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OPTIMISATION ON THE REDUCTION OF ACRYLAMIDE IN ROASTED COCOA BEANS

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulation of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or any degree or qualification.

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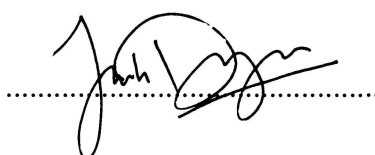
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ABSTRACT

Roasting is an important process that contributes to the formation of flavour, aroma and colour of cocoa beans. Pyrazines, a products of Maillard reaction are the character impact compounds that contribute to unique cocoa flavour. Unfortunately during roasting, carcinogenic acrylamide is also produced through Maillard reaction. Therefore, the objectives of this study were focused on optimising roasting conditions using Response Surface Methodology (RSM) to produce cocoa beans with high flavour and low concentration of acrylamide. The roasting conditions tested were a temperature in the range of 110 − 160 $^{\circ}$C and time ranging from 15 − 40 min. Statistical optimisation was carried out with the goal setting of a minimum concentration of acrylamide, maximum concentration of 2-methylpyrazine, 2,5-dimethylpyrazine, 2,3,5-trimethylpyrazine and 2,3,5,6-tetra-pyrazine, maximum for sensory characteristics (chocolate aroma, acidity and overall acceptability), minimum for sensory characteristic; burnt taste and in the range for colour (L value). The optimised conditions obtained were a temperature of 116 $^{\circ}$C and time of 25 min with desirability value of 0.8. The optimum condition was used to determine the effect of roasting cocoa beans from different origins and the quality parameters observed were pyrazines, acrylamide, amino acid, sugar and sensory evaluation. Papua New Guinea cocoa beans developed significantly ($p < 0.05$) highest concentration of acrylamide 0.32 mg/100g and Cameroon cocoa beans were significantly lowest, 0.11 mg/100g. Superior quality Ivory Coast cocoa beans was produced with this roasting condition; high pyrazines with low acrylamide concentration. pH of the beans significantly effect the development of flavour but did not contributes to the formation of acrylamide. Application of asparaginase using soaking method (asparaginase concentration of 1000 U/g and incubation temperature at 50 $^{\circ}$C) prior to roasting was able to significantly ($p < 0.05$) reduce formation of acrylamide (87%) without sacrificing concentration of reducing sugar and pyrazines in the beans. Therefore, application of asparaginase at optimum roasting condition was able to produce quality cocoa beans in term of high flavour and low in acrylamide formation.

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