Improvement of Flavour Quality of Under-Fermented Cocoa Beans through an Optimaization of Polyphenol

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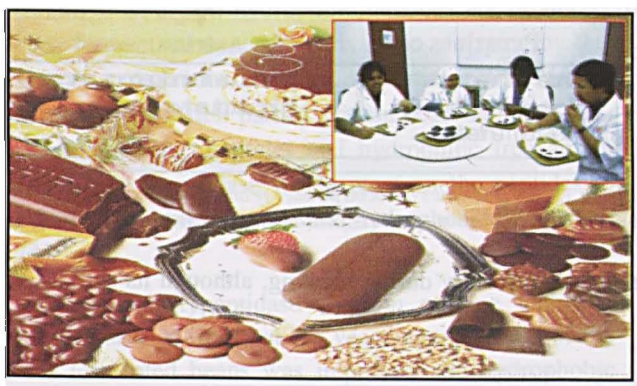
Malaysia is well known as one of the main world producer of cocoa products and is the biggest in Asia. Due to the cocoa bean's production shortage, this country is currently importing ± 44,000 tonnes annually from Indonesia constitute about 57% of the total Malaysian import. However, most of the Indonesian cocoa beans are under-fermented, which are characterized by low cocoa aroma intensity with excessive astringency and bitterness and still contain high concentration of polyphenols. Cocoa bean polyphenols have gained much more attention, owing to their antioxidant capacity and their possible beneficial implications in human health, such as in the treatment and prevention of cancer, cardiovascular disease and other pathologies. Therefore, a study has been carried out to improve flavor quality of under-fermented cocoa beans without affecting beneficial values of the polyphenols.



R&D is an integral activity in producing high quality products

Good quality of cocoa fruit followed by proper processing technology would produce high quality cocoa products

Results of the study showed that the unpleasant astringency of under-fermented cocoa beans is due to precipitation of salivary proline-rich protein on the tongue by cocoa polyphenol, whereas the low cocoa aroma intensities is due to undeveloped aroma precursors namely hydrophobic amino acids, hydrophilic peptides and reducing sugars during beans processing. Remaining indigenous key enzymes, i.e. polyphenol oxidase, aspartic endoprotease, carboxypeptidase, and invertase, and/ or exogenous enzymes could be employed to improve flavor quality of the beans (see Figure 1). These treatments have produced cocoa flavor, which are comparable to well-fermented cocoa beans with polyphenol content ± 5%. Its antioxidant activity was still high and better than the activity of α-tocopherol (FTC and TBA methods).

Study on the effects of cocoa liquor roasting (120°C, 15-45 min) on cocoa polyphenol, hydrophobicity and its impact on its flavor showed that 2.6-3.3% of total polyphenol and 19.5-33.1% of total tannin in fermented cocoa liquor, decreased upon roasting; however, only 4.8-8.9% and 2.3-7.5% decreases, respectively of total polyphenol and total tannin, was present in under-fermented beans. Polyphenol hydrophobicity in both fermented and under-fermented cocoa liquors was significantly decreased; the rate of decrease was faster in the under-fermented cocoa beans than that of fermented beans. These findings implied that excessive astringency in under-fermented cocoa liquor could also be reduced through roasting

treatments; however, its quantity is not much affected by roasting treatment. Sensory evaluation results showed that the astringency flavor has decreased with longer roasting time.

Further study on the effect of polyphenol on flavor formation during roasting showed that excessive polyphenol in cocoa liquor (> 100 g kg^{-1}) inhibited formation of cocoa flavor due to its interaction with flavor precursors mainly peptides and free amino acids. Pyrazines, the major cocoa aroma compounds, were produced inversely with polyphenol content in cocoa liquor, and sensory evaluation results showed that the excessive polyphenol was not only inhibited flavor formation, but also impaired sensory perception of cocoa liquor.

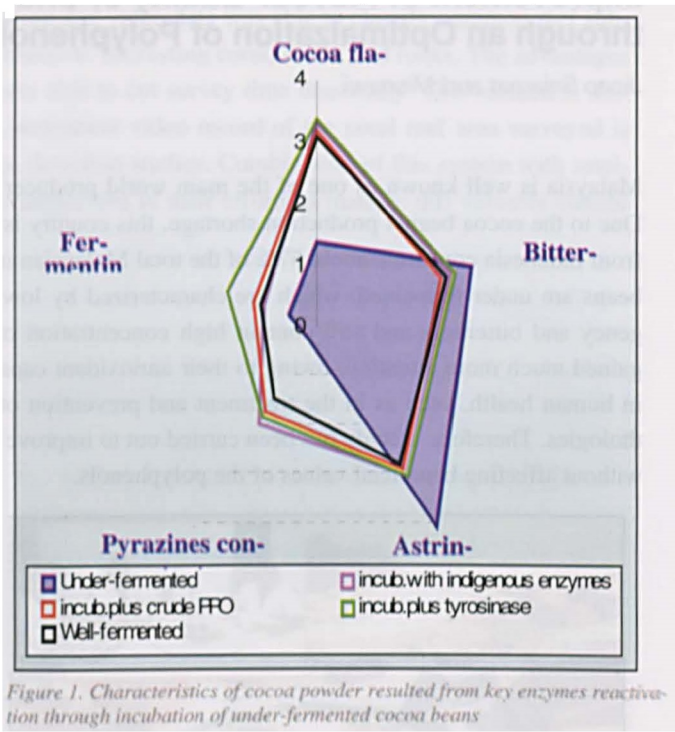


Figure 1. Characteristics of cocoa powder resulted from key enzymes reactivation through incubation of under-fermented cocoa beans

Study on the antioxidant activity of cocoa liquor after roasting showed that under-fermented cocoa liquor lost its antioxidant activity significantly during roasting, although its activity was still high and better that of α-tocopherol.

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