Ankara Üniv Vet Fak Derg, **56**, 215-218, 2009

Effects of road transport on yearling lambs up to 19 hours

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Summary: This study was performed to determine the weight losses, subsequent recovery rate and transportation costs of yearling lambs transported for 3, 6, 9 and 19 hours. In this research, total 63 shorn, male, yearling Akkaraman lambs were weighed to equal the initial live weights and assigned into 4 groups, namely group I (transported 3 hours), group II (transported 6 hours), group III (transported 9 hours+1 hour resting+9 hours) and control group (untransported). Transported lambs were loaded on the lorry at a density of 0.35 m^2/head while the control group (untransported) was kept at the same density on the farm. The lambs transported for 3, 6 and 9 hours lost more live weight than the lambs in control group ($p<0.05$). Compared to control group, significant increases were determined in the percentage of the live weight losses in transported lambs with the increasing journey duration. The cost due to net weight loss for 9 hours transportation was higher than the other groups. Consequently, although point of animal welfare view, transportation of slaughtering animals should be for short time, if marketing conditions entail long time transportation, lambs should be rested for feeding and watering during transportation for rapid recovery rate and reducing the cost of net weight losses.

Key words: Recovery, transportation cost, weight loss, yearling lamb.

Karayoluyla 19 saate kadar taşımanın toklular üzerindeki etkileri

Özet: Bu çalışma 3, 6, 9 ve 19 saat sürelerle taşınan toklularda meydana gelen ağırlık kayıpları, taşıma sonrası canlı ağırlık geri kazanımı ve taşıma maliyetlerini belirlemek amacıyla yürütülmüştür. Araştırmada, toplam 63 adet kırkılmış, Akkaraman toklu, başlangıç canlı ağırlıkları eşit olacak şekilde tartılmış ve grup I (3 saat taşınan), grup II (6 saat taşınan), grup III (9 saat taşıma+1 saat dinlenme+9 saat taşıma) ve kontrol grubu (taşınmayan) olarak 4 gruba ayrılmıştır. Taşınacak olan toklular kamyona 0.35 m^2/baş sıklıkta yerleştirilirken, kontrol grubu aynı sıklıkta çiftlikte tutulmuştur. 3, 6 ve 9 saat süreyle taşınan toklular, kontrol grubuna göre daha fazla canlı ağırlık kaybetmiştir ($p<0.05$). Kontrol grubuyla karşılaştırıldığında, taşınan gruplarda taşıma süresinin artışıyla birlikte canlı ağırlık kaybında önemli artışlar belirlenmiştir. 9 saatlik taşımada net ağırlık kaybının maliyeti diğer gruplardan daha yüksek olarak bulunmuştur. Sonuç olarak, her ne kadar hayvan refahı açısından kasaplık hayvanların kısa süreli olarak taşınması önerilmekte ise de, piyasa şartlarına göre uzun süreli taşıma zorunluluğu varsa (9 saat ve üzeri), hem taşımada kaybedilen kiloların hızlı geri kazanımı, hem de net ağırlık kayıplarının maliyetinin azaltılabilmesi için hayvanlara yem ve su vererek dinlendirilmeleri önerilmektedir.

Anahtar sözcükler: Ağırlık kaybı, geri kazanım, taşıma maliyeti, toklu.

Introduction

In the production of meat, transportation is an important concern such as breeding and fattening because of the weight losses (3, 6, 8), even deaths (7, 12) during transportation. Transport stress such as physical, physiological and psychological would be encountered during transport of animals (8) which is likely to reduce meat quality (4). The carcass quality can be adversely affected due to bruising on transport (7). Furthermore, depletion of glycogen in muscle during journey results in dark, firm and dry meat which means poor meat quality (8). Moreover, transport of animals for long distance increases transportation costs thus the market price of meat.

In Turkey, it was reported that, duration of journey was over 8 hours in 63% of the slaughtering animal transport (11), and approximately 50% of the transportations, animals travelled by road for long distance more than 1000 kilometres (13).

This study was performed to determine the net and live weight losses of yearling lambs transported for different distances with similar road and loading conditions as well as to find the subsequent recovery rate and evaluate the transport cost.

Materials and Methods

Animals and management: Sixty-three, shorn, male, yearling Akkaraman lambs were used in this study. Prior to study, the animals in a local farm were clinically examined and healthy lambs were purchased. The lambs were acclimatized for 10 days at density of 0.7 m^2/head. Fattening ration consisting of concentrate feed and hay was fed to lambs supplying the adequate nutrition requirements of lambs. Water was supplied ad libitum.

Study design: This study was performed in June 2006. Animals were ear-tagged and weighed to equal the initial live weights and assigned into 4 groups consisting of 16 lambs in each treatment group (group I, II and III) and 15 lambs in control group. Before transportation, food and water was provided then all lambs were weighed. After weighing, an absorbent diaper was tied on to lambs to collect the urine samples and a nylon cloth was laid on the floor to collect the stools. Lambs in treatment groups were loaded on the lorry at a density of 0.35 m^2/head while lambs in control group were kept at the same density on the farm. Dimensions of the lorry were 7.50 x 2.25 m. and the vessel divided into 3 parts for each transported group. After the transportation of 3 hours, lambs in group I unloaded from the lorry and a project team immediately weighed them at the same time with control group. After unloading the first group, another team continued to transportation with the group II and III. The group II was transported additional 3 hours (total 6 hours) after unloading the group I. The same procedure was applied to second group as indicated above. After unloading the second group, last group transported additional 3 hours (total 9 hours) and unloaded from the lorry for 1 hour resting included feeding and watering together with control group. After resting interval this group (III) reloaded on the lorry for an additional 9 hours transportation (total 19 hours including resting interval).

The lowest temperature was 14°C while the highest temperature was 25°C on the day of transportation. The journey distance for 3, 6, 9 and 19 hours transportations were as 157, 300, 463 and 932 kilometres respectively. After transportation, all lambs were kept in lairage for three days. The lambs were weighed daily to determine the rate of the live weight recovery. In recovery period, because the same lambs (group III) were transported for 9 hours and then 19 hours, no recovery rate was determined for the nine hour transportation.

Evaluation of the data: The net weight losses due to the transportation were calculated by the formula indicated as follows;

Net weight loss (NWL) = Live weight losses (LWL) - (weights of urine + stool)

The following formula was used to calculate the transportation cost;

Mean transportation cost/head = [(Net weight loss/head) x (price of kg live weight)] + [(fuel cost + driver cost + depreciation of the lorry)/48 heads + feed cost (just for 19 hours transportation)].

Statistical analysis of data was performed by SPSS 11.0 version for Windows. The differences between treatment groups were determined by ANOVA. The difference between treatment and control groups was determined by independent sample t test. Data were expressed as means ± SEMs.

Results

Weight losses and amount of excretion: The lambs transported for 3, 6 and 9 hours lost more live weight than the lambs in control group ($p<0.05$). Although not statistically significant ($p>0.05$), a slight live weight loss was determined in the lambs transported for 19 hours totally (Table 1).

In the study, it has been determined that more urine was excreted in transported lambs while the amount of stool was higher in controls. Both in control and treatment groups net weight losses were increased up to 9 hours journey (Table 1).

Table 1. Live weight of yearling lambs before and after transportation, amounts of excretion and net weight losses
Tablo 1. Tokluların taşıma öncesi ve sonrası canlı ağırlıkları, ifrazat miktarları ve net ağırlık kayıpları

Duration (hours)	Control	Transported lambs	p
	Pre-transport live weight (kg/head)		
3	61.42±1.59	61.78±0.62	-
6		62.80±0.58	-
9		62.18±0.93	-
19		62.18±0.93	-
	Post-transport live weight (kg/head)		
3	60.19±1.54	60.29±0.58	-
6	59.22±1.52	60.16±0.55	-
9	58.53±1.50	58.73±0.84	-
19	57.79±1.53	58.29±0.87	-
p (paired t-test)	-	-	
	Live weight losses (kg/head)		
3	1.23±0.07	1.49±0.09	*
6	2.20±0.01	2.64±0.13	*
9	2.89±0.11	3.45±0.19	**
19	3.63±0.19	3.89±0.24	-
p (paired t-test)	***	***	

	Excretions (kg/head)			
	Urine	Stool	Urine	Stoo
3	0.22	0.18	0.43	0.08
6	0.44	0.30	0.59	0.25
9	0.54	0.40	0.81	0.35
19	0.82	0.94	1.29	0.84
	Net weight losses (kg/head)			
3	0.83		0.98	
6	1.46		1.80	
9	1.95		2.29	
19	1.87		1.76	

p: Independent sample t-test, -: Not significant *: $p<0.05$, **: $p<0.01$, ***:$p<0.001$

Live weight recovery: As seen on the Table 2, after the 72 hours from the transportation, the most live weight recovery rate (3.61%) was determined in the lambs in control group, which was followed by the lambs in groups I (2.10%), III (1.59%) and II (1.24%).

Table 2. Live weight recovery after transportation of the yearling lambs
Tablo 2. Tokluların taşıma sonrası canlı ağırlık geri kazanımı

Live weight recovery (kg)	Groups			
	Control	Group I (3 hours)	Group II (6 hours)	Group III (19 hours)
Pre-transport average live weight	61.42±1.59	61.78±0.62	62.80±0.58	62.18±0.93
Post-transport 24th hour (kg/head)	61.89±0.73	62.00±0.81	62.26±0.85	61.69±0.94
Recovery rate (%)	100.77	100.36	99.14	99.21
Post-transport 48th hour (kg/head)	63.22±0.41	62.13±0.75	62.67±0.60	62.27±0.79
Recovery rate (%)	102.93	100.57	99.79	100.14
Post-transport 72nd hour (kg/head)	63.64±0.68	63.08±0.24	63.58±0.38	63.17±1.23
Recovery rate (%)	103.61[a]	102.10[b]	101.24[b]	101.59[b]

a, b: Values with different superscript within the same row differ significantly

Transportation costs: The cost due to net weight loss (NWL) for 9 hours transportation was higher than the other groups. The total cost of transportation in treatment groups (including fuel, driver and depreciation costs) was increased with the increasing transportation duration (Table 3).

Table 3. Transport costs according to the duration of transportation
Tablo 3. Taşıma sürelerine göre taşıma maliyetleri

Transport costs (US$/head)	Duration (hours)							
	Control groups				Treatment groups			
	3	6	9	19	3	6	9	19
Total transport cost	2.33	4.11	5.49	5.26	5.08	9.53	13.31	18.84
- NWL	2.33	4.11	5.49	5.26	2.79	5.05	6.46	4.98
- Fuel	-	-	-	-	2.06	4.00	6.14	12.34
- Driver	-	-	-	-	0.15	0.31	0.46	0.98
- Depreciation	-	-	-	-	0.08	0.17	0.25	0.54

Discussion and Conclusion

Lambs are transported for different distances for breeding, fattening or slaughtering all over the world. It's clear that, transportation causes different types of stress in lambs (8). Due to this, recent years, the animal welfare has become an important concern during transportation of animals in developed countries. It was reported that transportation over 24 hours has adverse effects on animal welfare in addition to this; incoordination, cramps and injuries may result from transport of animals at the stock densities higher or lower than optimal conditions (5). In the present study, the criteria concerning the stock density and duration of the transportation of the animals by road for slaughter recommended in the legislation of European Union Council (1, 2) was taken into account.

Live weight losses occur during transportation of animals due to fasting and transportation stress. Knowles (5) reported that, transportation of the sheep up to 24 hours at different stocking densities was caused live weight losses between 8.4-10.6%. In this study, a progressive decrease was found in live weight of all animals in all groups. Live weight losses of lambs transported for 3, 6, 9 and 19 hours were 2.42, 4.04, 5.53 and 6.25% respectively while in control group, at the same times, animals lost 1.99, 3.57, 4.69 and 5.92% of live weight.

Significant increases were determined in the percentage of total excretion (urine and stool) of the transported lambs with the increasing journey time. Determination of more urine excretion in transported lambs while higher amount of stool in control group may result from the depression of digestive system and stimulation of urinary system due to the stress or excitement. The net weight losses determined by subtracting the amount of total excretion from the live weight losses were 1.6, 2.9, 3.8 and 2.9% in 3, 6, 9 and 19 hours transported lambs respectively whereas in control group net weight losses were found as 1.3, 2.4, 3.2 and 3.0%.

After the three days of recovery period, a highest recovery rate (3.61%) was determined in control group, which was followed by 3 hours transportation (2.10%). The lowest recovery rate was in the lambs transported for 6 hours compared to other transported lambs. Determination of a slightly higher recovery rate in 19 hours transportation than 6 hours may be due to the one hour rest for feeding and watering after 9 hour transportation. Lambs transported 6 and 19 hours regained 99.14% and 99.21% of their weights after one day in lairage respectively, and live weight of lambs in control and transported for 3 hours were even more than those initial live weight. Similarly, Knowles et al. (10) were reported a rapid recovery of live weight in lambs after 24 hours in lairage and Knowles et al. (9) were also reported a well defined recovery of live weight in lambs after 96 hours in lairage.

The cost of net weight losses was higher in 9 hours transported lambs than other transported groups. Similar trends were also determined in control group. The costs of net weight losses were higher in the transported lambs

than untransported lambs for 3, 6 and 9 hours journeys. However, this cost was found higher in untransported lambs than the lambs transported for 19 hours (5.26 US$ vs 4.98 US$). The cost of net weight losses up to 9 hours transportation increased but a decrease was determined when the lambs transported 19 hours. This decrease may result from the compensation of the weight losses by the feeding and watering of the lambs at 9th hours of journey. The total transportation cost increased from 5.08 US$ to 18.84 US$ with the increasing duration of the journey because of the additional costs of fuel, driver and depreciation. This would be an expected result.

Consequently, the lambs should be either transported for a short time, if marketing conditions entail long time transportation; lambs should not be deprived of food and water whole transportation period. After 9 hours transportation one hour resting interval (included feeding and watering) is necessary for animal welfare and also the results of this study have shown that, resting (included feeding and watering) improved the subsequent recovery rate and reduced costs due to net weight losses.

Acknowledgements

This study was supported by Scientific Research Funds of Erciyes University (Project Number: VA-06-01).

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Geliş tarihi: 12.03.2008 / Kabul tarihi: 28.06.2008

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