

CHAPTER I

INTRODUCTION

1.1 INTRODUCTION

The poultry industry in Malaysia contributes significant amount (about 80%) of the total meat requirements/consumption of the country (Department of Veterinary Science DVS, 2011) and, poultry meat provides the protein requirement for most Malaysians (The Poultry Site, 2006). Poultry industry involves chains of consistent steps to transform domestic birds into ready-to-cook carcass, cut-up carcass parts or various forms of chicken meat products (Allen, 2001).

Poultry meat consumption per capita in Malaysia was reported to be 47 kg per person in 2014 and it is projected that chicken meat consumption will continue to grow annually (Jayaraman et al., 2013; DVS, 2014). Broiler consumption is on the high side in Malaysia basically due to the weight and tenderness in the meat as compared with native chickens which are generally very small and tough (Karim et al., 2008). However, the major challenge being faced by the meat industry globally is the meat quality variations among slaughtered animals.

Meat quality is a general term used to describe range of characteristics and perceptions of meat, including properties such as carcass conformation and composition, the sensory quality of the meat (tenderness, softness, taste, juiciness and flavor), microbiological quality, and issues related to production and animal welfare

and environmental factors (Maltin et al., 2003; Grunert, 2005). Several factors can affect meat quality and the composition of the muscle pre-slaughter which include biological factors (breed, sex, productivity and susceptibility to stress) and production system factors (environment, management, nutrition and weight). In addition other factors can influence meat quality during slaughter, such factors as bleeding, rest, hygiene, unloading and transport. Post-slaughter factors include cooling, ageing, packaging, shelf display and cooking (Karlsson et al., 1999; Muchenje et al., 2009). The overall performance and assessment of meat quality depend on the combined effect of all of these factors. The overall assessment of meat quality is critically determined by consumer's judgment. The important factors that influence the consumer evaluation when eating the product are tenderness, juiciness and flavour of meat in addition to other factors such as colour, nutrition value and price. However, tenderness is considered one of the major cause of consumers' complaint and the primary cause of failure to repurchase such meat product (Troy & Kerry, 2010).

Meat tenderness studies by physical analysis and by molecular methods are well documented (Page et al., 2002; Shun et al., 2015). Texture analysis and sensory evaluation are some of the ways used to evaluate the tenderness of meat. Molecular technology approach is now used to identify animals with particular genetic traits associated with the desired tenderness. Several genetic markers have been used to describe and predict meat quality traits (Page et al., 2002; White et al., 2005; Casas et al., 2006) with calpain reported as important candidate gene in muscle growth and development of meat.

Calpains (i.e., intracellular Ca^{2+} -dependent cysteine proteases) are proenzymes that are regulated by Ca^{2+} binding and autoproteolytic modification (Goll et al., 2003). The

calpains were determined because the Z-disks in the muscle strips that were incubated in a Ca^{2+} -containing solution disappeared in the absence of other ultra-structurally detectable changes (Dayton et al., 1981). Four calpain genes (i.e., μ -calpain gene, CAPN1; m-calpain gene, CAPN2; p94 gene, CAPN3; and μ /m-calpain, CAPN1.5) are normally expressed in chickens (Okumura et al., 2006). Among the calpain family members, CAPN1 degrades myofibrillar muscle proteins under postmortem conditions and appears to have an important role in postmortem proteolysis and tenderization process (Koochmaraie, 1992, 1994, 1996). Regulation of CAPN1 activity has been suggested to be involved in meat tenderness. Thus, CAPN1 is a good candidate gene for tenderness (Geesink & Koochmaraie, 1999).

Polymorphisms within the CAPN1 gene have been documented in association studies for meat quality traits, particularly for tenderness and marbling (Page et al., 2002; Okumura et al., 2006; Zhang et al., 2007a, b, 2008; Ribeca et al., 2013). In chickens, 4 polymorphisms, 3 synonymous single nucleotide polymorphisms (SNPs) (i.e., C2546T, G3535A, and C7198A), and one SNP within the 3'-UTR (G9950A) of the CAPN1 gene have been reported to have significant effects on meat tenderness (Zhang et al., 2007a,b, 2008). However, there are no available data on the evaluation of the association between these SNPs in Malaysian native chickens. The Malaysian native chicken is a slow growing breed which is an important indigenous breed distributed in Peninsular Malaysia and some parts of Indonesia and Thailand.

Therefore the objective of this study was to identify the polymorphism in CAPN1 gene and to evaluate meat quality variation by assessing SNP markers in broiler and native crossbred Malaysian chickens.

1.2 OBJECTIVES

The objectives of the study are;

- i. To analyze and compare the chicken meat tenderness of broiler and native chicken using the Warner-Bratzler shear force test.
- ii. To isolate the DNA from two different types of chickens.
- iii. To amplify the three target regions in the CAPN1 gene that includes reported polymorphisms (SNPs) (G3535A, C7198A, and G9950A) by using routine thermal cyclers (PCR).
- iv. To identify and compare the single nucleotide polymorphisms (SNPs) of the CAPN1 gene in different chicken population samples (Native & broiler).
- v. To evaluate variation in meat tenderness by assessing CAPN1 polymorphisms in broiler and native crossbred Malaysian chickens.