions localized on the **head**. This constitutes the most frequent anatomical site observed during the five-week study period.

Table 3. Number of wounds according to localization

Study week no.	Total number of cases	Lesion localization		
		Comb	Head	Earlobes
1	1	1	0	0
2	46	8	30	8
3	71	0	71	0
4	39	0	39	0
5	9	0	9	0
TOTAL	166	9	149	8

Description of lesions

The lesions observed in hens, caused by the sexually aggressive behaviour of roosters, are located in two major regions: the head region and the trunk region. Lesions in the head region can be further classified into three specific zones: the comb, the earlobes, and the head (skin on the back of the head).

Lesions located in the trunk region can be further divided into two narrower areas: the dorsal area of the trunk and the lateral surfaces of the thighs.

A significant limitation of this necessary method is the inability to determine the time frame during which these injuries occurred, as well as the exact onset or cessation of their appearance. However, a description of these lesions can nevertheless be conducted. Lesions located on the trunk and the lateral surfaces of the thighs are characterized, in most cases, by the presence of skin flaps partial avulsion of the skin flaps and dry necrosis, affecting both the cutaneous edges of the wound and the exposed subcutaneous connective tissue and muscle masses.

Typically, there is no significant loss of tissue; however, wound edge approximation is impossible due to skin retraction and the presence of inflammation. In the perilesional area, fibrin deposition is frequently observed, indicating a chronic inflammatory process.

Figure 2. Hen, skin partial avulsion, dehydration and necrosis of the skin flap and subcutaneous connective tissue. Litter debris and clotted blood is noticed

Figure 3. Partial skin avulsion and skeletal muscle laceration and rupture

Figure 4. Massive skin retraction after avulsion, followed by dehydration and necrosis

Chronic lesions often display a surface contaminated with litter debris, suggesting prolonged exposure and a lack of adequate mechanical protection (Figures 2, 3, 4).

In addition to the primary necrosis, multiple scratches can be identified on the exposed muscle tissue, and the skin surrounding the lesions often appears frayed, most likely as a result of mating attempts. In severe cases, extensive destruction of the skin may be noted, potentially involving up to half of the thigh's surface. Generally, lesions are unilateral, affecting either the right or the left side of the body, with bilateral cases being rare. When tissue damage is extensive, lameness is observed, indicating functional impairment. Furthermore, in extreme cases, the occurrence of cannibalism may overlap with these lesions.

Study II: Monitoring mating activities of roosters and breeding hens

Throughout the entire observation period, a total of 1,000 mating attempts were monitored and described, with 200 attempts recorded per week. Among the 1000 mating attempts observed, no instance of complete courtship behaviour was recorded. In 49% of cases, incomplete courtship behaviour was observed, while in 51% of cases, courtship behaviour was entirely absent. From the perspective of the hen's behaviour, the specific mating posture was adopted voluntarily in 12.8% of cases, was forcibly induced in 54.5% of cases, and was avoided by fleeing in 32.7% of cases.

The proportion of attempts resulting in successful mating without coercion was 2.8%, while 14.2% of complete matings involved coercion. In 44.2% of cases, "mounting" occurred without cloacal contact, whereas in 38.8% of cases, the mating attempt did not result in mounting. These values vary depending on the week of the study and will be detailed for each individual week in the following sections.

The behaviour of the hen

A general trend of increased receptivity of the hen towards the rooster is observed, both directly through an increased number of cases where the female voluntarily adopts the specific mating posture, and indirectly through a decreased number of cases where the female attempts to escape. Even in the fifth week of observation, 53% of females adopt the position forcibly, with a slight decrease in this behaviour

observed in the third week of the study, likely due to an increase in the number of situations where the female chose to flee (Figure 5).

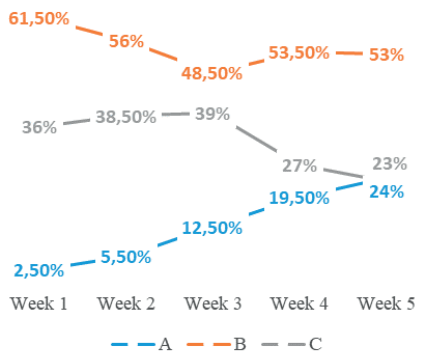

Figure 5. Behavioural development of the hen:
A. Percentage of mating attempts in which the female voluntarily adopted the specific position;
B. Percentage of mating attempts in which the female adopted the specific position by force;
C. Percentage of mating attempts in which the female fled

To explore potential associations between female behavioural responses during mating and the incidence of traumatic injuries, Spearman's rank correlation was applied using weekly percentages.

The analysis revealed no statistically significant correlations between the incidence of injuries and any of the three behavioural categories observed. A moderate negative correlation was found between the percentage of hens adopting the mating posture by force and injury incidence ($\rho = -0.60$, $p = 0.285$), while fleeing behaviour showed a strong positive trend ($\rho = 0.70$, $p = 0.188$). However, neither of these relationships reached statistical significance. Voluntary posture adoption showed no association with injury occurrence ($\rho = 0.10$, $p = 0.873$).**The courtship behaviour of the rooster**Throughout the five-week observation period, the courtship behaviour remained predominantly incomplete or absent. As shown in Figure 6, **no mating attempts included complete courtship behaviour (score 2), with this category consistently at 0%** each week. The proportion of **absent courtship behaviour (score 0)** ranged between 43.5% and 55%, peaking in **week 2.** Meanwhile, **incomplete courtship behaviour (score 1)** fluctuated between 45% and 56.5%, reaching its highest in **week 1** and lowest in week 2.

To assess whether the distribution of courtship behaviour changed significantly over time, a chi-square test of independence was applied. The analysis was based on numeric data derived from weekly mating attempt observations. Specifically, the number of mating attempts in which courtship behaviour was absent or incompletely present was calculated for each of the five observation weeks, using the reported percentages and a consistent total of 200 attempts per week.

The category of complete courtship behaviour was excluded from the analysis, as it was consistently absent (0%) across all five weeks, providing no variation for comparison.

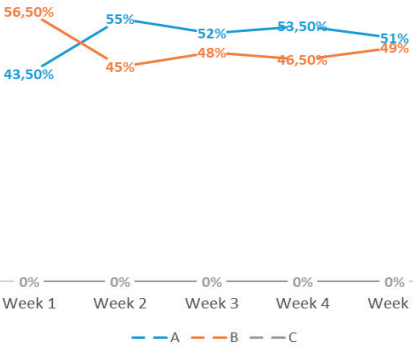

Figure 6. The courtship behaviour of the rooster:
A. Percentage of mating attempts in which courtship behaviour was absent;
B. Percentage of mating attempts in which courtship behaviour was partially present;
C. Percentage of mating attempts in which courtship behaviour was fully present

The observed frequencies were used to construct a contingency table, and the chi-square test revealed no statistically significant association between the week of observation and the type of courtship behaviour displayed ($\chi^2 = 6.36$, df = 4, $p = 0.174$).

To assess whether rooster courtship behaviour influenced female responses during mating, Spearman rank correlation was applied using weekly percentages of courtship categories (absent, incomplete) and hen behavioural outcomes (voluntary posture, forced posture, fleeing). The analysis revealed no statistically

significant correlations across any pair of variables. Correlation coefficients ranged from –0.30 to +0.30, with all *p*-values above 0.6. These results suggest that variation in courtship expression (limited to absent and incomplete behaviours) had no consistent or measurable effect on the way hens responded during mating attempts.

Outcome of the mating attempt

The outcome of the mating attempt is graphically detailed in Figure 7.

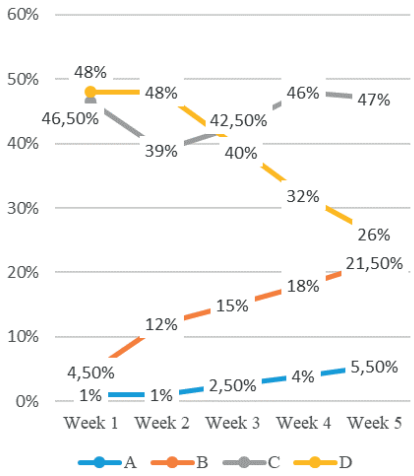

Figure 7. Outcome of the mating attempt:
A. Percentage of mating attempts that ended with a complete mating without force;
B. Percentage of mating attempts that ended with a forced complete mating;
C. Percentage of mating attempts in which mounting was complete but cloacal contact was not achieved;
D. Percentage of mating attempts that did not end with mounting

The number of mating attempts that did not result in mounting decreased throughout the study period, reaching 26% by week 5. For the number of mating attempts in which mounting occurred but no cloacal contact was made, variations were observed with both increases and decreases, with the values in weeks 1 and 5 being nearly identical (46.5% and 47%, respectively). The number of mating attempts that resulted in forced complete mating continuously increased from week 1 to week 5. The number of mating attempts that resulted in complete mating without coercion also increased throughout the study, although it remained much lower than the number of attempts that resulted in forced complete mating.

To assess the relationship between female behaviour, rooster courtship expression, and the outcome of mating attempts, Spearman's rank correlation was calculated based on weekly percentage data.

A strong and statistically significant positive correlation was found between the proportion of hens adopting a voluntary posture and the percentage of mating attempts that ended in complete mating without force ($\rho = 0.97$, $p = 0.005$). Similarly, voluntary behaviour showed a perfect positive correlation with the percentage of forced complete matings ($\rho = 1.00$, $p = 0.000$). These findings may reflect a general trend in which voluntary posture co-occurs with successful mating, regardless of coercion level.

Other associations were not statistically significant. Fleeing behaviour was positively but non-significantly correlated with the percentage of attempts where mounting did not occur ($\rho = 0.67$, $p = 0.219$), and forced posture was negatively associated with forced complete matings ($\rho = –0.70$, $p = 0.188$). No meaningful correlations were observed between courtship behaviour and any of the mating outcomes.

Study III: Calculation of the hatching rate corresponding to the period during which Studies I and II were conducted

The eggs collected over the course of the five weeks of the study were incubated, with the exception of those from week 1, due to the extremely limited number of eggs. In week 2 of the study, a total of 150 eggs were incubated for experimental purposes, with a very low hatching percentage anticipated. The obtained values are presented in Table 4. A clearer representation of this trend can be observed.

Table 4. The hatching percentage corresponding to each study week

The study week during which the eggs used for incubation were collected	Hatch rate percentage
Week 1	0% No eggs were set for incubation
Week 2	15%
Week 3	50%
Week 4	62%
Week 5	75%

The hatchability percentage is visibly affected in the initial weeks but shows a clear upward trend

throughout the study. In week 5, a 27% complete mating rate is correlated with a 75% hatchability percentage, a phenomenon explained by the hens' ability to store sperm and the fact that a single hen can mate with multiple roosters.

Although the hatching percentage is low at the beginning of the study, it increases steadily, reaching 83% after 6 weeks from the onset of egg laying.

The recorded hatchability rates increased progressively from 15% in week 2 to 75% in week 5. When compared to commercial expectations for the same genetic line, which range between 70% and 80% for weeks 22 to 25, the observed values were considerably lower in the early part of the laying period, with convergence occurring only by the fifth week.

The results revealed a **perfect positive correlation** between the percentage of voluntary posture and hatch rate ($\rho = 1.00$, $p = 0.000$), suggesting that cooperative female behaviour during mating may strongly influence reproductive success.

A Spearman correlation was performed to determine the relationship between the total percentage of completed matings (both with and without force) and hatch rate. The analysis revealed a **perfect positive correlation** between the overall completion rate of mating attempts and hatchability ($\rho = 1.00$, $p = 0.000$), indicating that successful copulation, regardless of its nature, is a strong predictor of reproductive output.

The relationship between negative female behavioural responses during mating and hatch rate was also explored using Spearman correlation. A strong negative trend was found between fleeing behaviour and hatch rate ($\rho = –0.80$, $p = 0.200$), suggesting that increased avoidance behaviour by hens may be associated with reduced reproductive success. However, this correlation did not reach statistical significance. Forced posture showed a weaker, non-significant negative correlation with hatch rate ($\rho = –0.40$, $p = 0.600$).

Overview of the phenomenon of sexual aggressiveness in the present study

Wounds specific to sexual aggression

The manifestation of sexual aggression is closely correlated with mating behaviour. Sexual aggression occurs when the natural stages of mating behaviour are partially or entirely absent, leading to the emergence of behavioural abnormalities. Roosters, in their desire to mate, no longer perceive the avoidance signals emitted by hens, and they end up forcing matings. As a result of forced matings or even just forced mating attempts, males inflict specific injuries on females.

These injuries, primarily affecting the skin in the head and torso regions, are localized precisely where the male grips the hen during mating. The injuries occur through tearing of the skin with the claws or beak during the mating attempt. Injuries caused by sexual aggression differ from those resulting from dominance-based fights and are categorically distinct from the injuries associated with cannibalism due to their location and morphological characteristics (Lupu & Militaru, 2022).

The study and understanding of animal behaviour, a field known as ethology, are essential for assessing species' well-being and adaptability. In birds, ethology helps identify factors influencing stress, aggression, and social interactions, which are relevant for both research and management in controlled environments (Bălăceanu, 2021).

In the present study, the phenomenon of aggressiveness is characteristic of the onset of the laying period and extends over a time span of 21 to 25 weeks, as confirmed by previous studies. De Jong et al. (2009) observed that males exhibit aggressive behaviour immediately after being introduced into female groups, with forced sexual interactions occurring during the initial encounters between males and females, starting at 20 weeks of age.

The presence of these localizations (comb and earlobes) exclusively in weeks 1 and 2 suggests the idea of sexual immaturity on the part of the roosters, as they were unsure how to grip the hen during mating.

The head was the most frequently affected region, likely due to sexual aggression during forced mating attempts, where males may peck or restrain females by targeting the cranial area. Most injuries were classified as score 2, corresponding to wounds between 0.5 and 1 cm, indicating a moderate but repeated level of trauma. The peak incidence of score 1 injuries in week 3 coincided with the highest number of new cases overall, occurring when the birds

were 23 weeks old and still within the early post-laying period. This suggests that the initial weeks after the onset of egg production represent a critical window in which the frequency and intensity of sexually aggressive interactions escalate rapidly before stabilizing.

Despite not reaching statistical significance, the strong positive correlation between fleeing behaviour and injury incidence ($\rho = 0.70$) highlights a potential biological link between avoidance responses and the risk of trauma. This suggests that hens subjected to aggressive mating attempts may experience both behavioural stress and physical injury, especially during the early reproductive period.

Trunk and thighs lesions exhibited characteristics repeated trauma without healing tendency, likely linked to repeated forced mating. The presence of necrosis, inflammation, and contamination suggests prolonged exposure without healing. Such injuries may impair mobility and, in severe cases, provoke cannibalism, highlighting the welfare risks associated with unregulated sexual aggression.

When examining courtship behaviour in roosters, it was either absent or weakly expressed. Throughout the study, courtship behaviour was absent in 51% of cases, while in 49% it was incomplete. The analysis of courtship behaviour revealed no statistically significant variation in its distribution across the five-week study period. Although weekly fluctuations in the proportion of absent and incomplete behaviours were observed, the chi-square test indicated that these differences were not meaningful at a statistical level. This suggests a general consistency in courtship expression over time. Numerous previous studies support and confirm this observation, indicating that in many cases recorded under commercial breeding conditions, mating is not preceded by courtship behaviour, or when it does occur, it is expressed with low intensity (Millman et al, 2000; Jones et al, 2001; De Jong et al, 2009). These deficiencies appear to be correlated with selective breeding for production traits. Kjaer and Mench (2003) suggest that genetic selection for high production efficiency may have inadvertently influenced behavioural patterns, including courtship expression.

Furthermore, it remains unclear whether the deficiency in courtship behaviour and the occurrence of hyper-aggressiveness are independent issues or interconnected phenomena. There is a possibility that these traits are genetically linked to a production characteristic, such as the development of a prominent breast, a trait that has been a key focus of selection in breeding programs. Duncan (2009) highlights the potential genetic correlation between physical traits selected for production efficiency and alterations in mating behaviour, raising important questions about the unintended consequences of modern poultry breeding practices.

Hens are generally expected to respond to the rooster's courtship behaviour; however, under certain circumstances, they may exhibit avoidance strategies or even rejection behaviours (Willis & Ludlow, 2015).

Contrary to expectations, our study found no clear relationship between female receptivity and the rooster's courtship behaviour. These results suggest that variation in courtship expression had no consistent or measurable effect on the way hens responded during mating attempts.

Instead, female receptivity showed a gradual upward trend throughout the study. This increase could suggest a progressive adaptation of the females. Another possible explanation is that the initial stress, combined with male aggressiveness, gradually leads to a reduction in defensive behaviour.

The role of females in the manifestation of sexual aggressiveness remains insufficiently understood. It is not yet clear whether hen behaviour is a direct consequence of male aggression during mating interactions or if females fail to display a typical mating response, which in turn leads to male frustration (Millman et al., 2000). Finally, no strong preference for a particular rooster lineage was observed. Researchers hypothesize that female avoidance of males results from learned experiences rather than an innate aversion (Millman & Duncan, 2000a).

When examining the relationship between mating behaviours and outcomes, the data revealed that voluntary female posture was strongly associated with the successful completion of mating, both with and without the

use of force. This suggests that female cooperation may play a key role in mating efficiency. In contrast, courtship behaviour - limited in this study to absent or incomplete forms - showed no clear association with mating success. Although fleeing behaviour tended to correlate with failed mounting attempts, this relationship was not statistically significant, pointing to the multifactorial nature of mating dynamics.

The male-to-female ratio plays a crucial role in ensuring optimal fertility rates (Duncan, 2009). With the introduction of genetic lines selected for increased breast yield, concerns have grown regarding male aggressiveness and its negative effects on mating behaviour and fertility. Currently, a 1:12 mating ratio is more commonly used (Leeson & Summers, 2010). However, in practice, this ratio often approaches 1:20, as a considerable number of roosters fail to successfully fertilize hens (Duncan, 2009).

In the context of reproductive performance, several behavioural variables were examined for their potential association with hatch rate. The strong positive correlation observed between voluntary female posture and hatchability suggests that cooperative behaviour during mating may directly contribute to successful fertilization. Likewise, the perfect correlation between the total number of completed matings (whether forced or not) and hatch rate highlights the importance of copulation success in determining reproductive output. While fleeing behaviour showed a notable negative trend, and forced posture also correlated negatively with hatch rate, these associations were not statistically significant. Even so, the consistent direction of these patterns supports the idea that female responsiveness and mating outcome are key elements influencing reproductive efficiency in the early laying period.

According to commercial performance expectations for this **genetic line,** hatchability between weeks 22 and 25 typically ranges between 70% and 80%. In the present study, observed hatch rates during weeks 2 and 3 were considerably lower than these standards, suggesting that, beyond physiological maturation, additional factors such as mating-related stress or trauma may have interfered with reproductive success. However, as the study progresses, a clear upward trend in hatching rates is observed, suggesting a possible adaptation within the flock. This improvement may be influenced by a stabilization of mating interactions, a reduction in excessive male aggression, or an increase in successful copulation attempts over time.

The cause of the lesions observed in the study is multifactorial, involving both male and female behavioural patterns. While roosters reach physical maturity, their behavioural development remains incomplete, leading to excessive aggression and uncoordinated mating attempts. Simultaneously, the lack of receptivity in females exacerbates this dynamic, as their avoidance or passive resistance contributes to unsuccessful and potentially injurious mating interactions.

These findings suggest that the temporal mismatch between physical and behavioural maturity in roosters, combined with female non-receptivity, creates conditions that heighten the risk of lesions. The intensity of this phenomenon decreases after the five-week study period, suggesting a potential behavioural adaptation over time. This decline may be attributed to progressive social stabilization, a reduction in male hyper-aggressiveness, or an increase in female receptivity as the flock dynamics adjust. Future research should explore whether this decline is a consistent pattern across different genetic lines and housing conditions, as well as investigate possible interventions that could accelerate this stabilization process, thereby minimize the risk of lesions and improve overall reproductive success.

This study addresses a significant issue that remains unexplored at the national level and has received limited attention internationally regarding the impact of sexual aggression in roosters on the welfare, productivity, and fertility of breeding flocks. International research has predominantly focused on parent stock of conventional fast-growing broilers, while little attention has been given to parent stock of coloured broilers, despite their growing economic importance. The findings highlight that the absence of proper courtship behaviour and aggressive mating attempts not only compromise the physical integrity of the hens but also negatively affect reproductive success, ultimately reducing overall farm performance. In an industry where optimizing productivity is

essential for economic sustainability, identifying and mitigating factors that contribute to this behaviour becomes a priority. Given the lack of national research on this topic and the narrow scope of international studies, the present study serves as a necessary starting point for a deeper understanding and improved management of behavioural dynamics in coloured broiler parent flocks

CONCLUSIONS

The phenomenon of sexual aggression emerges with the onset of sexual maturity, which coincides with the initiation of egg-laying and occurs within the age range of 21 to 25 weeks.
Specific lesions associated with the phenomenon of sexual aggressiveness are observed only in the first 5 weeks after egg-laying begins.
Head area lesions were recorded in 3.26% of the hen population.
Lesions were observed in 89.8% of cases on the back of the head, 5.42% on the comb, and 4.81% on the earlobes. The localization of lesions on the comb and earlobes was specific only to the first two weeks of the phenomenon's manifestation.
In terms of size, 35% of lesions were smaller than 0.5 cm, 38.5% measured between 0.5–1 cm, and 26.5% were larger than 1 cm.
No cases of complete courtship behaviour were recorded. Throughout the study, in 51% of cases, courtship behaviour was entirely absent, while in 49% of cases, it was incomplete, with no significant differences observed over the course of the study.
The cause of the lesions is complex and involves both male and female behaviour. Roosters exhibited behavioural immaturity despite reaching physical maturity, while the lack of receptivity in females exacerbated the mechanism leading to the occurrence of lesions.
The hatching percentage is visibly affected in the first weeks but shows a clear upward trend throughout the study.

REFERENCES

Bălăceanu, R. A. (2021). *Comportamentul animalelor, de la etogramă la etologie*. Bucharest, RO: Printech Publishing House.

Cheng, H., & Jiang, S. (2020). Genetics and genomics of behavioural and welfare traits in poultry species. In S. E. Aggrey, H. Zhou, M. Tixier-Boichard, & D. D. Rhoads (Eds.), *Advances in poultry genetics and genomics* (pp. 221–261). Cambridge, UK: Burleigh Dodds Science Publishing.

De Jong, I. C., Wolthuis-Fillerup, M., & Van Emous, R. A. (2009). Development of sexual behaviour in commercially-housed broiler breeders after mixing. *British Poultry Science*, *50*(2), 151–160.

Duncan, I. J. H. (2009). Mating behaviour and fertility. In P. M. Hocking (Ed.), *Biology of breeding poultry* (pp. 111–132). Wallingford, UK: CABI.

El-Shoukary, R. D., Swelum, A. A., Ali, F., Gharib, H. S., Lohakare, J., Abdel-Wareth, A. A., & Abuoghaba, A. A. (2025). The behavioural aggressiveness, social stress and physiological parameters screening in local Egyptian chicken strains. *Egyptian Journal of Veterinary Sciences, 56*(5), 1005–1015.

Gao, J., Cheng, X., Wu, X., Zou, C., He, B., & Ma, W. (2025). Integrated microbiome and metabolomics analysis reveals altered aggressive behaviours in broiler chickens showing different tonic immobility. *Animals, 15*(4), 601.

Jones, E. K. M., & Prescott, N. B. (2000). Visual cues used in the choice of mate by fowl and their potential importance for the breeder industry. *World's Poultry Science Journal, 56*(2), 127–138.

Jones, E. K. M., Prescott, N. B., Cook, P., White, R. P., & Wathes, C. M. (2001). Ultraviolet light and mating behaviour in domestic broiler breeders. *British Poultry Science, 42*(1), 23–32.

Kjaer, J. B., & Mench, J. A. (2003). Behaviour problems associated with selection for increased production. În W. M. Muir & S. E. Aggrey (Eds.), *Poultry genetics, breeding and biotechnology* (pp. 67–82). Wallingford, UK: CABI Publishing.

Leeson, S., & Summer, J. D. (2009). *Broiler breeder production*. Nottingham, UK: Nottingham University Press Publishing House.

Lupu, M., & Militaru, M. (2022). Aggression of broiler breeder males against females in a poultry reproduction farm: Injuries and possible contributing factors. *Scientific Works. Series C. Veterinary Medicine, 68*(1), 36–42.

Millman, S. T., & Duncan, I. J. H. (2000a). Do female broiler breeder fowl display a preference for broiler breeder or laying strain males in a Y-maze test? *Applied Animal Behaviour Science, 69*(4), 275–290.

Millman, S. T., & Duncan, I. J. H. (2000b). Effect of male-to-male aggressiveness and feed-restriction during rearing on sexual behaviour and aggressiveness towards females by male domestic fowl. *Applied Animal Behaviour Science, 70*(1), 63–82.

Millman, S. T., & Duncan, I. J. H. (2000c). Strain differences in aggressiveness of male domestic fowl in response to a male model. *Applied Animal Behaviour Science, 66*(3), 217–233.

Millman, S. T., Duncan, I. J. H., & Widowski, T. M. (2000). Male broiler breeder fowl display high levels of aggression toward females. *Poultry Science*, *79*(9), 1233–1241.

Mitrănescu, E., & Furnaris, F. (2012). *Managementul bunăstării animalelor.* Bucharest, RO: Printech Publishing House.

Ndagimba, R. J., Kolo, R. R., & Egbeyale, T. L. (2024). Behavioural responses of broiler chickens fed diets containing different enzymes. *Nigerian Journal of Animal Production,* 1051–1058.

Rushen, J. (1983). The development of sexual relationships in the domestic chicken. *Applied Animal Ethology, 11*(1), 55–66.

Willis, K., & Ludlow, R. T. (2015). *Raising chickens for dummies (2nd ed.).* Hoboken, NJ: John Wiley & Sons Publishing House.

Wood-Gush, D. G. M. (1958). The effect of experience on the mating behaviour of the domestic cock. *Animal Behaviour, 6*(1–2), 68–71.