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RESEARCH ARTICLE

Effect of Transportation on Maintenance, Behavior, and Performance in Turkey Poults during the Brooding Period

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ABSTRACT

Transporting turkey poults is one of the most stressful parts of transportation management. Although the impact of transportation stress on animal welfare is widely known, limited data is available about how transportation influences behavior, performance, and welfare. Consequently, to evaluate the transportation effects on Turkey's performance and behavior, turkey poults were classified into two groups according to two types of transport, the first group was 150 poults Grade marker one day -old chick flight from France to Egypt for 4.30 hours with short Journey transport and the second group was 150 poults Grade maker one day-old chick flight for 24-48 hours with long journey flight from Tunisia to Egypt. The current study indicated that the short-term transport showed a marked increase in some maintenance behavioral patterns such as kinetic behavior and comfort behavior compared with long journey transport. While growth performance as feed intake and total feed conversion ratio was mild increase in the long journey transport (1.65±0.005) in long journey than short journey (1.42±0.003) with mild increase in abnormal behavior as cannibalism (0.83±0.35) in long journey transport than short journey transport (0.500±0.35). In conclusion, transportation has a substantial effect on turkey poults' welfare, behavior, and growth performance.

Keywords: Turkey poults, Transport stress, Maintenance behavior, Growth performance, and Brooding period.

Introduction

The transportation of poults has caused a great deal of public concern because of the possible harm to the well-being of the birds [1]. Turkey's output is thought to be modest when compared to that of broilers, however, it has increased significantly since 1980, rising from 122 million to 226 million turkeys produced in EU nations in 2006 [2]. Poultry, especially turkey poults, are transported on their first day of life. The period between hatching and placement at the farm is considered one of the most critical stages in their growth [3]. Pullet transportation is a crucial part of the poultry industry, and precautions should be taken to prevent circumstances that could put birds under a lot of stress, resulting in high fatality rates or lower future production [4]. Poults generally retain their feed before shipping, unlike broilers and laying hens [5]. Instead, at around 17 weeks of age, they are typically moved from a rearing barn to a laying barn, where they may travel a very short or very long distance [5,6]. Behavioral changes of poults can be useful to observe and comprehend. They can serve as a gauge of their well-being [7].Behavior changes may be a sign of environmental conditions, which can be used to assess if they have a detrimental effect on well-being [7]. To

maintain a homeostatic body temperature, poults undergo a variety of behavioral adjustments during transportation [8].

One of the five freedoms of animal welfare is the freedom from harm, panic, chronic fear, or preventable stress caused by handling birds during transportation. By guaranteeing circumstances and care that prevent mental anguish poor transportation conditions and longer durations may cause birds to become fatigued [9]. Therefore, this study aimed to investigate how turkey poults affected their welfare, behavior, and growth performance.

Material and Methods

Birds and Management

This study was conducted after the approval of the Institutional Animal Care and Use Committee at the Faculty of Veterinary Medicine, Zagazig University (ZU-IACUC/2/F/45/2024).

Experimental design

Two groups of 300 one-day-old poults grade maker were used for the experiment, the first group was reared in Lotus Farm which is situated on Red Primus Road in the Wadi El Natrun Center of the Governorate of El Behera, and the second group was reared in Abd El Sattar Issa Farm, which is situated on Bilbies Obour Road, Kilometer 44. A total of 300 Grade marker one-day-old chicks were split into two groups based on two different modes of transportation: the first group, which consisted of 150 randomly chosen turkey poults from the farm for short journey that took roughly 4.30 hours (flight from France to Egypt), and the second group, which consisted of 150 randomly chosen turkey poults from the farm for long journey (flight from Tunisia to Egypt) with a stopover in Turkey before arriving in Egypt; journey took thirty hours to complete this trip. The experiment started from September 1, 2023 until September 21,2023, the incubation period for the poults.

Management and housing of poults

Two groups of turkey poults specialized in agricultural operations devoted to the breeding, raising, and processing of turkeys were the sites of the study at the specialized farms. These farms typically include expansive facilities that use cutting-edge methods to guarantee ideal development performance, typical behavior, and productive output. Usually, turkey poults are kept in spacious sheds or barns with climate control. These buildings offer a regulated setting that shields the birds from harsh weather and potential predators. After the floor was sprinkled with slacked lime, each group was raised in a deep litter made of sawdust (10 cm thick). Before the arrival of the chicks, houses were warmed. The density of young turkeys was set to 5, 7, and 9 birds per square meter, depending on the group. The temperature was maintained at 21-23℃ using the ventilation system.

Feeding system

The feeding quantity for turkey poults was 3-4% of body weight each day, and they were fed twice a day. When necessary, water and nourishment were manually delivered [10]. The initial feed was placed on plastic trays; tiny chick feeders; and marked with vibrant colors [11]. The basal diet was developed to meet the nutritional requirements of poults fed starting ration [12].

Lighting regime

Poults were powered by 200-watt lamps positioned 2.5 feet above the poults during the experiment [13] recommended that this offers sufficient light intensity at the pullet's level. For the first three days, lights were continuously lit for twenty-four hours, and after that, one hour every day was used to stop the photoperiod.

Brooding temperature

Electric heaters were installed 30-46 cm above the pen floor to ensure newly hatched poults received the appropriate brooding temperature. The temperature

was measured by thermometer at the level of the chick's back and maintained at about 36-38°C during the first week of brooding, after that, it decreased about 3.5°C weekly until 20-24°C in 5th week. Failure to provide adequate heat during the early days of the brooding period results in an increase of mortality [14]. Supplementary heat is required for five weeks when brooding turkey poults in winter [15].

Identification

Young turkeys were identified using various colored paints applied to their wings, heads, and bodies.

Vaccination and Medication

The poults were vaccinated by Hitchner vaccine (IB –NCD) on the 5th day of age, then repeated on the 14th day of age, Lasota vaccine: on the 30th day of age, and then vaccination by Lasota periodically every month. The poults were treated with Ciprofloxacin by dose (1mL /L) drinking water Colistin: 1/2 g liter drinking water. Vit E and Selenium: 1mL/ L drinking water.

Observation and data collection

Observations and data collection were conducted for two groups post-transportation. Behavioral patterns were recorded using a stopwatch, a camera, and an observation sheet after data was collected through the focal sampling technique [16].

Behavioral pattern

The observed behavioral pattern was recorded as mentioned in detail below.

Some behavioral patterns [17,18] such as foraging behavior was demonstrated by scratching and pecking on the ground, floor, or other pen sections. The drinking habits of poults who got their water from drinking troughs. The data were collected by the same observer but not at the same time.

Kinetic behavior

Mean frequency of standing, walking, running and sitting behavior were recorded 8 h per week [19].

Standing

chicks were standing not engaged in any activity

Walking

- Mean frequency of walking was recorded/8 h/week.

Running

- Mean frequency of running was recorded/8 h/week

Sitting behaviour: chicks lying on the ground or on one sided

- Mean frequency of sitting was recorded/8 h/week.

Comfort behavior

Feather preening: Birds clean and care about their plumage with their beak using short and repeated actions while standing or sitting. The mean frequency of feather preening was recorded/8 hours.

Dust bathing: includes scratching, pecking, side rubbing, head rubbing, vertical wing shaking, and side-lying with scratching, vigorous body shaking, and feather ruffling. The mean frequency of dust bathing was recorded/8 h. Other comfort behavior: include the following

Wing flapping: in which the bird stretches its full height and flaps its wings repeatedly. Body shaking in which the bird shakes its body vigorously.

Head shaking: the head is tilted to one side and shaken vigorously in a circular fashion. ***Leg/wing stretch***

Strutting: the bird fans its wings toward the floor with its head pulled in and held high, puffing its breast and strutting.

Perching behavior: chicks were roosting high on the ground (standing or sitting on a perch). The mean frequency of perching was recorded/8 h/week

Abnormal behavior

Cannibalism: in which the bird is counteracting with other birds [20] or the cannibalism in turkeys manifested through pecking was studied as previously reported [21]. The mean frequency of aggression was recorded/8 h/week

Feather pecking: only pecks at the feathered parts of conspecifics. The mean frequency of feather pecking was recorded/8 h/week

Live Bird Performance

According to Moursy [11], live bird performance was observed, and the following productive performance was recorded throughout the experiment.

Live body weight

Each group's live body weight was recorded weekly to the closest gram.

Body weight gain

The body weight gain between two successive weeks was individually calculated according to the following formula: Weight gain = W2-W1, where W1 and W2 = weight of individual at two successive weeks.

Feed consumption

Feed consumed by all birds in each treatment was weekly recorded.

Feed conversion ratio

It was calculated for each group during the experiment as follows:

Feed conversion rate = feed consumption (g) / weight gain (g).

Statistical analysis

All statistical analyses were conducted using SPSS V.20 software (SPSS Inc., Chicago, IL, USA). The normality of the distribution was confirmed using the Kolmogorov-Smirnov test and the t-test on data examined with SPSS V.20 software. The mean was used to describe quantitative data. as well as the standard deviation. The 5% level was used to assess the significance of the data [22]. The Duncan test was used as a post hoc analysis following the comparison of two groups for quantitative variables that were normally distributed. The statistically significant differences between the two groups were analyzed using the t-test. The findings were displayed as the standard error of the mean.

Results

The kinetic behavior (frequency) of breeding poults was significantly impacted by transportation. Throughout the brooding period, there was a significant difference in walking frequency ($P < 0.05$) between the first group (short journey) (25.33±1.37) and the second group (long journey) (35.41±1.82). However, there was no discernible difference in the frequency of standing, running, and sitting between the two groups of trips made over the same time period as a result of transportation (Table 1).

Table (1) The Effect of Transport-Related Stress on Turkey Poults' Kinetic Behavior During the Brooding Period.

Kinetic Behavior	Time /Week	First Group Short Journey	Second Group Long Journey	Significance
Frequency of Standing	1st week	21.50±5.85	8.00±1.41	*
	2nd week	9.50±2.50	10.50±0.50	NS
	3rd week	8.50±2.62	7.00±1.29	NS
	Total	13.16±2.73	8.50±0.74	NS
Frequency of Walking	1st week	27.00±2.51	38.50±4.96	*
	2nd week	24.50±3.40	34.50±2.62	*
	3rd week	24.50±1.25	33.75±1.31	*
	Total	25.33±1.37	35.41±1.82	*
Frequency of Running	1st week	27.50±0.95	30.27±2.5	NS
	2nd week	23.50±5.43	27.0±3.1	NS
	3rd week	22.50±1.50	33.00±1.29	*
	Total	24.50±1.84	30.16±1.46	NS
Frequency of Sitting	1st week	57.50 5.56	38.50 3.09	*
	2nd week	58.00±8.44	55.50±8.42	NS
	3rd week	44.50±3.77	44.0±2.44	NS
	Total	53.33±3.76	46.00±3.52	NS

Means within the same rows carrying different superscripts are significantly different at $P < 0.05$. NS means non-significant.

Table (2) showed that there was a clear significant effect appeared in feather preening(frequency) and wing flapping(frequency)of body care behavior between two groups of journey due to the stressful effect of transportation but on the other hand the dust pathing (frequency) anther mean of body care behavior and the wing and leg stretch (frequency) revealed that non-significant observed between two groups short journey transport and long journey transport

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Table (2) The Effect of Transport-Related Stress on Turkey Poults' Body Care Behavior during Brooding Behavior.

Body care behavior	Time /week	First Group Short Journey	Second Group Long Journey	Significance
Frequency of Feather Preening	1st week	27.500 ± 5.85	12.50±3.68	*
	2nd week	25.00±8.18	14.50±5.85	NS
	3rd week	55.50±5.12	26.50±4.27	*
	Total	36.00±5.38	17.83±3.07	*
Frequency of Dust Path	1st week	4.50±2.21	10.50±7.88	NS
	2nd week	3.500±2.06	2.25±1.31	NS
	3rd week	14.50±5.18	7.00±1.29	NS
	Total	7.50±2.35	6.58±2.64	NS
Frequency of Wing Flapping	1st week	38.00±5.22	13.50±5.85	*
	2nd week	24.50±7.32	23.50±8.34	NS
	3rd week	51.25±1.49	32.50±2.62	*
	Total	37.91±4.28	23.16±3.94	*
Frequency of wing and leg stretch	1st week	12.50±3.09	11.00±2.08	NS
	2nd week	22.50±0.95	19.500±5.12	NS
	3rd week	18.50±4.03	17.50±1.70	NS
	Total	17.83±1.99	16.00±2.05	NS

pecking(frequency) due to effect of transportation between short journey transport and long journey transport during brooding period (Table 3). This may be due to the same environmental condition

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Means within the same rows carrying different superscripts are significantly different at $P < 0.05$.

There were non-significant differences in abnormal behavior such as aggressive (frequency) and feather

Table (3) The Effect of Transport-Related Stress on the Abnormal Behavior of Turkey Poults During the Brooding Period.

Abnormal behavior	Time /week	First Group Short Journey	Second Group Long Journey	sig
Frequency of cannibalism	1st week	0±0	0.50±0.50	NS
	2nd week	0±0	0.50±0.50	NS
	3rd week	1.50±0.95	1.50±0.50	NS
	Total	0.500±0.35	0.83±0.29	NS
Frequency of feather pecking	1st week	0±0	0.50±0.50	NS
	2nd week	0±0	1.00±1.0	NS
	3rd week	3.00±1.73	0.50±0.50	NS
	Total	1.00±0.67	0.66±0.37	NS

Means within the same rows carrying different superscripts are significantly different at $P < 0.05$.

The mean of feed intake in long journey transport increased than that in short journey transport but this difference during the brooding period is non-significant. While there was mild increase in feed conversion ratio ($P > 0.05$) in the second week in short journey (4.26±0.06) than in long journey (3.81±0.056) (Table 4 and Figure 5)

Table (4): Feed Intake for Short and Long Journeys of Turkey Poults (Gram/Bird) at Different Weeks (N = 150)

First Group Short Journey	Second Group Long Journey	Different periods
168.01±0.50[a]	168.73±0.52[b]	First week
267.69±1.04[a]	272.03±0.98[b]	Second week
454.74±1.84[a]	459.10±1.90[b]	Third week

Means ± SE within the same rows carrying different superscripts is significantly different at $P < 0.05$.

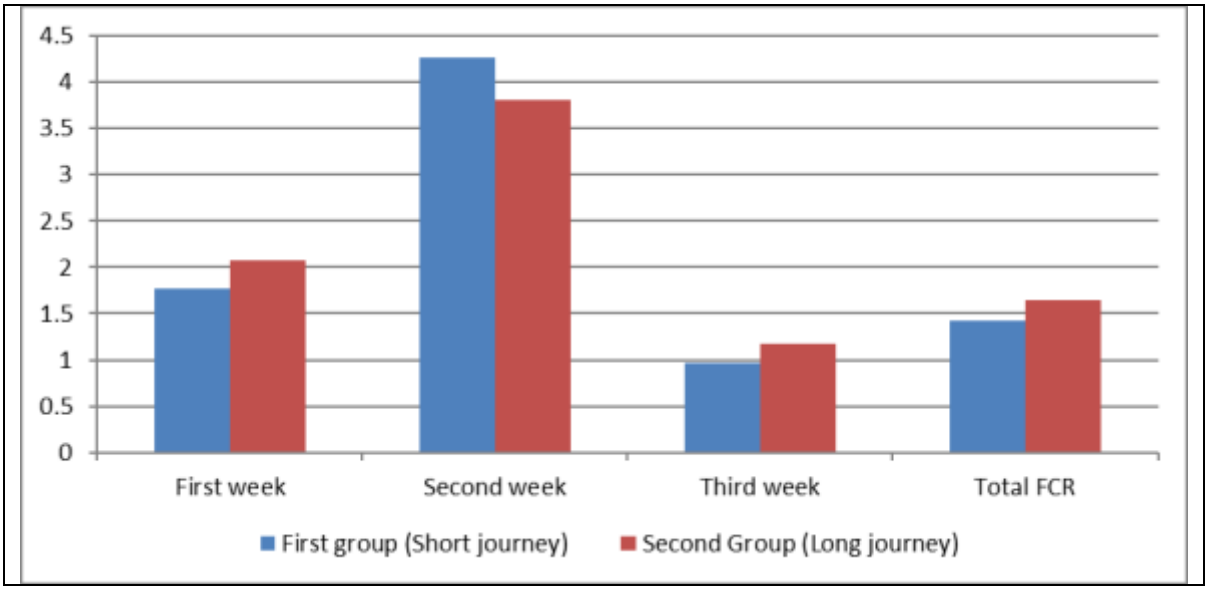

Figure 5: Feed conversion ratio (FCR) for short and long journeys of turkey (n = 150) at different weeks. Means ± SE within the same rows carrying different superscripts is significantly different at *P* < 0.05.

Discussion

Numerous studies indicated that prolonged transportation may negatively impact turkey pullet's performance and behavior later in life [23, 24]. As for maintenance behavior in Table (1) the results showed how transportation affected turkey pullet's kinetic behavior, as in the first week, the first group (short journey) exhibited the highest values in standing behavior than the second group (long journey) but in both second and third weeks showed no significant results. While the effect of transportation on walking behavior frequency was significant during the three weeks of the brooding period. In another behavior like running behavior frequency, the second group (long journey) showed the greatest values than the first group (short journey) but sitting behavior frequency was higher in the first group (short journey) than the second group long journey especially in the first week. The obtained results coincided with Bergoug *et al*. [23] findings that benefited how transportation impacted badly the kinetic behavior of birds who were transported for 5.0 or 10.0 hours as their kinetic behavior decreased significantly compared to those that were not, and this effect persisted at the age of 21 days. In accordance with previous studies [25], turkey hens and toms exposed to thermal stress (18°C) caused by transportation for eight hours spent noticeably more time huddling (52%, and 30%), shivering (6%, and 2%), and piloerection (28%, and 57%) than those exposed to neutral conditions (20°C) for the same amount of time, this agreement may be due to the turkey poults in the current study were able to conserve heat and energy by spending more time motionless.

As in body care behavior, the results obtained agreed with those reported by Wein *et al*. [26] who found that a stressful event like transportation could significantly impact all behavioral patterns, especially body care behavior. These results attributed to that preening may be described as a comfort behavior, but during situations of the stress of transportation, it can also be categorized as a displacement behavior [27]. However, the findings of the current study, which observed that turkey hens exposed to transportation for an extended period (eight hours) frequently engaged in feather preening and wing and leg stretch behavior, conflicted with the findings

presented by Henrikson *et al*. [28]. This disagreement may be the result of different environmental circumstances.

However, there is no significant difference in the frequency of feather pecking between the two groups of transportation (short and long journey), despite the appearance of aggressive behaviour. These findings concurred with previous findings [29] that the performance of birds pecking or gulping behaviors is aggressive and stereotypic concerning exposure to heat or cold stress during transportation. This agreement may be due to the same environmental circumstances.

Although the difference was not statistically significant, feed intake was higher during long-distance transportation than during short-distance transportation. In the second week, the feed conversion ratio slightly increased for shorter trips compared to longer ones, but the change was not statistically significant. These results agreed with the findings of previous studies [30- 36] that the growth performance of chickens was affected by the season, time of day, the distance between the airport and the poultry farm [23, 37- 41] and the duration of transportation [42- 44] as the body weight of poults and their behavior who were transported for 5.0 or 10.0 hours decreased significantly compared to those that were not, and this effect persisted at the age of 21 days. This agreement may be due to the same managerial systems.

Conclusion

The current work suggested that the kinetic, comfort, and abnormal behaviors of turkey poults were altered by long-distance transportation consequently, turkey poults should not be transported over long distances as this has a detrimental effect on the welfare of the animal's development, conduct, and well-being. Since reducing transit-induced stress is a major objective for improving animal welfare, this susceptibility might be mitigated by improving housing conditions and reducing transport stress in the new facility. According to the study, turkey poults should be transported based on several factors, including the density of the poults in the crates and the state of the roads, crates, and vehicles. Environmental elements such as temperature and humidity, season, time of day, distance from the airport to the poultry farm, and transportation time all these factors have an impact on kinetic behavior, feeding intake, body weight, growth rate, abnormal behavior, comfort behavior, and farm welfare productivity.

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Conflicts of interest.

The authors declare no conflicts of interest

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الملخص العربي

تأثير النقل على الصيانة والسلوك والأداء في فراخ الديك الرومى خلال فترة التحضين

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يعد نقل صغار الديك الرومي من أكثر مراحل ادارة النقل اجهادا. على الرغم من ان تاثير اجهاد النقل على رفاهية الطيور معروف على نطاق واسع، الا ان البيانات المتاحة حول كيفية تاثير النقل على السلوك والأداء محدوده. وبالتالي، لتقييم تأثيرات النقل على اداء وسلوك الديك الرومي، تم تصنيف كتاكيت الديك الرومى الى مجموعتين وفقا لنوعين من النقل. كانت المجموعة الأولى 150 طائرا من سلالة " جريد ماكر " عمر يوم واحد تم نقلها جوا من فرنسا الى مصر لمدة 4.30 ساعات مع نقل رحلة قصيرة وكانت المجموعة الثانيه 150 فرخا من سلالة " جريد ماكر " عمر يوم واحد تم نقلها جوا لمدة 48-24 ساعة مع رحلة طويلة من تونس الى مصر. اشارت الدراسة الحالية الى ان النقل قصير المدى اظهر زيادة ملحوظة فى بعض انماط السلوك الحافزة مثل السلوك الحركي وسلوك الراحة مقارنة بالنقل طويل المدى بينما كان اداء النمو مثل استهلاك العلف و نسبة التحويل الغذائي الكلى زيادة طفيفة في النقل بالرحلة الطويلة (0.005±1.65) مقارنة بالنقل فى الرحلة القصيرة (0.003±1.42) مع زيادة طفيفة في السلوك غير الطبيعى مثل السلوك العدوانى(0.35±0.83) فى النقل بالرحلة الطويلة مقارنة بالنقل بالرحلة القصيرة (0.35±0.50) . في الختام، للنقل تأثير كبير على رفاهية واداء نمو صغار الديك الرومى.