
UNIVERSITI PUTRA MALAYSIA

# COMPARISON OF CARCASS CHARACTERISTICS AND MEAT QUALITY IN GOATS SUBJECTED TO PRE-SLAUGHTER HEAD-ONLY ELECTRICAL STUNNING AND SLAUGHTER WITHOUT STUNNING

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## CERTIFICATION

This project report entitled **"A Comparison of Carcass Characteristics and Meat Quality in Goats Subjected to Pre-Slaughter Head-only Electrical Stunning and Slaughter without Stunning"** is prepared by **Nur Sakinah binti Lokman** and submitted to the Faculty of Agriculture in partial fulfilment of the requirement of SHW4999 (Final Year Project) for the award of the degree of Bachelor of Agriculture (Animal Science).

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## ABSTRACT

Stunning method that most widely used in small ruminants was electrical stunning system. Based on the electrophysiological evidence, the stimulation of the brain results in unconsciousness and insensibility in animals while the stunned animals may not experience unnecessary pain and distress during slaughter. The head-only electrical stunning (HOES) method has been accepted for the halal market. However, it has been shown to have adverse effects on carcass and meat quality which become the main problem in the industry. Visual carcass defects such as haemorrhages (i.e., speckles) are among the drawbacks related to carcass characteristics. Meanwhile, haemorrhages are not usually encountered in slaughter without any form of stunning (i.e., traditional halal slaughter (NS)). Thus, this study was conducted with the aim to determine the effects of HOES and NS method on carcass characteristics and meat quality assessment in goats. 12 male Boer crossbred goats were used in this study. The goats were divided into two groups of 6 animals each. In the first group, animals were NS according to the traditional halal slaughter procedure while the second group of goats were subjected to pre-slaughter HOES. Meat quality traits such as pH, water holding capacity, colour, tenderness, MFI and sarcomere length were determined on *semitendinosus* (ST) muscle, while the incidences of blood splash were morphologically examined on shoulders and legs of each carcass. The present results indicate no differences ($p>0.05$) in meat quality traits examined between the treatments. However, higher incidence of hemorrhages were observed on carcass of HOES animals than those NS. Thus, this study affirms that electrical stunning prior slaughter increased carcass hemorrhages without adversely affecting meat quality traits.

## ABSTRAK

Kaedah renjatan yang selalu digunakan dalam ruminan kecil ialah sistem renjatan elektrik. Berdasarkan bukti elektrofisiologi, rangsangan pada otak akan menyebabkan pengsan dan tidak sedar sementara haiwan yang terkena renjatan itu tidak akan berasa sakit dan tidak tertekan ketika penyembelihan. Renjatan Elektrik Kepala Sahaja (HOES), telah diterima oleh pasaran halal. Walau bagaimanapun, ada bukti menunjukkan kesan buruk kepada kualiti bangkai (karkas ) dan daging di mana menjadi masalah utama di dalam industri. Kecacatan bangkai secara pandangan kasar seperti pendarahan (tompok darah) adalah antara kelemahan pada ciri-ciri bangkai. Manakala, dalam penyembelihan tanpa renjatan, masalah pendarahan tidak selalu berlaku (contoh, penyembelihan halal secara tradisional(NS)). Maka, penyelidikan ini dilakukan dengan tujuan untuk mengenalpasti kesan kaedah HOES dan NS terhadap karakter bangkai dan kualiti daging. 12 kambing kacukan Boer digunakan dalam kajian ini. Kambing ini dibahagikan kepada dua kumpulan dimana 6 ekor setiap kumpulan. Di dalam kumpulan pertama, haiwan disembelih NS mengikut prosuder penyembelihan halal tradisional manakala kumpulan kedua mengikut kaedah HOES. Kualiti daging seperti pH, keupayaan menampung air, warna, keanjalan, MFI, panjang sarkomer ditentukan pada otot *semitendinosus* (ST) manakala kejadian percikan darah dikaji secara morfologi pada bahu dan kaki bangkai. Keputusan kajian menunjukkan tiada perbezaan signifikan ($p>0.05$) dalam kualiti daging yang dikaji di antara rawatan. Manakala, kejadian pendarahan dilihat tinggi pada bangkai HOES berbanding bangkai yang disembelih NS. Maka, kajian ini mengesahkan renjatan elektrik sebelum penyembelihan meningkatkan pendarahan pada bangkai tanpa memberi kesan pada kualiti daging.

## LIST OF ABBREVIATIONS

| | |
|---|---|
| **%** | Percentage |
| **°C** | Degree celcius |
| **G** | Gram |
| **Kg** | Kilogram |
| **NS** | Non-Stunning |
| **HOES** | Head-Only Electrical Stunning |
| **Wt** | Weight |
| **D** | Day |
| **H** | Hour |
| **pHu** | pH ultimate |

# CHAPTER 1

# INTRODUCTION

## 1.1 BACKGROUND OF STUDY

The last step of the meat production chain (slaughter) is a very delicate operation and has received much debate with regards to its humaneness (Sabow *et al*., 2015a). Slaughter procedures are generally regulated by legislation and codes of practice that are species specific. However, the suitability of commonly used methods does not only depend on species but also the availability of facilities, consumer demands and/or perceptions and economic considerations (Anil, 2012).

Slaughter methods can be broadly classified as conventional (automated procedures involving stunning) and religious (animals are killed by neck cutting using a sharp knife) (Nakyinsige *et al.,* 2014a). According to traditional religious slaughter without stunning, animals must be executed by neck incision so as to bring the animal to a quick death without agony, through severing of carotid arteries, jugular veins, trachea and esophagus permitting a rapid and complete bleeding (Farouk, 2013). Conversely, conventional slaughter methods focus around secular laws and entail stunning of animals before exsanguinations. According to the EU Council Directive (European Community, 1993) and Council Regulation ((EC) No 1099/2009) (European Community, 2009), animals must be stunned at point of slaughter to render them unconscious and insensible to distress and pain from the act of slaughter. Among the various stunning techniques adopted by the meat industry, the electrical stunning

system is the most widely used in small ruminants, such as in sheep and goats (Zivotofsky & Strous, 2012; Robins *et al.,* 2014). Electrical stunning is accomplished by passage of a sufficient amount of current through the central nervous system (McNeal *et al.,* 2003). It works by producing brain dysfunction and unconsciousness either temporarily in which case the animal dies as a result of bleed out (exsanguination); head-only electrical stunning or with subsequent killing by cardiac arrest; heat-to-body electrical stunning (Farouk, 2013; Nakyinsige *et al.,* 2013). The head-only electrical stunning method has been accepted for the halal market. The basis for this is that head-only electrical stunning is not known to result in the death of any animal (Salamano *et al.,* 2013). However, it has been shown to have adverse effects on carcass and meat quality which become the main problem in the industry. Visual carcass defects such as haemorrhages (blood splash and blood spots) are among the drawbacks on carcass characteristics which affect consumer acceptance of the meat. Meanwhile, haemorrhages are not usually encountered in slaughter without any form of stunning (i.e., traditional halal slaughter).

Stunning and slaughter procedures need to maintain product quality as well as protect animal welfare. Although there has been some research in this area, most information originates from work in sheep and cattle (Anil, 2012). However, there is a dearth of information regarding the effects of slaughter methods on carcass characteristics and meat quality in goats. Thus, this study was conducted with the aim to determine the effects of head-only electrical stunning and traditional halal slaughtering method (no stunning) on carcass characteristics and meat quality assessment in goats.

## 1.2 RESEARCH PROBLEM

Head-only electrical stunning method has been shown to have adverse effects on carcass and meat quality which become the main problem in meat industries. However, haemorrhages are usually not a problem in slaughter without any form of stunning. To the best of our knowledge, there are some studies on the influence of slaughter methods (conventional with stunning versus no stunning) on carcass and meat quality, most works were conducted in poultry, sheep and cattle. However, No previous work has been carried out in goats regarding the subject matter.

## 1.3 HYPOTHESIS

Because there exists relationship between the pre-slaughter handling of animals and meat quality, it strengthens the hypothesis that slaughtering goats without stunning may play a vital role in improvement of meat and meat products quality with positive economic and qualitative influences.

## 1.4 OBJECTIVE

The general objective of this study is to compare carcass characteristic and meat quality in goats subjected to pre-slaughter head-only electrical stunning and slaughter without stunning. The specific objectives of this study are:

- To determine the incidence of carcass haemorrhages and blood spots in goats subjected to pre-slaughter head-only electrical stunning and slaughter without stunning.
- To evaluate the physico-chemical characteristics of goat meat subjected to pre-slaughter head-only electrical stunning and slaughter without stunning.
- To determine myofibrillar fragmentation index and sarcomere length of meat obtained from goat subjected to pre-slaughter head-only electrical stunning and slaughter without stunning.

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