

Physicochemical and Sensory Properties of Dark Chocolate Formulations Using Trinidad Cocoa Beans (*Theobroma cacao* Linnaeus) and Jaggery

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Abstract: Jaggery, a non-centrifugal sugar, was investigated as a healthier option for refined sugars in dark chocolates using Trinidad's premium cocoa beans. Physicochemical and sensory evaluations were conducted on dark chocolate bars from five formulations: Formulation 1 (70% dark chocolate with 29% white sugar); Formulation 2 (70% dark chocolate with 29% brown sugar); Formulation 3 (70% dark chocolate with 29% jaggery); Formulation 4 (60% dark chocolate with 39% jaggery) and Formulation 5 (50% dark chocolate with 49% jaggery). The nutritional profile of the 70% dark chocolates with refined sugars and jaggery revealed no significant differences ($p > 0.05$) in the fat, fibre and carbohydrate percentages but significant differences ($p < 0.05$) in the moisture content of the 70% jaggery chocolate bars compared to the 70% refined sugar bars. The physical attributes of texture and viscosity revealed that Formulation 1 was the hardest of the bars, while Formulation 5 was the softest but had a higher viscosity. The hardness of the jaggery chocolate bars decreased ($p < 0.05$) as the percentage of jaggery increased, while the viscosity increased ($p < 0.05$) with increasing percentage of jaggery up to 80 Pascal-second. The colour tristimulus a^* and b^* values were significantly different ($p < 0.05$) for all the jaggery bars. From the consumer study, the preferred chocolate bars were the traditional refined sugars (Formulation 1, followed by Formulation 2). However, Formulation 5 was preferred as much as Formulation 2, suggesting that the jaggery bars may have appealed to some taste panel members. Further studies are proposed to optimise the jaggery formulations for consumer acceptance and potential commercialisation.

Keywords: Cocoa, Jaggery; Dark Chocolate; Physicochemical Analyses and Sensory Evaluations