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ESTIMATION OF PORK QUALITY TRAITS USING STRESS INDICATORS

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ABSTRACT

The current study was designed to estimate the pork quality traits using blood glucose and lactate levels. A total of forty pigs were evaluated under Indian conditions. Completely randomized block design based on 2x2 factorial experiment was undertaken with 10pigs per treatment. The pigs were transported with high and low stocking densities. Under both conditions they were transported for short duration and long duration. The pigs were evaluated for blood glucose and lactate levels before and after transport and after lairage. Blood glucose and lactate concentrates were determined along with pH and drip loss. Levels of stress indicators were high with short duration transport when compared to long duration transport. Pigs with high lactate levels exhibited high initial pH values in longissmus dorsi muscle were significantly decreased. After lairage the stress indicator levels trend to decrease to base line levels. The blood glucose level did not differ significantly with stocking density.

KEYWORDS: Blood Glucose, Blood Lactate, Pork and Transportation

INTRODUCTION

Production of high quality pork with good lean percentage and quality traits is a need of present common trends. Meat and carcass quality are greatly influenced by several ante mortem and postmortem factor. Pigs are sensitive to transport stress and quickly of meat is influenced greatly.

Transport condition of market pigs influence the carcass quality as well as the behavior and welfare of the animals. It is also a domestic reality that the importance of trucking density is overlooked and pigs are frequently overloaded. Moreover they are transported for long time. Both over stocking and long distance transportation are known to increase the stress of animals. There will be increased blood glucose and lactate levels following increased secretion of adrenal stress hormones under stress conditions and also during muscle damage and general tissue damage (Krowles and Warriss 2000) therefore they can be used as indicators of transportation stress.

Objectives:

- To compare the levels of glucose and lactate in blood of pigs subjected to transportation stress with low and high densities
- To compare pH and drip loss in meat of pigs subjected to transportation stress low and high densities
- To find the relationships between blood parameters and pH and drip loss in meat from pigs subjected to transportation stress with low and high densities

MATERIAL AND METHODS

A total of forty pigs weighing approximately 100± 5 kg were assigned into 4 groups under 2x2 (Stocking densities X transport time) factorial arrangement. Low and high stocking densities were 0.39 m^2 and 0.31 m^2 / 100kg Body weight respectively short and long duration transportation times which were one hour and three hours respectively. All the animals were transported on a same truck driven by a same driver to the department. Ear vein samples were collected from four animals per each stocking density X transportation time combination, prior to loading, after loading, after unloading and after lairage. Animals were randomly selected at each sampling point.

Blood was also collected into anticoagulant added vial and they were carried on ice and blood lactate levels were determined by using blood analyzer in a commercial laboratory. One animal from each group was slaughtered after two hours of lairage. pH at 24 hours postmortem was measured by using pH meter. Drip loss was measured after 48 hours of storage.

Statistical Analysis

All the measurements were analyzed through SPSS (version 17.0). In the analysis the model included only the main effects of stocking density and transportation time

RESULTS

Blood glucose concentration was significantly affected ($p< 0.05$) by stocking density and transportation time and the results were given in Table 1. The results indicated that blood glucose concentration is more likely to be influenced by on overall transportation condition, including the stocking density and transportation time rather than by a single factor. These results were in accordance with Seshoka ET. al., 2013

Table 1: Mean ±S.E Values of Blood Glucose Levels

	High Stocking Density		Low Stocking Density	
	Short Duration	Long Duration	Short Duration	Long Duration
BEFORE LOADING	64.8±0.39	57.6±0.30	64.8±0.30	59±0.31
AFTER LOADING	91.8±0.35	70.2±0.30	59.4±0.31	68.4±0.32
AFTER UNLOADING	82.8±0.34	68.4±0.34	59.1±0.36	55.8±0.32
AFTER LAIRAGE	55.8±0.32	66.6±0.31	55.8±0.35	48.6±0.31

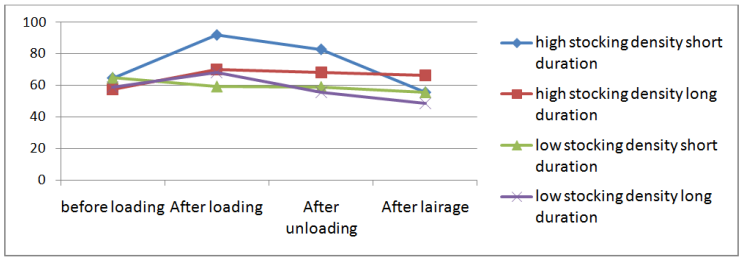

Figure 1: Mean ±S.E Values of Blood Glucose Levels

Lactate levels also indicated the same trend. Similar results were found by Benjamin et al. (2001) and Hambrecht et al. (2005) in pigs transported over long duration which may be due to rough or aggressive handling. Chai et al. (2010) also reported high lactate levels after transportation over a long duration; and in addition noted that low stocking density resulted in lower lactate levels compared to high stocking density.

Table 2: Mean ±S.E Values of Blood Lactate Levels

	High Stocking Density		Low Stocking Density	
	Short Duration	Long Duration	Short Duration	Long Duration
BEFORE LOADING	70.2±0.32	68.4±0.30	69.3±0.31	68.94±0.33
AFTER LOADING	135±0.34	95.4±0.32	113.4±0.36	93.78±0.38
AFTER UNLOADING	91.8±0.31	81±0.35	75.6±0.38	74.16±0.32
AFTER LAIRAGE	75.6±0.34	70.2±0.37	70.02±0.38	68.4±0.39

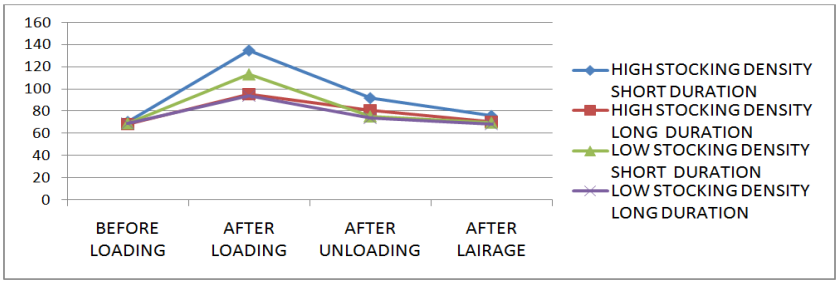

Figure 2: Mean ±S.E Values of Blood Lactate Levels

Table 3: Mean ±S.E Values of Pork Quality Traits

	High Stocking Density		Low Stocking Density	
	Short Duration	Long Duration	Short Duration	Long Duration
pH	5.26±0.31	5.36±0.35	5.3±0.38	5.15±0.32
DRIP LOSS	3.1±0.32	1.5±0.30	1.1±0.31	3±0.33

Studies showed Lower muscle pH was associated with higher stress parameters which were similar to *Perre et al.*, 2010 who reported that transport could affect meat pH values or increase the proportion of DFD (dark, firm, dry) or PSE (pale, soft, exudative) conditions. These results were in accordance to Pérez *et al. (2002)*. The drip loss was less at the low stocking density than high stocking density but no significant difference was observed. The less percent drip loss was seen in short duration transportation than long duration. These results were similar to Seshoka et. al., 2013.

CONCLUSIONS

Market pigs receive most stress during loading and subsequently recover from stress during lairage on the basis of circulating concentration of glucose and lactate levels. Pre slaughter conditions affect blood parameters and with extend of lairage time they tend to decrease and meat quality improves. It was demonstrated that lactate could be used to predict changes in the ultimate pH of pork and drip loss of meat. Although glucose was affected by transportation, there was no association with the selected meat quality parameters. The study also highlighted the potential of handheld devices and the "point-of-care" diagnostic testing approach to revolutionize management of product quality.

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