Effects of the addition of tropical edible seaweed on the physicochemical properties and lipid oxidation of chicken sausage

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Introduction: The effect of the addition of three types of tropical edible seaweeds, namely Kappaphycus alvarezii (KA), Sargassum polycystum (SP) and Caulerpa lentilifira (CL) on sausages studied.

Materials and methods: Nine sausage formulation of three compositions (2%, 4% and 6%) from each seaweed were made, analysed and compared with control sausage in terms of physicochemical properties, total phenolic content and lipid oxidation.

Result: The treated sausage showed to have low moisture and fat content ($p<0.05$) but high in ashes and dietary fibre content ($p<0.05$) compared to the control sausage. The addition of seaweed powder increased the texture properties, mainly the hardness and chewiness ($p<0.05$), but was found no significant difference in cohesiveness and springiness ($p>0.05$). Besides, treated sausage shown to have high water holding capacity and cooking yield. The addition of seaweed improves the water retention capacity in sausages ($p<0.05$). The colour of the chicken sausage was affected by the type of seaweed added. In general, the L* (brightness) and b* (yellowish) values was low for all sausage samples containing seaweed powder ($p<0.05$). In contrast, a* (redness) value increased with the addition of seaweed powder for sausage sample of KA and SP but decreased for the sausage sample of CL ($p<0.05$). Moreover, treated sausages have more phenolic content and high antioxidant capacity. Hence, this contributes to lowering lipid oxidation of sausage during storage ($p<0.05$).

Conclusion: Overall, the seaweeds, especially KA and SP can be potentially used to develop an excellent technological quality of meat products.

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Literature:

Fresh and processed meat offers numerous nutritional values such as a good source of a high biological value protein, fat-soluble vitamins, mineral and essential fatty acids. It is a core part of daily meals; thus, the consumption of good quality meat is crucial for a healthy diet (Klurfeld, 2018). Lipid oxidation causes quality deterioration in meat and meat products by reducing shelf life. It affects the nutritional value, texture, colour and aroma, leading to rancidity. Several factors that cause lipid oxidation are the presence of light and oxygen, storage temperature and also influenced by specific technological procedures during processing (Falowo et al., 2014).

Meat product that has been affected by lipid oxidation reduces eating quality and is a harmful effect on human health when consumed. Therefore, some technologies have been developed and studied to minimise lipid oxidation in meat products, such as the use of synthetic antioxidant and vacuum packaging. Although these techniques had been applied, there was a safety concern. Hence a natural antioxidant was receiving more attention. Extensive research is being carried out to find its novelty to delay the lipid oxidation and maintain eating quality and nutritional value in foods (Kumar et al., 2015).

Seaweed has been used as food since ancient times largely in Asian countries (Lopez-Lopez et al., 2009a). Seaweeds had a potential benefit both for health and chronic diseases such as cancer or diabetes, among others (Brown et al., 2014; Cao et al., 2016). They contained various nutritive compounds such as dietary fibre, protein, minerals, vitamins, essential unsaturated fatty acids, polyunsaturated acids, and bioactive components. Therefore, seaweed as food ingredients opens new possibilities for developing functional foods (Lopez-Lopez and Cofrades, 2007; Plaza et al., 2008).

Topical seaweed such that Kappaphycus alvarezii (KA), Sargassum polycystum (SP), and Caulerpa lentilifira (CL) also contained high in ash (37.15-46.19%) but low in lipid content (0.29-1.11%) on dry weight (DW) basis. Whereas the crude protein of KA and CL is 9.76% and 10.41%, respectively, they are higher than SP (5.4%). These seaweeds also contained high dietary fibre, which is 25.05% (KA), 39.67% (SP) and 32.99% (CL) compared to the terrestrial plant. Soluble fibre for KA was 18.25%, followed by CL (17.21%), significantly higher compared to SP (5.57%) (Matanjun et al., 2009). Dietary fibre increases some of the functional properties in meat products, for instance, increasing the oil and water retention, emulsification, gel formation, and texture modification and enhancing the long-shelf of the product (Elleuch et al., 2011).

Various bioactive compounds in seaweed open their possibilities to be used as a functional ingredient in food processing, including meat products (Lopez-Lopez et al., 2009b). The addition of seaweed in meat product serves as a fat binder and improve the textural in terms of hardness and softness (Mendoza et al., 2001). Study on the use of carrageenan (Kappa I) in a low-fat frankfurter show a reduction in cooking loss and improved the product quality (Cierach et al., 2009). The addition of Sea Spaghetti seaweed has a positive impact on pork meat products in terms of water and oil holding capacity, hardness and textural (Fernandez-Martin et al., 2009). Furthermore, the addition of Kappaphycus alvarezii into mechanical deboned chicken sausage enhances the physicochemical in terms of texture such as hardness, cohesiveness and chewiness. It also increases the water holding capacity and

reduced lipid oxidation during storage (Pindi et al., 2017). Therefore, a study on the incorporation of three types of tropical seaweed in meat product was conducted.

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