

The change of chemical and antioxidant properties of coconut sap induced with arginine during heating treatment

Perubahan sifat-sifat kimia dan antioksidan nira kelapa dengan penambahan arginine selama pemanasan

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Abstract

Coconut sap is the sweet translucent substance that is derived by tapping coconut flowers commonly used as raw material of palm sugar. The chemical compositions, *i.e.* reducing sugar and amino acid on coconut sap are important in generating the brown color and flavor of the sugar produced. The polar amino acid with the positively charged end such as arginine makes it suitable for binding to molecules with many negative charges on their surfaces such as carbonyl groups of reducing sugars. This interaction is called carbonylamino reaction, the initial stage of Maillard reaction. This research aimed to determine the effect of variation arginine concentration on chemical and antioxidant properties of coconut sap during heating process. A 2.5 L of coconut sap obtained was then added with arginine with various concentration of 0,4; 0,8 and 1,2 mM, heated with an open process until the end of process *i.e.* the temperature of 118 °C of sap was reached. Fifty grams of sap samples was collected when the sap temperature reached 80, 100 and 118 °C during heating treatment. The same weight of granulated sugar produced was also collected subsequently. The results showed that the 0.8 mM of arginine concentration and the sap temperature of 100 °C were the optimum condition to obtain the highest DPPH radical scavenging activity and Fe²⁺ chelating activity *i.e.* 69.93 and 23.78 %, respectively. This condition yielded sap with chemical properties as follows: pH value 6.7; water content 39.18 %; reducing sugar 6.79 %db; sucrose 70.82 %db; total sugar 77.61 %db; free amino acid 0.14 %db; total protein 0.69 %db; total polyphenol 0.83 %db; and browning intensity 0.105. The inhibition of lipid peroxidation of sap were 20.09 % and 50.85 % evaluated with Ferric thiocyanate (FTC) and thiobarbituric acid reactive substances (TBARs) methods, respectively.

Keywords: antioxidant activity, coconut sap, Maillard reaction

Abstrak

Nira kelapa adalah cairan manis, putih dan jernih yang diperoleh dengan cara penyadapan bunga kelapa digunakan salah satunya sebagai bahan baku gula semut. Komposisi kimia yaitu gula reduksi dan asam amino pada nira kelapa penting untuk menghasilkan warna coklat dan flavor gula yang dihasilkan. Arginin yaitu asam amino polar dengan rantai samping bermuatan positif mengakibatkan arginine mudah mengikat molekul dengan banyak muatan negatif pada permukaannya salah satunya gugus karbonil gula reduksi. Reaksi antara asam amino dan gula reduksi disebut reaksi karbonil-amino yang merupakan tahap awal reaksi Maillard. Penelitian ini bertujuan untuk mengetahui pengaruh variasi konsentrasi arginin terhadap sifat kimia dan antioksidan nira kelapa selama pemanasan. Sebanyak 2,5 L nira kelapa hasil sadap ditambah arginin dengan variasi konsentrasi 0,4; 0,8 dan 1,2 mM, dipanaskan dengan proses terbuka hingga suhu nira mencapai 118 °C. Selama pemanasan, sebanyak 50 g sampel diambil ketika suhu nira mencapai 80, 100 dan 118 °C dan juga gula yang dihasilkan. Hasil penelitian menunjukkan bahwa konsentrasi arginin 0,8 mM dan suhu nira 100 °C merupakan kondisi optimum yang menghasilkan aktivitas DPPH radical scavenging activity dan Fe^{2+} chelating activity tertinggi yaitu berturut turut 69,93 dan 23,78%. Kondisi ini menghasilkan nira dengan sifat kimia sebagai berikut: nilai pH 6,7; kadar air 39,18%; gula reduksi 6,79% db; sukrosa 70,82% db; total gula 77,61% db; asam amino bebas 0,14% db; total protein 0,69% db; total polifenol 0,83% db; dan intensitas pencoklatan 0,105. Penghambatan peroksidasi lipid nira adalah 20,09% dan 50,85% berturut-turut dievaluasi dengan metode FTC dan TBARs.

Kata kunci: aktivitas antioksidan, nira kelapa, reaksi Maillard.