ASIAN JOURNAL
ISSN: 0976-3376

Available Online at http://www.journalajst.com

ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

Asian Journal of Science and Technology
Vol. 3, pp.061-063, July, 2010

RESEARCH ARTICLE

ROLE OF ROASTING ON THE SENSORY AND PHYSICOCHEMICAL PROPERTIES OF COCOA FUDGE

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Received 16th May, 2010; Received in revised form; 17th June, 2010; Accepted 25th June, 2010; Published online 6th July, 2010

Cocoa seeds were roasted at 120ºC for 10 and 20 minutes were ground to a fine paste to obtain cocoa liquor. Cocoa fudge samples were prepared using the prepared liquor cocoa butter, sugar and lecithin. The two samples were analyzed for their physicochemical and sensory properties. The results of the study reveal that the roasting duration has a significant influence on both the properties. An increase in roasting duration of the cocoa seeds increases the mean physicochemical properties like moisture, ash, acid number and decreases the fat content, saponification value and sensory properties. The mean sensory values of the two samples were significantly different at $p<0.001$.

Key words: Cocoa fudge, sensory properties, roasting duration, physicochemical properties

INTRODUCTION

Chocolate is frequently mentioned as the most commonly craved food and for most chocolate cravers; nonchocolate substitutes are inadequate (Drewnowski, Kurth, Ho and Saari, 1992; Weingarton and Elston, 1991). Rozin and Michener (1998) showed that chocolates craving cannot be eliminated by ingesting white chocolate or pills containing pharmaceutically active constituents of chocolates; these constituents may contribute to the genesis of craving, but for decreasing their craving symptoms, "Chocoholics" definitely need the sensory experience of the real product (Thamke, Durrschmid and Rohm, 2009). Cocoa and chocolate are rich sources of polyphenols. The flavan-3-ol monomers catechin and epicatechin and oligomers procyanidins are the major flavonoids in chocolate. Recent attention has been directed to the antioxidant potential of these flavonoids in cocoa and chocolates and their potential protective effects on the risk of cardiovascular diseases (Bearden, Pearson, 2000).

The incorporation of dark chocolates and cocoa powder into the diet is one means of effectively increasing antioxidant intake. Furthermore the inclusion of dark chocolate and cocoa powder in a diet that is rich in other food sources of antioxidants, such as fruits, vegetables, tea and wine, results in a high antioxidant intake and may consequently reduces the risk of cardiovascular diseases (Ying wan and Joe Vinson; Terry Etherthon; 2001). The attractive aroma of roasted cocoa is the result of a sophisticated technological process applied to the seeds of the cocoa tree (cocoa beans, *Theobroma cacao* L.).

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Among the manufacturing steps, both, fermentation and roasting are considered to be the most important with respect to flavor formation, because, e.g., roasting of nonfermented cocoa does not deliver the characteristic cocoa aroma (Lopez, 1994). It was reported by Minifie (1980) that stabilizers and emulsifiers were used to improve the texture and surface appearance of the chocolates.

Flavour is one of the most important constituents in cocoa products; its precursors are developed during fermentation and drying of cocoa beans. The aroma precursors in cocoa beans, which include free amino acids, peptides and reducing sugars develop into cocoa specific aroma through Millard reactions during roasting (Barel, Leon and Vincent, 1985; Mohr, Landschreiber and severin, 1976). Hence the investigator analyzed cocoa beans roasted at two different timings by developing cocoa fudges. The aim of the present study was to develop the cocoa fudge samples with roasted beans at different durations and to identify whether there is significant difference in the sensory key attributes of the cocoa fudge sample and to evaluate the influence of roasting duration in the physicochemical properties of the developed samples.

MATERIALS AND METHODS

Pre-Processing of beans

Roasting of the cocoa seeds was carried out in a microwave oven, which was set at 120ºC and maintained for 30 minutes to reach equilibrium, before used. Weighed 100g of cocoa seeds were kept in an oven plate and the door was opened and closed as quickly as possible after placing the plate with the seeds. The seeds were roasted at 120ºC for 10 minutes and 20 minutes separately. These

roasting duration were optimized after considering the results from the previous studies with the duration of 14 minutes at 95ºC (Felix frauendorfer And Peter Schieberle, 2008**).**

Product development

The cocoa fudge samples were developed by roasting the cocoa seeds to the specific temperatures, deshelled and cocoa liquor was made. The samples were prepared by mixing the ingredients like cocoa liquor, sugar, cocoa butter, and lecithin at the proportion of 50%:40%:10%:0.3%. The product developed with the roasting duration of 10 minutes was named sample I and with 20 minutes was named sample II.

QUANTITATIVE ASSESSMENT

Physicochemical properties

The samples were tested for their physicochemical properties like moisture, pH, acid number, saponification value, total ash, soluble ash, insoluble ash and fat using standard procedures of AOAC, and the results were tabulated and analyzed statistically.

Sensory evaluation

The sensory evaluations of the samples were carried out by seven trained panelists in the faculty of Food Science, Periyar University, Salem. The panelists were selected from 20 persons who were interested, possed good health condition and had knowledge about the sensory evaluation of chocolates. A 9-point hedonic scale comprised of the criterias like appearance, aroma, glossiness, sweetness, mouth feel, after taste, distribution of particles, overall acceptability was used to evaluate the cocoa fudge samples which ranged from like- extremely to dislike extremely (Larmond, 1977).

Statistical analysis

The tabulated results were analyzed statistically using Microsoft Excel, Two-way Analysis of Variance (ANOVA) without replication.

RESULTS AND DISCUSSION

Roasting is needed for development of cocoa flavour and the quality of roasted cocoa depends on the origin of the beans and roasting condition (Hoskin and Dimick, 1994). After roasting the beans possesses the typical cocoa aroma and is less astringent (Jackson, 1990; Minifie, 1990 and Misnawi, Jinap, Jamilah and Nazamid, 2004). The moisture content of the two samples was found to be 0.055% and 0.115% respectively in contrast with the results found in Engmann and Mackely (2006) which is because increased duration of roasting. Chocolates made from low pH (4.75-5.19) and high pH (5.50-5.80) cocoa beans presented low sensory response to chocolates flavor and more off-flavour. Lowered moisture causes difference in the appearance, distribution of supplements; On the other hand chocolate samples made from medium pH (5.20-5.49) cocoa beans received a high response in strong chocolate flavor (Edys.de Brito and Narendra Narain, 2002) but the pH of cocoa fudge samples was 6.51 and 6.37 which was found to be alkaline; 1.97 and 1.98g of the total ash; greater difference was found in the saponification value with 79.47 for sample I and 14.49 for sample II. The acid number of both samples was 4.449 and 5.346 respectively. Increased acid number and ash had a negative influence on the after taste and the mouth feel of samples. The fat content of the cocoa fudge samples prepared was 14 and 12.5g respectively. These results are clearly represented in Figure 1. The organoleptic characteristics of the developed chocolate samples were determined. The two samples varied in the sensory profile, which is pictorially expressed in figure 2. The mean scores for various attributes for the two samples were 7.42 and 6.42 for appearance; 6.42 and 5.71 for aroma; 7.28 and 6.28 for glossiness; 5.85 and 6 for

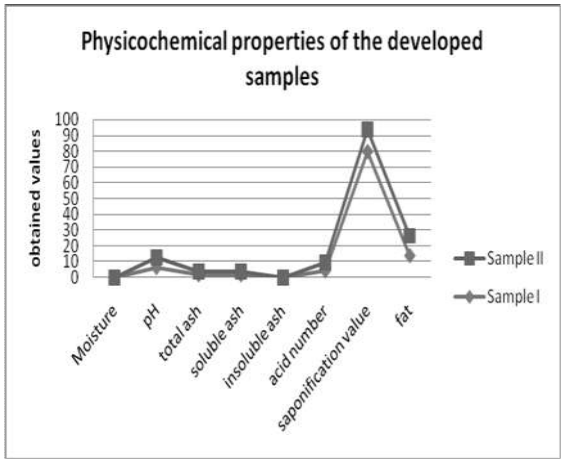

Fig.1. Physicochemical properties of the developed samples

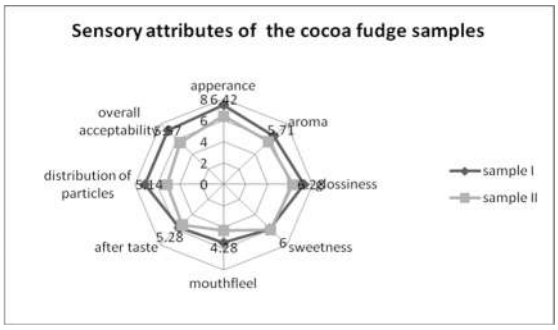

Fig. 2. Sensory attributes of the cocoa fudge samples

sweetness; 5.42 and 4.20 for mouth feel; 5.71 and 5.28 for after taste; 7.14 and 5.14 for distribution of particles; 7.14 and 5.57 for overall acceptability respectively. The mean sensory values of the two samples are significantly different ($p<0.001$) from each other. The roasting duration showed a significant effect over all the samples which was found to be contrary from the results of Misnawi, Jinap, Jamilah, Nazamid (2004) in which the roasting duration of 15-45 minutes at 120 ºC significantly affected cocoa flavour and not on the other sensory properties.

Conclusion

In this present study the investigator analyzed the effect of roasting on physicochemical and sensory attributes of cocoa fudge samples. The results revealed that there was no significant difference in the physicochemical properties of the developed samples, but a significant difference at $p<0.001$ was noted in the sensory attributes of the developed samples, this is because roasting enhances the key aroma favoring aldehyde bodies; the enhancement of colour is due to Millard reaction. The flavonoids present in the cocoa seeds also had a major influence in these properties and the analysis of these flavonoids gains its importance. Hence further studies are yet to be carried out in the estimation of flavonoids responsible for the above properties.

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