

Correlation of Browning Intensity and Antioxidant Activity in Dendeng

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ABSTRACT

Browning is the phenomenon occurred in dendeng making as a result of non-enzymatic browning process known as Maillard reaction. The objective of this research was to study the correlation of non-enzymatic browning intensity and antioxidant activity in dendeng (Indonesian traditional dried meat). The non-enzymatic browning intensity of 8 commercial dendeng samples produced by different producers were measured at λ 420 nm, and then these results were correlated with their antioxidant activity using linear regression equation. The results indicated that non-enzymatic browning intensity had closed correlation with antioxidant activities measured as DPPH scavenging activities ($y = 534.9x + 1.80$; $R^2 = 0.88$) and antioxidant capacities ($y = 1910x + 55.96$; $R^2 = 0.88$).

Key Words: Dendeng, Antioxidant activity, Non-enzymatic Browning, Maillard reaction

INTRODUCTION

Specific colour of dendeng product, dark brown colour, could be resulted from non-enzymatic browning reaction known as Maillard reaction. The Maillard reaction is the forming of glycated product occurred through non-enzymatic glycosidation of amino acids or proteins. This reaction takes place between reducing sugar, such glucose, fructose, maltose, lactose, as well as in some cases (e.g., meat) reducing pentoses, and amino acids and/or proteins. The end stage of that reaction was the forming of brown pigments and polymers. Generally, the Maillard reaction needs intermediate water activity (a_w) range (0.5-0.8) condition, therefore it could take place in dried or intermediate moisture food (Zamora and Hidalgo, 2005), like dendeng that has a_w ranged from 0.54 to 0.65 (Bintoro et al., 1987).

Besides brown pigments in the end of stage, the Maillard reaction also produced some volatile compounds characterized as aroma compounds (Zamora and Hidalgo, 2005), as well as mutagenic (Zamora and Hidalgo, 2005) and antioxidant compounds (Yilmaz and Toledo, 2005; Sun et al., 2010; Zhuang and Sun, 2011; Dong et al., 2012; Miranda et al., 2012). This research was conducted to evaluate correlation of non-enzymatic browning intensity and antioxidant activity in dendeng known as Indonesian traditional dried meat.

MATERIALS AND METHODS

Sampling method and sample preparation: Sampling method and sample preparation followed procedure explained by Suryati et al. (2012). Dendeng samples were purchased from eight home industries in West Java and Central Java Province, Indonesia. Samples were brought and kept at ambient temperature for a week and then it were stored in the refrigerator temperature for a week. Sample preparation was initiated by soaking process in the potable water for 5 min and drained for 15 min, and then samples were fried in deep frying oil at 150 °C for 1.5 min. Fried dendeng samples were kept in the cold temperature (-25 °C) prior to next analyses.

Analysis of non-enzymatic browning product: Non-enzymatic browning product was extracted from dendeng using water extraction as method described by Yilmaz and Toledo

(2005) with some modification and analysed using spectrophotometer (GeneQuant 1300, Sweden). The analysis was done on crushed fried dendeng samples. Amount of 0.5 g of sample was added with 10 mL of aquades and was homogenized with vortex for 30 sec, and then the mixture was centrifuged at 4 °C, 10000 rpm for 30 min. Supernatant was taken and diluted in such a way that the absorbance was lower than 0.8 at λ 420 nm. The absorbance was corrected by dilution factor. The corrected absorbance indicated the intensity of browning product.

Data analysis: Maillard product intensity of dendeng samples were correlated with DPPH scavenging activity and antioxidant capacity to evaluate their correlation. Antioxidant activity data used the data that have been published before (Suryati et al., 2012) adjusted based on dry matter to eliminate moisture effect.

RESULT AND DISCUSSION

Intensity of Maillard reaction product was varied among fried dendeng samples from some industries (Figure 1). This could be affected by different ingredient formula (Suryati et al., 2012) and also processing method in dendeng making. Non-enzymatic browning in dendeng could be occurred as a result of high protein content in beef contained reactive amino acids, such lysine, methionine, arginin and histidin reacted with reducing sugar. Reducing sugar in dendeng was derived from palm sugar and white sugar as a part of ingredient added in dendeng processing (Suryati et al., 2012). Drying process and water activity range in dendeng were contributed to non enzymatic browning reaction intensity. Non-enzymatic browning in dendeng also increased in line with storage time (Buckle and Purnomo, 1986).

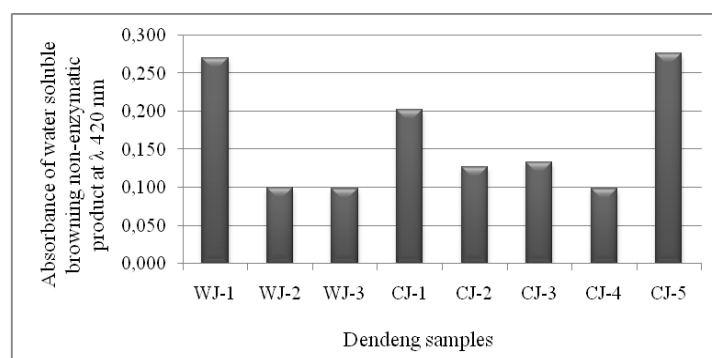


Figure 1. Water soluble non-enzymatic browning product intensity of fried dendeng samples measured at λ 420 nm. WJ = dendeng from West Java; CJ = dendeng from Central Java

Intensity of Maillard reaction product in dendeng samples had positive correlation with radical DPPH scavenging activity following equation: $y = 534.9x - 1.80$, with $R^2 = 0.88$ (Figure 2).

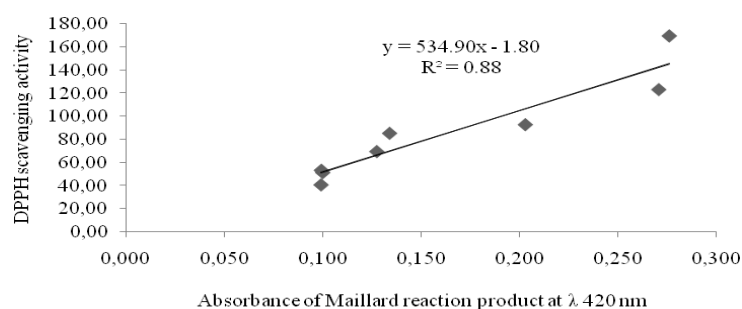


Figure 2. Correlation of Maillard reaction product intensity with radical DPPH scavenging activity at fried dendeng produced by some industries

Intensity of Maillard reaction product in dendeng samples consistently also had positive correlation with antioxidant capacity following equation: $y = 1910x - 55.96$, with $R^2 = 0.88$ (Figure 3). These equations indicated that the intensity of Maillard reaction product in dendeng had close correlation either with radical DPPH scavenging activity, or with antioxidant capacity. The close correlation of them was indicated by the high determination value (R^2) both of the equations reached 88%. This means that the water soluble Maillard product measured at λ 420 nm contributed to antioxidant activity in dendeng. The result was supported by some proofs that Maillard product has antioxidant activity (Yilmas and Toledo, 2005; Sun et al., 2010; Zhuang and Sun, 2011; Dong et al., 2012; Miranda et al., 2012).

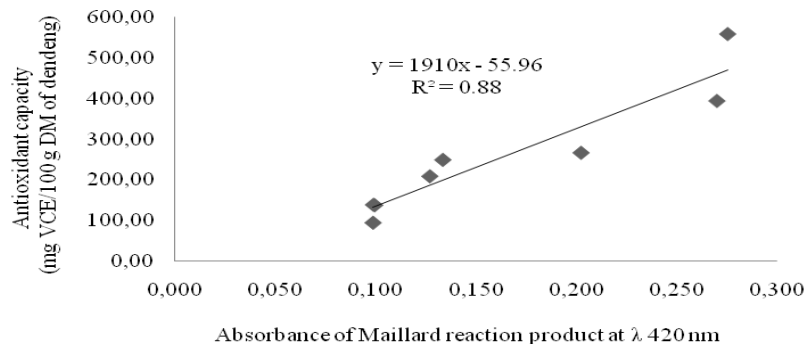


Figure 3. Correlation of Maillard reaction product intensity and antioxidant capacity at fried dendeng from some industries

The antioxidant activity in dendeng gave value added to dendeng as food, that was could inhibit rancidity process in product. Fried dendeng also supplied antioxidant for body health. Therefore dendeng had potency as a functional food, besides as a source of proteins. In conclusion, although Maillard reaction formed dark brown colour on dendeng, but it contributed to its antioxidant activity.

CONCLUSION

In conclusion, Maillard reaction in dendeng processing give contribution to product not only the dark colour, but also antioxidant activity.

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