

# Chapter 1

## A Review of Honey Application in Marinades Towards Hetero-Cyclic Amines (HCA) Formation: Physicochemical and Sensory Properties of Marinated Products

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### **ABSTRACT**

*Marinade is a mixture of non-meat ingredients in the form of a liquid solution applied to raw meat to delay the activity of bacteria and enzymes. Traditional marinade commonly uses salt as an ingredient. However, consuming a high intake of salt may lead to health problems. Traditional marinade only focused on prolonging the shelf life of the meat. Hence, this review aims to provide an overview of the recent advances on the application of honey in marinades towards hetero-cyclic amines formation and physicochemical and sensory properties of marinated products in detail. The physicochemical and sensory properties of various marinades have been thoroughly discussed. The results indicated that honey marinade showed better properties compared to other ingredients such as sugar, salts, and lactic acid in terms of formation of HCA, chemical, physical, and sensory properties. This chapter offers an overview of the recent advances in the application of honey in marinades in the meat industry.*

DOI: 10.4018/978-1-6684-6265-2.ch001

## **INTRODUCTION**

Marinade is defined as a mixture of non-meat ingredients, in a form of liquid solution or powder which is added to uncooked food especially meat, to enhance its flavour (Yusop et al., 2011). It is one of the popular techniques used to slow down the bacterial and enzymatic activity, and provides the tenderness, textural, and structural changes with a prolonged shelf-life of the meat product (Ozogul & Balikci, 2013). In general, marinades contain salt, phosphates, sugar, seasonings, spices, oils, and/or acids and usually applied to a grilled, roast, fried and steam meat product (Daly et al., 2013; Viegas et al., 2015). Nowadays, many marinades product has been developed and commercialized in the market such as liquid marinade, paste marinade, and powder marinade to make it easy for the consumer. Moreover, the interest in using marinade towards the meat and fish product maybe because it can reduce the formation of Hetero-cyclic Amine in the cooked product (Jinap et al., 2015).

Hetero-cyclic amines (HCA) are mutagenic and carcinogenic compounds developed in proteinaceous foods that have been roasted, grilled, steamed, or broiled at high temperatures (Kataoka et al., 2012). It is an organic compound which contains one or more aromatic rings (Pleva et al., 2020). High intake of HCA may increase the risk of variety of common cancer such as colon, breast, prostate and colorectal (Ali et al., 2019; Fu et al., 2011). However, the formation of HCA in food products can be prevented by using marinade during food preparation (Aaslyng et al., 2016; Jinap et al., 2018). Moreover, several studies have shown that marinade has also improved the physicochemical properties of meat product (Sharedeh et al., 2015).

The physicochemical properties of marinated products are important to know the characteristics of its final product (Jambrak, 2017). The chemical (moisture content, pH, and antioxidant activity) and physical properties (cooking loss, drip loss, water-holding capacity, and texture profile) are the most analysis done towards the marinated products (Arcanjo et al., 2019; Babikova et al., 2020). Several studies also comparing the physicochemical properties of unmarinated and marinated products (Manful et al., 2020; Quelhas et al., 2010). This comparison is to know the effectiveness of the marinades towards the meat product (Mohammed et al., 2017). Moreover, the addition of the marinade in meat product not only improves the physicochemical properties but also enhance the sensory acceptability of the product (Behera et al., 2020).

Sensory properties are a scientific discipline used to evoke, quantify, evaluate, and interpret responses to certain features of products as they are experienced by the senses of sight, scent, taste, touch, and hearing (Zeng et al., 2008). It can be measured by using sensory affective test and the attributes used to measures are appearance, colour, odour, taste, texture, and overall acceptability (Tomac et al.,

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