Effect of Transport of Domestic Lambs Injected with BUTAFOS ATP on Some Physical and Chemical Parameters of Carcass

Hussein Jumaa Sharif [1] Mahfouz Khalil Abdullah [2]
1,2Department of Animal Production, College of Agriculture, University of Tikrit, Iraq.
1Corresponding author s E-mail: Hussein.j.sharif@st.tu.edu.iq
2Email of the second researcher: mafo@tu.edu.iq

Abstract

This experiment was conducted at the animal production fields of the Faculty of Agriculture / Tikrit University, for the period from 28/8/2023 to 11/9/2023, Twelve local Lambs of about 7-8 months of age and an average weight of 40.3 kg / were, randomly distributed into three groups (4 lambs / group). The first group represented control Treatment, in which lambs were neither transferred nor injected transfer and without anti-stress, In the second Treatment lambs were transported without anti-stress , while in the third Treatment lambs were injected with BUTAFOS ATP an hour before it was transferred, the second and third groups were moved to a distance 150 km for a period of three hours in a Kia pickup (2 tons) . The results of chemical analysis of meat showed a significant increase ($P<0.05$) in the protein ratio of the T1 and T3 treatments, reaching (18.48 and (18.28%) respectively as compared to the T2 treatment. A significant increase ($P<0.05$) in the pH of the T2 treatment (6.11) as compared with other treatments. Higher significant ($P<0.05$) percentages of palmitic (19.08 and 19.15%, citric acid (8.32 and 8.485) and oleic acids (20.81 and 20.61%) were observed in T1 and T3 as compared to T2. With regard to linoleic, linolenic and myristic acids, higher ($P<0.05$) percentages, 11.01, 1.29 and 4.01%, were observed in the ant-stress injected treatment (T3) as compared to T1 and T2.

Keywords: lambs, transport, antistress, BUTAFOS ATP

Introduction

Transporting of live animals is complex and expensive as compared to transporting of other agricultural products, as animals must be watered, fed, carefully monitored and provided with proper care before slaughter. On this basis, many countries have adopted various laws and legislations regulating transport operations, believing that the harms resulting from transport procedures, which greatly affect the qualitative and quantitative production of meat [1]. Sheep meat is an important source of food in the world, so the transport of live sheep is an important part of the meat industry and transport stress poses a serious threat to the health and quality of sheep meat [2]. The transport of live animals is an important part of breeding and the transport environment threatens the health and safety of the animal and affects the quality of meat after slaughter [3]. The process of transporting animals to the slaughter is one of the basic steps in the meat processing process, as it is considered one of the things that has a long-term impact on animal management and the quality of meat produced [4].The process of transporting animals is a must, as animals are exposed to many stressful things before slaughter, including transportation, as the transfer process is one of the most stressful stages of life for animals and that all farm

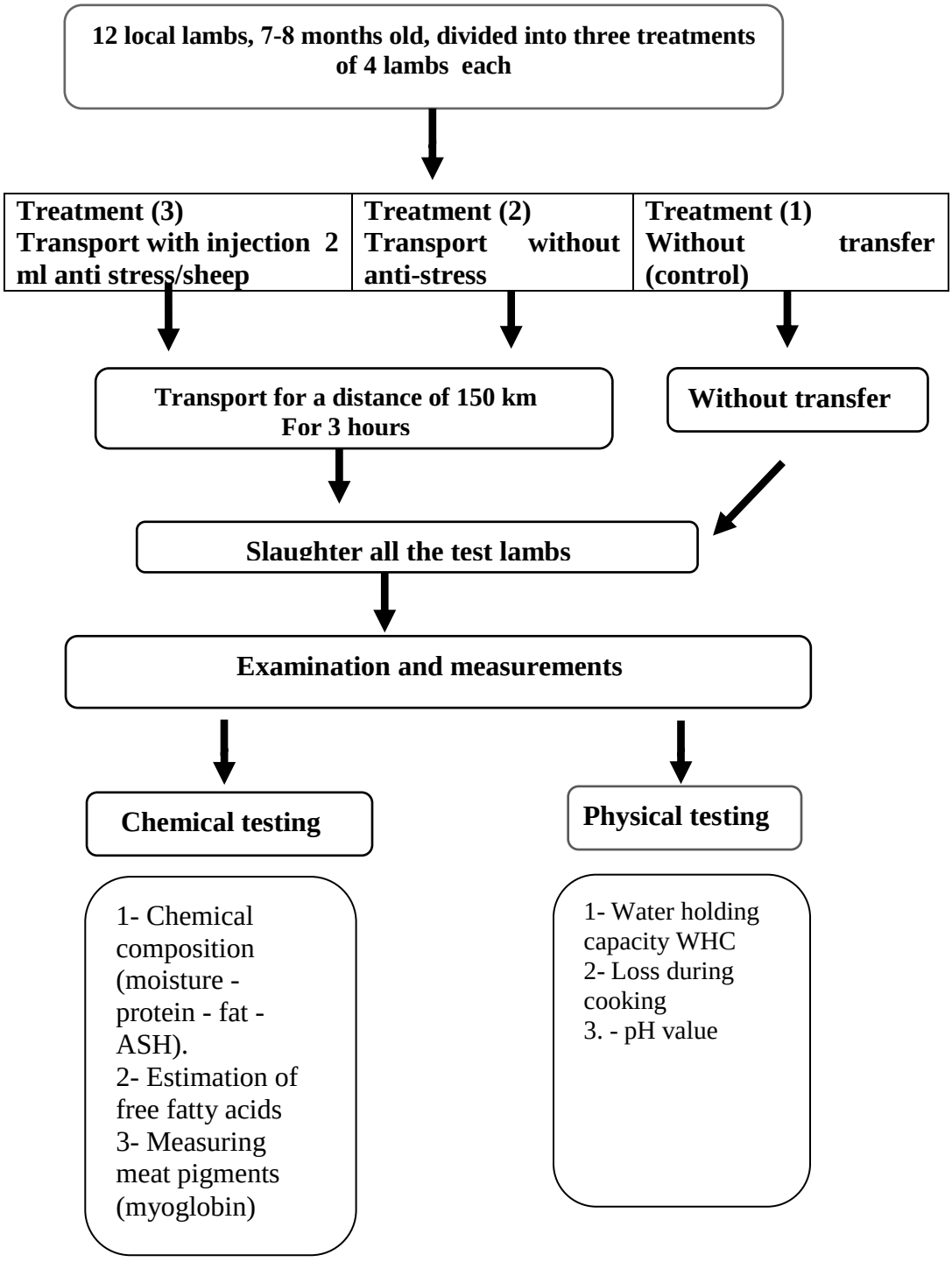
ISSN 2072-3857

animals are transported at least once in their lives [5]. Transport is one of the most stressful conditions for animals before slaughter [6]. Loading and unloading, fasting, weather changes and mixing of different groups of animals are potential stressful types during transport that may cause physiological stress in sheep [7]. Transportation stress can be physical such as fatigue, injury, thirst and hunger, or heat and psychological stress and poor handling of the animal [8]. Transport conditions can be very stressful and cause an unavoidable loss of productivity or even the animal may perish [9]. Excessive stress resulting from animal transport can lead to a decrease in meat quality [10]. Stress from transportation negatively affects animal except for the effort produced by transport, loading and unloading, and the duration of transport is the most stressful in transportation [11]. Stress is a reflex that occurs as a result of an animal's inability to cope with stress, its negative effects of various factors and its inability to adapt, and can have many negatives in the production process [12]. The use of an additional anti-stress agent that is low-cost, non-toxic and easy to use will be highly valuable in reducing the stress to which transported animals are exposed through stimulation of the glands and thus an increase in the secretion of hormones into the blood [13]. Among these antibiotics, BUTAFOS ATP has been used, as it is part of the family of phosphorescent compounds, and it is often used in veterinary treatments by reducing stress and tension that animals may be exposed to during transportation and can also have other effects such as promoting the growth of animals or improving their overall performance, and it has been classified by [14], as a therapeutic category and is considered safe as it does not leave any harmful residue in meat and milk products that may be dangerous to human health.

Materials and working methods

This study was conducted in the livestock fields belonging to the Faculty of Agriculture / Tikrit University, for the period from 28/8/2023 to 11/9/2023. It Twelve local lambs at the age of 7-8 months and an average weight of 40.3±3 Kg / Lambs were purchased From the animal sales center in Salah al-Din province / Tikrit city, and were transferred to the location of the study, where they adapted for 15 days and subjected to the required veterinary tests. The experimental animals were randomly distributed into three groups of equal number (4 lambs / group). The first group was considered a control group, as they were slaughtered at the end of the experiment without transfer and without anti-stress . The second group was transported without injection, and the third group was injected With 2 ml of BUTAFOS ATP. After 1 hour of injection the lambs of the second and third treatments were transported simultaneously for a period of 3 hours (from 10 am to 1 pm) by a Kia pickup that took the road between Tikrit and Shirqat back and forth. The feed was cut off for 12 hours before the slaughter process according to the traditional method used in Iraq. Then the carcasses were transported after skinning and hollowing to the refrigerating chamber at a temperature of 4 ° C for 12 hours . Before, during and after the slaughter process all required measurements and analysis were performed as shown in Plan (1(

ISSN 2072-3857



Scheme (1) Experiment design

ISSN 2072-3857

Studied attributes:

Chemical tests:

chemical composition:

:1Moisture:

A sample of pure meat was weighed by (5 g) and placed in the eyelid and the eyelid and its contents were placed in an electric oven with a temperature of (105) degrees Celsius for a period of (16) hours, then the dried samples were taken out of the oven and were left at room temperature for of cooling and then weighed after drying, and the Moisture was calculated according to the following equation:

Humidity %=(((n + b)– (n + a))/s)*100

b = sample weight before drying

a= sample weight after drying

s = Wet sample weight (g (

n = empty eyelid weight

:2Protein

Keldahl method was used to determinethe percentage of protein in the to determine as described by [15] . Briefly, a known weight of the sample up to (0.5 g) was placed in a flask, 5 ml of concentrated sulfuric acid and an appropriate amount of potassium sulfate mixture and copper sulfate were added, and the digestion process was proceeded by heating the contents until the conversion of the mixture into a clear liquid with a pale blue color. The liquid was quantified to the distillation flask of the Kildahl device, which contains 40% sodium hydroxide Solution is connected to a condensed distillation flask ending with a test tube immersed in a receiving flask containing a known volume of 20% boric acid solution and a fewdrops of red methyl -bromocresol blue indicator. About 25 ml of the distilled solution was then titrated against 0.1 M HCl solution. percentage of protein is calculated according to the following equation.

Protein percentage=((Vol of HCL consumed ml x N× standard 0.014 x 6.25y)/(Weight of sample))*100

:3Fat

The fat Percentage was estimated according to the method described by [16] where the fat was extracted from pure meat samples by naturalizing 3 g of the meat sample with 60 ml of a mixture consisting of chloroform + methanol and in a ratio of (1:2) with the addition of distilled water equivalent to 1/5 of the volume of the mixture to the test tubes and after mixing the contents, these tubes were left at room temperature Overnight and then the top layer containing the fat extract was Collected and filtered through through aqueous sodium sulfate after that the tubes were placed in a water bath at 60 °C to evaporate the solvent and obtaining fat, which was estimated according to the following equation:

Fat percentage=((Weight of fat extract)/(Weight of meat sample))*100

:4Ash

The percentage of ash in meat samples was estimated by burning dry meat samples after placing them in a previously known weight lid in a Nabertherm type incineration furnace at a temperature of 525 °C for 16-18 hours. The percentage of ash in the coal sample was then estimated by the difference between the weight of the dry sample and the weight after incineration.

Physical tests :

pH value

The pH value of the meat samples was measured according to the method of [17] by taking 5 g of minced meat and sewing it with

ISSN 2072-3857

100 ml of distilled water in a mortar and naturalizing it and then leaving it for 5 minutes after which the pH was measured using a pH-meter.

Determination of free fatty acids

Ten g of the sample was placed in the thimble of the fat extraction device (Soxhole) 250 ml of hexane was added, and the Process was proceeded for about 5 hours. Then resulting solvent is collected from the device and placed in the oven for half an hour at a temperature of 60 °C to ensure the evaporation of solvent residues from the flask and Obtaining Fatty substances. It was then taken out of the oven, left to cool, and the beaker was weighed and extracted using 250 µl of a solution of 9-fluorenylmethyl chloroformate to (1) ml of oil, after which 25 µl of sodium phosphate solution (0.05 M, pH9.3) was added. and mixed briefly,The samples were kept at 40 °C for 10 minutes after which a volume of 100 µL of the reaction mixture is injected into HPLC systems. The HPLC system used in this study consists of two pumps from the German SYKAM solvent delivery system, a fluorescent spectrophotometer that operates at specific excitation and emission wavelengths of 265 and 315 nm, respectively. The analytical column was a C18- ODS 250 (mm*4.6 mm) packaging. The gradient conditions for acetonitrile-water were as follows - A: 85-15% 0 to 4 minutes, B: 87-13% 5 to 8 minutes, and C: 97-3% 9 to 14 minutes. The temperature of the shaft furnace was set to 50 ° C and the moving phase was filtered, degassed and pumped at a flow rate of 1.5 ml / min.

Measurement of meat pigments

The concentration of myoglobin in meat was estimated according to the method of [18], where 10 g of minced meat was naturalized with 90 ml of distilled water using a homogenization device, then 10 g of this mixture was taken and 15 ml distilled water was added to it, then it was naturalized using the naturalizer, then the naturalized mixture was filtered through filter paper No. 1 and estimated by chromatic method and light absorption was recorded at a wavelength of 525 nm using a spectrophotometer type (EMC lab v –1 100) . The concentration of myoglobin was estimated according to the following equation :

Myoglobin concentration = absorbency × 2.4

Water holding capacity

The water-holding ability of meat was estimated using the method [19]. Briefly, 50 g of chopped pieces were mixed with 50 ml of distilled water for two minutes, then the mixture was centrifuged at a temperature of 4 C° and at a speed of 5000 rpm for 10 minutes in a centrifuge type (K3 Series) and then the ability of the meat to carry water was estimated according to the following equation.:

WHC %=((d– a)/s)*100

d = weight of added water

a = weight of water after centrifugation

s = Weight of meat sample (g(

Loss during cooking

The percentage of weight loss during cooking was estimated according to the method [20] by weight a sample of pieces studied and randomly processed by a sensitive balance and packed in bags (polyethylene) resistant to heat and tightly sealed. It was cooked in a water bath at 80 C° for 90 minutes, Then weigh the piece of cooked meat after it has been drained of liquids using filter paper. The percentage of weight loss during cooking was estimated according to the following formula:

lossing %=((b– a)/s)*100

b = Weight of meat before cooking

a = weight of meat after cooking

ISSN 2072-3857

s = Weigh the meat before cooking (g(

Statistical analysis: Data was statistically analyzed according to Complete (Randomize Design CRD), using the ready-made statistical analysis program SAS 10 [21] according to the following mathematical model: Yij = μ + Ti+eij

as: Yij = the viewing value j of the treatment i .

M = the general mean of the studied trait.

Ti = effect of the i treatment,

since i =(1,2,3,4(

eij = experimental error that is distributed normally, independently with an average of zero and an equal variance of e2 σ.

Results and discussion

Effect of transportation and anti-stress on the chemical composition of meat.%

The results of the statistical analysis in Table (1) showed a significant increase (P<0.05) in the percentage of protein for the treatments T1 and T3, as compared to the T2 treatment, Means were, 18.48, 18.28 and 18.05%, respectively. Other chemical items of chemical composition including moisture, ash and fat were not significantly differed among treatments.

Table 1. Effect of transport and anti-stress on the chemical composition of meat.

Items	Mean ± SE			P
	T1	T2	T3	
Moisture	67.25 ± 0.48 a	68.00 ± 0 a	67.50 ± 0.29 a	NS
Protein	18.48 ± 0.21a	18.03 ± 0.05b	18.28 ± 0.09 a	*
Fat	12.40 ± 0.25 a	12.20 ± 0.09 a	12.43 ± 0.18 a	NS
Ash	1.00 ± 0.04 a	1.15 ± 0.06 a	1.03 ± 0.05 a	NS

Means with different letters were significantly differed; *, (P<0.05 ;(

NS, insignificant

T1: non-transfected group used as control .

T2: Lambs are transported by Land for 3 hours for three hours without anti-stress

T3: Lambs injected with the anti-stress BUTAFOS ATP are transported by land for 3 hours

Transport and anti-stress effect in some physical tests of meat.

A significant increase (P<0.05) in pH for T2 (6.11) was observed on T1 and T3 (5.68 and 6.85). This is evidence of glycogen depletion as a result of the effort that the animal was exposed to during the transport process, while the pH value decreased to 5.68 in the control treatment because the animals were not exposed to any effort, where the glycogen remain high in the meat, which was converted into lactic acid after the animal was slaughtered and the throwing stiffness process occurred. the values of pH were elevated in the meat of animals transported for 3 hours. [22]. The pH of meat may decrease due to the conversion of muscle glycogen to lactic acid after slaughter [23]. There were no significant differences among the treatments in water holding capacity, loss during cooking and myoglobin concentration.

ISSN 2072-3857

Table 2. Effect of transport and anti-stress on some physical tests for meat.

Items	Mean ± SE			P
	T1	T2	T3	
Water holding capacity %	34.25 ± 0.85 a	32.75 ± 1.25 a	37.00 ± 2.65a	NS
Cooking loss %	36.70 ± 1.21 a	37.10 ± 2.30 a	34.63± 0.62 a	NS
Ph	5.68 ± 0.08 b	6.11 ± 0.05 a	6.85 ± 0.08 b	*
Myoglobin/nm	0.55 ± 0.10 a	0.56 ± 0.11 a	1.72 ± 1.20 a	NS

Means with different letters were significantly differed; *, (P<0.05 ;(
NS, insignificant
T1: non-transfected group used as control .
T2: Lambs are transported by Land for 3 hours for three hours without anti-stress
T3: Lambs injected with the anti-stress BUTAFOS ATP are transported by land for 3 hours

Transport and anti-stress effect of some free fatty acids:
Table (3) shows a significant increase (P<0.05) in the percentage of palmitic acid for treatment T1 and T3 (19.08 and 19.15%), respectively, compared to treatment T2. A significant increase (P<0.05) was observed in the percentage of citric acid for treatments T1 and T3 (8.32). and 8.48%, respectively, compared to treatment T2. In oleic acid, it was observed to increase significantly (P<0.05) in the T1 and T3 treatments (20.81 and 20.61)%, respectively, compared to the T2 treatment. The percentage of linoleic acid increased significantly (P<0.05) in the treatment injected against stress T3 (11.01%) compared to treatments T1 and T2. A significant increase (P<0.05) in linolenic acid increased in treatment T3 (1.29%) compared to treatments T1 and T2. Myristic acid increased. Significantly (P<0.05) in the third treatment (4.01)% compared to treatments T1 and T2. This is due to the lack of a decrease in fatty acid levelsin the experimental treatments T1 and T3 is due to the fact that the animals in the first treatment were not exposed to any significant effort in addition to the anti-stress effect in reducing the effort on the animals of the third treatment .

ISSN 2072-3857

Table 3. Effect of transport and injection with anti-stress on free fatty acid ratios.%

Items	Mean ± SE			P
	T1	T2	T3	
Palmatic	19.08 ± 0.03 a	16.52 ± 0.22 b	19.15 ± 0.05 a	*
Stearic	8.32 ± 0.05 a	5.98 ± 0.08 b	8.48 ± 0.04 a	*
Oleic	20.81 ± 0.04 a	16.33 ± 0.06 b	20.61 ± 0.26 a	*
Lenolic	10.30 ± 0.05 b	7.44 ± 0.06 c	11.01 ± 0.10 a	*
Linolenic	1.17 ± 0.02 b	0.86 ± 0.02 c	1.29 ± 0.02 a	*
Myristic	3.84 ± 0.03 b	2.17 ± 0.02 c	4.01 ± 0.05 a	*

Means with different letters were significantly differed; *, (P<0.05 ;(
NS, insignificant
T1: non-transfected group used as control .
T2: Lambs are transported by Land for 3 hours for three hours without anti-stress
T3: Lambs injected with the anti-stress BUTAFOS ATP are transported by land for 3 hours

Conclusion

The results of the study showed that the use of anti-stress in local lambs transported at the age of (7-8) months led to an increase in fatty acid levels and also a rise in the percentage of protein and maintaining normal levels of pH, while the control treatment (without transfer) exceeded the rest of the experiment parameters in most of the studied traits.

References

AL-dore, M, K 1988. The effect of cross-transfer with paste on physiological parameter, live weight loss, and carcass quality characteristics, and there is meat from Awassi meat. Master's thesis, University of Baghdad.

[2]Ruiqin Ma, Shu Li, Xinxing Li, Buwen Liang and Yan Cui. 2022. A prediction method for transport stress in meat sheep based on GA-BPNN. Computers and Electronics in Agriculture. Vol 203, December, 107476. [1]

[3]Valadez-Noriega. M , L.X. Estévez-Moreno, A.A. Rayas-Amor, M.S. Rubio-Lozano, F. Galindo, G and Miranda-de la Lama. 2018.Livestock hauliers' attitudes, knowledge and current practices towards animal welfare, occupational wellbeing and transport risk factors: a mexican survey.Preventive Veterinary Medicine.

ISSN 2072-3857

[4]Salaye , R, F and Sabow, A, B. 2022. Effect of Stress in Some Blood Parameters and Heat Shock Protein 70 of Awassi Syrian Lambs. Tikrit Journal for Agricultural Sciences . 22 (2):71-77.

[5]Broom, D.M. 2005. The effect of land transport on animal welfare. Revue Scientifique et Technique 24, 683-691.

[6]De la Fuente J, Sánchez M, Pérez C, Lauzurica S, Vieira C, González de Chávarri E, Díaz MT. 2010. Physiological response and carcass and meat quality of suckling lambs in relation to transport time and stocking density during transport by road. Animal. Feb;4(2):250-8.

[7]Samimi , A. S., J. Tajik, S. M. Aghamiri and A.Karimi. 2018. A serial evaluation of electrocardiographic indices and cardiac arrhytmias during pregnancy, lactation and dry periods in Saanen goats. Bulgarian. J.Vet. Med. 21:59-66.

[8]Vogel K D, Fabrega Rromans E, Llonch Obiols P and Velarde V. 2019. Stress physiology of animals during transport. Chapter 3: 30–57.

[9]Uzal F A, Plattner B L and Hostetter J M. 2016. Alimentary system. Jubb, Kennedy & Palmer's Pathology of Domestic Animals 2:1.

[10] Mantis F, Bizelis I, Symeon G.K and Rogdakis.E. 2019. Effects of pre-slaughter short-term factors on pork quality. Animal Production Science 59(12): 2273–79.

[11]Akin, P.D., Yilmaz, A., Ekiz, B. 2018. Effects of stocking density on stress responses and meat quality characteristics of lambs transported for 45 minutes or 3 hours. Small Rumin. Res. 169, 134–139.

[12] Etim, N.N.; Williams, M.E.; Evans, E.I.; Offiong, E.E. 2013. Physiological and behavioural responses of farm animals to stress:Implications to animal productivity. Am. J. Adv. Agric. Res. 2013, 1, 53–61 .

[13]Kassab ,A,Y, and Mohamm Netto ed, A,A. 2014. Ascorbıc acid administration as anti-stress before transportatıon of sheep. Egyptian Journal of Animal Production 51, 19–25.

[14]EMA. 2014. The European Medicine Agency: Science Medicine Health. Butafosfan (all mammalian food producing species) EMA/CVMP/335153/2013 [Internet]. London, UK:European public MRL assessment report (EPMAR.(

[15]van Dijk, D. ; Houba, V.J.G. 2000. Homogeneity and Stability of Material distributed within the Wageningen Evaluating Programmes for Analytical Laboratories Commun. Soil.Sci.Plant.Anal, 31 (11-14), 1745-1756.

[16]Folch, J., M. Lees, and G. H. S. Stanley. 1957. A simple method for the isolation and purification of lipids from animal tissues. Journal of Biological Chemistry. 226:497-509 .

[17]Xiong, Y. L., Cantor, A. H., Pescatore, A. J., Blanchard, S. P., and Straw, M.L. 1993. Variations in muscle chemical compositions, pH, and protein extractability among eight different broiler carcasses. Poultry Sci., 72:583-588.

[18]Zessin, D. A., Pohu, C. V., Wilson, G. D., and Carrigan, D. S. 1961. Effect of pre-slaughter dietary stress on the carcass characteristics and palatability of pork. J. Anim. Sci. 20:871-876.

[19] Denhertog-Meischke, M. J. A., Smulderes, F. J. M., Vanloglestijn, and Vanknapen, F. 1997. The effect of electrical stimulation on the water holding capacity and protein denaturation of two bovine muscles. J. Anim. Sci. 75: 118-124.

[20]Rasmussen, A. L., and Mast, M. G. 1989. Effect of feed withdrawal on composition and

quality of broiler meat. Poultry Sci. 68: 1109-1113.

[21]SAS, 2010. SAS / STAT Guide for personal computers. Release 6-12. SAS Institute Inc., Cary, N.C., U.S.A.

[22]XIN, L., XIA, A. Q., CHEN, L. J., DU, M. T., Li, C., Ning, K., and ZHANG, D. Q. 2018. Effects of lairage after transport on post mortem muscle glycolysis, protein phosphorylation and lamb meat quality. Journal of Integrative Agriculture, 17(10): 2336-2344.

[23]SCHEFFLER, T.L., SCHEFFLER, J.M., KASTEN, S.C., SOSNICKI, A.A. A GERRARD, D.E. 2013. High glycolytic potential does not predict low ultimate pH in pork. Meat Science, 95(1): 85-91.

ISSN 2072-3857