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CHEMICAL COMPOSITION AND ANTIOXIDANT ACTIVITY OF BEEF RENDANG WITH ADDITION OF CAROTINO®

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Abstract

Rendang is one of famous Malaysian traditional food and also well-known internationally. According to CNN International's, it has been reported that about 35,000 people choosed rendang as the most delicious food among the other 50 meals voted in 2011. Beef was the best and has suitable texture to be used in cooking rendang. Addition of carotino® are believe to improve the quality of beef rendang prepared in terms of chemical composition (fat, protein, moisture, ash) and quantity of antioxidant. The results showed that beef rendang resulted in significant differences ($p<0.05$) of antioxidant level and protein content in beef rendang but did not affect the fat, moisture and ash content. Significant differences ($p<0.05$) were observed for cooking time with regards to antioxidant level, protein content and moisture content in the beef rendang. In conclusion, beef rendang can be produced by addition of Carotino® with cooking time recommended at ½ hour to 1 hour.

Keywords: Rendang, antioxidant, carotino, chemical composition.

1.0 INTRODUCTION

Cooked and uncooked meats are differing in terms of physical structure and chemical composition such as protein, fat, vitamins and minerals. Cooked meat is more complex and highly susceptible to oxidation than raw meat (Wood et al., 2008). Stability of oxidative levels of meat depends on the reaction between anti-endogenic substances and pro-oxidants contained in meat and substrate content exposed to oxidizing processes such as unsaturated fatty acids, cholesterol, proteins and pigments.

2.0 LITERATURE REVIEW

2.1 Beef Rendang

Rendang is one of the traditional foods available in Malaysia. Rendang has become popular and known around the world based on CNN International's online polls in 2011, by which 35,000 people have choosed rendang as the tasty mainstay of the 50 other favourite food voters (Anon 2015). Rendang ingredients are vary according to country. For an example in Malaysia itself, the differences found from cultures and assimilation with other countries especially Southeast Asian countries such as Indonesia, Singapore, Brunei, Thailand and the Philippines. However, the shady taste and appearance is maintained so that the younger generation will still be able to see their own shades of origin (Anon 2015; Sharif et al., 2013). An improvement in the quality of beef rendang should be done as consumers are increasingly concerned and aware about the importance of daily food nutrition taken. Lipids and proteins are high quality values available in all types of meat. However, the process of shading cooking that takes a long period of time, may lead to the oxidation of lipid and protein that are present in meat, thus reduces the quality of beef cooked (Teets & Were 2008; Tornberg 2005).

2.2 Antioxidant

Antioxidants are substances that help in reducing lipid and protein oxidation rate in meat products thus helping to improve product shelf life and at the same time improve product quality (Karre et al., 2013; Sampaio et al., 2012). Antioxidants play role in stabilizing the free radicals formed, so the oxidation process especially lipid oxidation can be resisted (Weiss et al., 2010). The free radical stabilization process will form an aromatic compound when reacting with antioxidants. The formation of aromatic compound prevent the free radicals from breaking the double bond of unsaturated fats thus, causing the lipid oxidation process fail (Alamed et al., 2009).

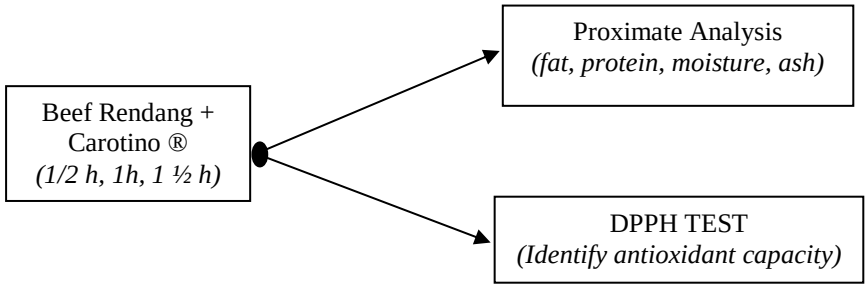
2.3 Carotino®

Carotino® is a unique product produced from a special palm oil filtration process. Carotino® retain most of the valuable components found in plant fat such as carotene, vitamin E and ubiquinone (Kritchevsky 2000). Carotino® is not genetically modified and usually the plant fat does not contain cholesterol and no saturated fat. Carotino® red color indicates high carotenoid and antioxidant levels in this plant fat (Hekmat & Haines 2003).

2.4 Chemical Composition

The oxidation process has significance impact on human body as well as the food produced. For example, the process that occurs during metabolism is also an oxidation process and it is useful for the survival of cells in the body and the disadvantages of this oxidation process will only occur if there are other negative effects such as leading to the formation of free radicals that alter the original oxidation concept. When the oxidation process occurs in food, the chemical composition of food in the diet will change, and this lead to a reduction in the nutritional value of the food, affecting the color, taste, texture and impossibility to affect the level of food safety. The addition of antioxidants is one of the methods to prevent excessive oxidation of food; therefore antioxidant activity can usually be detected in food (Michael et al., 2001)

3.0 THEORETICAL FRAMEWORK



Based on the objective of this study, to determine the chemical composition of beef rendang cooked with Carotino® proximate analysis was implied. Meanwhile, to determine antioxidant capacity of the beef rendang cooked with Carotino®, DPPH test was conducted at different set of time for ½ hour, 1 hour and 1 ½ hour cooking time.

4.0 METHODOLOGY

4.1 Beef Rendang formulation

Table 1: Beef Rendang Formulation

Formulation	Total (%)	Total (g)
Beef	43.94	500.0
Coconut milk	43.94	500.0
Dried chilies (powder)	1.76	20.0
Coriander (powder)	1.14	13.0
Turmeric (powder)	1.14	13.0
Red onion	1.76	20.0
Garlic	1.14	13.0
Cinnamon	0.88	10.0
Clove	0.44	5.0
Lemongrass	1.76	20.0
Carotino®	1.14	13.0
Salt	0.97	11.0

4.2 Proximate Analysis

Proximate analysis was used to determine chemical composition including fat, protein, moisture and ash content according to AOAC, 2000. Raw protein content is determined by Kjehdal method and raw lipid content is determined by soxhlet method. The humidity rate was determined by drying the sample for 24 hours at 105 ˚C and the ash content was determined by sampling for 24 hours at 550 ˚C (AOAC 2000).

4.3 DPPH Test

The DPPH test was conducted in this study to determine antioxidant capacity because the oily shady texture was a critical and difficult to detect antioxidant rate. Therefore, the antioxidant test through DPPH radical appetite was performed against evening primrose oil and citrus essential oil. Therefore, the texture of the sample to be studied is also very oily, so this analysis is chosen as one of the determination of antioxidant content (Michael et al., 2001).

5.0 FINDING & DISCUSSION

5.1 Descriptive statistics & analysis

In this study, all analysis is using two-way Analysis of Variance (ANOVA) using SPSS 2.0 software.

Antioxidant content through DPPH test in beef rendang with Carotino® is higher than beef rendang cooked without Carotino®. Carotino® is highly certified with antioxidant content consisting of carotene, vitamin E and Ubikuinone 10 compared to regular palm oil, corn oil or soybean oil (Benade 2001; Goh 1996; Nagendran et al., 2000). At the beginning of the beef rendang cooking process, the antioxidant levels shown are higher. This condition can be explained by the production of antioxidants that are hidden in amino acids as a result of protein purification process (Serpen et al. 2012). When the cooking time is longer, the amount of antioxidant in beef rendang decreases due to the oxidized protein and internal antioxidant damage found in meat such as vitamin E, vitamin C, carotenoids, ubiquinone, polyphenols and thiols. In this phase, peroxide substances will dominate over antioxidant substances (Serpen et al., 2012).

The fat value for beef rendang cooked with Carotino® is within 26.78% to 33.80% and the fat content is decreasing when the cooking period increases. Fat content is proportional to the amount of water or moisture content found in beef rendang. If the amount of water decreases then the fat content will increase (Ogunsola & Omojola 2008).

Beef rendang cooked with Carotino® has a high protein value of approximately 22.98% - 33.4% although it has been cooked for a long period of time because Carotino® contains high levels of antioxidant such as tocopherol which does not show HAA heterocyclic aromatic forming compound. HAA mutagenic food produced from high-temperature cooked meat products. Thus, making protein content more protected (Cross & Sinha 2004; Huda et al., 2012).

Moisture content of beef rendang cooked with Carotino® is still high (15.93%) although it has been cooked for a long period of time since Carotino® oil is a good antioxidant because it contains carotenoids, Vitamin A and Vitamin E and prevents the process of protein denaturation in meat thus making the meat still juicy (Babji et al., 2001; Serpen et al., 2012).

Ash content of beef rendang cooked using Carotino® is still low 4.35% and does not exceed the amount of specific ash content for serunding which is 5.52% -6.80%. Carotino®, rich in antioxidant have ability to prevent the decomposition of chemical compositions in beef while being cooked for a long period of time (Fachruddin 1997; Laksono & Syahrul 2001).

6.0 CONCLUSION AND FUTURE RECOMMENDATION

Carotino®, rich in antioxidants, able to maintain the quality of beef rendang with a total antioxidant, fat content, protein content, moisture content and adequate amount of ash for the beef itself.

Further study should be focused on assessing the quality of a food-cooked oil based product by combining Carotino® with selected oils such as Carotino® mix with common cooking oil palm used. This is because Carotino® is expensive cooking oil but rich in antioxidants, although it is used in small quantities, it was able to improve the nutritional value of the food produced.

REFERENCES

Alamed, J., Chaiyasit, W., Mcclements, D. J. & Decker, E. A. 2009. *Relationships between Free Radical Scavenging and Antioxidant Activity in Foods.* Journal of Agricultural and Food Chemistry 57(7): 2969-2976.

Anon. *Rendang.* http://en.wikipedia.org/wiki/Rendang [atas talian 8 Februari 2015].

AOAC 2000. *Official Methods of Analysis.* Association of Official Analytical Chemists. Washington, DC.

Babji, A. S., Wan Rosli, W. I., Alina, A. R., Tan, S. S., Mohd. Suria Affandi, Y. & Foo, S. P. 2001. *Utilization of Palm Based Fats as Animal Fat Analogues in Improving the Nutritional Quality of Meat Product.* Dlm Cutting-edge technologies for sustained competitiveness: Proceedings of the 2001 PIPOC International Palm Oil Congress, Agriculture Conference. Kuala Lumpur, Malaysia, 20-22 August.

Benade, A. J. S. 2001. *The Potential of Red Palm Oil-Based Shortening as a Food Fortification for Vitamin a in the Baking Industry.* Food Nutrition Bull 22 (416-418).

Cross, A. J. & Sinha, R. 2004. *Meat Related Mutagens or Carcinogens in the Etiology of Colorectal Cancer.* Environmental and Molecular Mutagenesis 44(1): 44-55.

Fachruddin, L. 1997. *Teknologi Tepat Guna: Membuat Aneka Abon.* Penerbit Kanisius, Yogyakarta.

Goh, S. H. 1996. *Coenzyme Q, Malaysian Oil.* Science Technology 5:19.

Hekmat, S. & Haines, J. 2003. *Comparison of the Effects of Carotino and Canola Oils on the Sensory Properties of Various Foods*. Nutrition Research 23(9): 1211-1219.

Huda, N., Fatma, Y., Fazillah, A. & Adzitey, F. 2012. *Chemical Composition, Colour and Sensory Characteristics of Commercial Serunding (Shredded Meat) in Malaysia*. Pakistan Journal of Nutrition 11(1): 1-4.

Karre, L., Lopez, K. & Getty, K. J. 2013. *Natural Antioxidants in Meat and Poultry Products*. Meat Science 94(2): 220-227.

Kritchevsky, D. 2000. *Impact of Red Palm Oil on Human Nutrition and Health*. Food Nutrition Bull 21: 182-188.

Laksono, C. & Syahrul. 2001. *Studi Mutu Dan Penerimaan Konsumen Terhadap Abon Ikan*. Journal Nature 3(1): 17-184.

Michael, A., Paul, D. P., Emilios, P., M., S. & Kevin, R. 2001. *Methods for Testing Antioxidant Activity*. www.rsc.org/analyst [atas talian 11 November 2015].

Nagendran, B., Unithan, U. R., Choo, Y. M. & Sundram, K. 2000. *Characteristics of Red Palm Oil, a Carotene- and Vitamin E-Rich Refined Oil for Food Uses*. Food Nutrition Bull 21: 189-194.

Ogunsola, O. O. & Omojola, A. B. 2008. *Nutrional Evaluation of a Dehydrated Shredded Meat Product (Danbunama)*. Pakistan Journal Nutrition 7(1): 554-556.

Wood, J. D., Enser, M., Fisher, A. V., Nute, G. R., Sheard, P. R., Richardson, R. I., Hughes, S. I. &Whittington, F. M. 2008. *Fat Deposition, Fatty Acid Composition and Meat Quality: A Review*. Meat Science 78(4): 343-358.

Sampaio, G. R., Saldanha, T., Soares, R. A. & Torres, E. A. 2012. *Effect of Natural Antioxidant Combinations on Lipid Oxidation in Cooked Chicken Meat During Refrigerated Storage*. Food Chemistry 135(3): 1383-1390.

Serpen, A., Gokmen, V. & Fogliano, V. 2012. *Total Antioxidant Capacities of Raw and Cooked Meats*. Meat Science 90(1): 60-65.

Sharif, M. S. M., Zahari, M. S. M., Nor, N. M. & Muhammad, R. 2013. How *Could the Transfer of Food Knowledge Be Passed Down?* Procedia - Social and Behavioral Sciences 105: 429-437.

Teets, A. S. & Were, L. M. 2008. *Inhibition of Lipid Oxidation in Refrigerated and Frozen Salted Raw Minced Chicken Breasts with Electron Beam Irradiated Almond Skin Powder*. Meat Science 80(4): 1326-1332.

Tornberg, E. 2005. *Effects of Heat on Meat Proteins - Implications on Structure and Quality of Meat Products*. Meat Science 70(3): 493-508.

Weiss, J., Gibis, M., Schuh, V. & Salminen, H. 2010. Advances in Ingredient and Processing Systems for Meat and Meat Products. Meat Science 86(1): 196-213.