

DOES THE HEIGHT OF TRANSPORT BOXES INFLUENCE TURKEY WELFARE DURING ROAD TRANSPORT?

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Abstract – The hypothesis of this study was to evaluate if it is necessary for tom turkeys to stand or not during transport. Turkeys were transported in transport boxes of internal heights of 35.5, 40.0, 45.5 and 55.0 cm. Welfare was evaluated by behaviour, stress level and meat quality. The purpose was to evaluate the influence of box height on these variables. In conventional crates (35.5 and 40.0 cm) birds sat most of the time whereas in the test crates (45.5 and 55.0 cm) 12 to 18 % of the birds frequently stood up, raised their back and tried to walk while the vehicle was moving. In the latter case the birds had a high risk of injuries. Birds transported in 45.5 cm boxes had higher stress hormone levels (LDH, CK and corticosterone) than those transported in 35.5 cm boxes. Birds transported in 35.5 cm crates had higher pH values 1.5 and 20 hours pm, but lower lightness value 20 hours pm, than those transported in 45.5 cm crates. Present results showed that tom turkeys should not allow to stand during transport. They should have sufficient floor space to sit on the floor and have free head movement.

Key words: – behaviour, stress level, meat quality.

I. INTRODUCTION

The reason behind this study was to develop turkey transport in Finland. At the time of the study there were two turkey slaughterhouses in Finland, one in the North and one in the South. About 1.43 million turkeys are raised annually for meat production in Finland [4]. Transports of birds is a cause for concern since the birds may suffer from stress during loading, the journey and lairage. The recommended space allowance in a box is 115 cm² per kg of body weight for birds 3 to 5 kg and 105 cm² per kg of body weight for birds over 5 kg [3]. Little is known about the optimal height of crates [3]. The objective of this study was to evaluate the effect of the internal height of boxes on the welfare, stress response and meat quality of tom turkeys.

II. MATERIALS AND METHODS

After reaching slaughter weight the birds were caught by hand and loaded in plastic crates for both slaughterhouses [1]. In the North, catching was done by farmers. In the South, all birds were caught by specialised staff. The former birds were BUT- 8 turkeys and the latter were of the Nicholas N300 breed. The birds were 17 weeks old. The average live weight of the tom turkeys of this study was 13.5 kg. Four to five turkeys were loaded in a box with a floor space of 0.80 m². The space allowance was for four and five birds 148 and 119 cm² per kg, respectively. The average transport time was about one hour. Loaded containers were lifted mechanically onto the vehicle. Before loading, an infrared observation camera (B/W CCD mini video camera Samsung, Radioduo, Finland) was installed in one conventional and one test box. Animal behaviour was monitored in dark conditions during lifting, transport and lairage for time intervals of five minutes sequentially both in a conventional and a test box (Ulead Videostudio 8.0 capturing program and Acer Travelmate 8106 recording computer). Behaviour was recorded during four transports to both slaughterhouses. Usual activity was defined as movements without injuring wings or legs such as leaning another bird, raising the head or changing the position. Harmful activity was defined as wobbling, losing balance, wing flapping, lying, treading or standing on another bird or pecking a bird. Animal stress and meat quality were evaluated during a single transport in the North. Stress level of the birds was evaluated by blood sampling at farm, after transport and after three hours rest in 35.5 and 45.5 cm crates. 30 birds were sampled at farm, 60 birds were sampled after unloading (30 in conventional and 30 in test boxes) and 60 birds were sampled after rest in the lairage (30 in conventional and 30 in test boxes). Blood was collected from the vena brachialis,

centrifuged (4000 rpm for 10 minutes at 4 °C), total plasma was stored at – 80 °C and sent to the University of Oulu for stress hormone analysis. Creatine kinase (CK) and lactate dehydrogenase (LDH) activities were determined with commercial CK and LDH reagents (Roche, Switzerland). Total corticosterone concentration was determined using a radioimmunoassay kit (Anti-Corticosterone ¹²⁵I, DRG International Inc., Mountainside, NJ, USA). Meat quality (m. pectoralis) was measured 1.5 and 20 hours post mortem (pH value by Knick 651 Portamess, and colour by Minolta CR 200).

III. RESULTS AND DISCUSSION

It was found that the most common position during transport in a conventional box both in the South and North of Finland was sitting (Tables 1 and 2). Birds improved their position and engaged in their usual activity to the same extent in conventional and test crates. Thus, the normal activity of turkeys was independent of the studied box heights. On the other hand, standing and harmful activity were observed considerably more frequently in the test boxes than in the conventional crates in the South and North of Finland (Tables 1 and 2). For example, wobbling, wing flapping or treading on another turkey were very common in the studied test boxes. These harmful activities of birds can result in bruises and broken bones in wings when turkeys try to maintain their balance while standing in a moving

Table 1. Frequency of positions of turkeys in a moving vehicle during four transports in a conventional and a test box (South Finland).

Position	Height of box 40.0 cm		Height of box 55.0 cm	
	Number	%	Number	%
Standing	8	5.4	35	18.3
Sitting	108	73.5	81	42.4
Improving position ¹	23	15.6	27	14.1
Usual activity ²	7	4.8	7	3.7
Harmful activity ³	1	0.7	41	21.5
Total	147	100.0	191	100.0

¹By standing up, rocking, moving wings or sitting.

²Leans on another bird, raises the head, walks or crouches.

³Wobbling, losing balance, wing flapping, lying, treading or standing on another bird, or pecking a bird.

Table 2. Frequency of positions of turkeys in a moving vehicle during four transports in a conventional and a test box (North Finland).

Position	Height of box 35.5 cm		Height of box 45.0 cm	
	Number	%	Number	%
Standing	0	0.0	31	12.2
Sitting	100	65.3	69	27.1
Improving position ¹	36	23.5	55	21.5
Usual activity ²	14	9.2	26	10.2
Harmful activity ³	3	2.0	74	29.0
Total	153	100.0	255	100.0

^{1,2 and 3} Classification as in Table 1.

vehicle. In general, normal activities were found in the sitting birds, whereas harmful activities were observed only in the standing birds.

In this study, floor space was from 120 to 178 cm² per kg in both the conventional and the test boxes. These values exceeded significantly the recommended space of 105 cm² per bird [2].

During lairage, behaviour of the birds was different than during transport. Sitting was the most common position. However, turkeys quite often improved their position in both the conventional and the test crates. Due to the dark lairage conditions, the birds were calm and quiet in the South compared to the North of Finland (Tables 3 and 4). However it was detected that in a 55.0 cm high test box a turkey could climb on the back of a sitting bird and remain there for a half hour during lairage.

Table 3. Frequency of positions of turkeys in a stationary module after four transports in conventional and test box (South Finland).

Position	Height of box 40.0 cm		Height of box 55.0 cm	
	Number	%	Number	%
Standing	0	0.0	4	4.3
Sitting	78	95.1	74	79.5
Improving position ¹	3	3.7	3	3.2
Usual activity ²	1	1.2	6	6.5
Harmful activity ³	0	0	6	6.5
Total	82	100.0	93	100.0

^{1,2 and 3} Classification as in Table 1.

Table 4. Frequency of positions of turkeys in a stationary module after four transports in a conventional and a test box (North Finland).

Position	Height of box 35.5 cm		Height of box 45.0 cm	
	Number	%	Number	%
Standing	2	1.6	3	2.7
Sitting	86	68.3	85	75.2
Improving position ¹	29	23.0	11	9.7
Usual activity ²	9	7.1	14	12.4
Harmful activity ³	0	0.0	0	0.0
Total	126	100.0	113	100.0

^{1,2 and 3} Classification as in Table 1.

The stress level of birds was evaluated by the change in LDH and CK activity and corticosterone content of blood plasma from farm to unloading and lairage during a single transport in the North of Finland (Table 5). During unloading the LDH activity of birds transported in test boxes was significantly higher than that of birds transported in conventional boxes. During lairage LDH activity decreased to the farm level. Turkeys transported in test boxes also had higher CK activity compared to that of birds transported in conventional crates. CK activity decreased during lairage.

Table 5. Mean values of LDH and CK activity and corticosterone content of blood plasma of turkeys.

Blood plasma value	Height of box	At farm*	During unloading*	After lairage*
LDH, U/l	35.5 cm	368a	381a	345B
	45.0 cm		500Ab	296B
CK, U/l	35.5 cm	5771	6123	6012
	45.0 cm		6857	6183
Corticosterone, ng/ml	35.5 cm	9.5A	17.3C	19.5BCa
	45.0 cm		20.8BC	23.7Cb

The difference between the means is very significant ($P < 0.01$) for a,b or extremely significant ($P < 0.001$) for A,B,C.

*Number of samples taken at farm 30, during unloading 60 (30+30) and after lairage 60 (30+30).

Corticosterone is a useful measure of the response to acute short-term stress induced by handling or restraint. Elevated plasma corticosterone is therefore a widely accepted indicator of stress condition in birds [6]. Blood plasma corticosterone content of birds increased significantly during transport ($P < 0.001$). During unloading and after lairage turkeys in

conventional boxes had a lower corticosterone content than birds in test crates (Table 5). Thus, it was concluded that transport in higher test boxes is more stressful for turkeys than transport in the lower conventional boxes. This conclusion is supported by the results of broilers that gentle handling resulted lower plasma corticosterone level than normal handling during loading [5].

The pH value of the pectoralis muscle was higher 1.5 and 20 hours pm in birds transported in conventional boxes compared to those transported in test boxes. The meat of the latter was somewhat lighter than that of the former (Table 6).

Table 6. Mean values of meat quality of turkey pectoralis muscle.

Meat quality	Height of box 35.5 cm	Height of box 45.0 cm	Average
pH value 1.5 h pm	6.25	6.18	6.33
pH value 20 h pm	6.21a	5.94b	6.08
L* 20 h pm	59.7	61.4	60.5
a* 20 h pm	1.8	1.9	1.8
b* 20 h pm	-2.1	-2.2	-2.1
n	33	23	55

The difference between the means is very significant ($P < 0.01$) for a,b.

IV. CONCLUSION

This study found some differences in the welfare, stress level and meat quality of turkeys transported in boxes with internal heights from 35.5 to 55.0 cm. Birds remained calm and quiet in the conventional crates. High internal height of test boxes increased the frequency of harmful activities that could result in bruising and elevated stress level during transport and lairage. It was concluded that tom turkeys should not allow to stand during transport.

ACKNOWLEDGEMENTS

The financial support of Finnish poultry industry companies Atria Suomi Oy and HK Ruokatalo Oy is gratefully acknowledged. We also thank Virpi Norja for blood sampling at the farm and during lairage and Mrs Martimo-Halmetoja and Mrs Orreveteläinen for blood sample analyses at University of Oulu.

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