ABSTRACT

An Investigation of the Effect of Microorganisms and Fermentation Time on Cacao (*Theobroma cacao* L.) Flavour

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Natural cacao fermentation on an estate, a zero-time inoculated fermentation and naturally fermented control, located elsewhere, were monitored. The inoculum utilised was sourced from the estate fermentation. Cocoa liquors made using beans collected on days 0, 3, 5 and 7 of fermentation and chocolates produced from beans collected on day 7 of fermentation, were evaluated via organoleptic assessment. Microbiological and physicochemical changes were monitored during fermentations. A decrease in yeast proliferation occurred up to 5 days of fermentation, then an increase (estate); increase up to 2 days, then decrease (control) and decrease up to 4 days, then increase (inoculated). Acetic-acid bacteria population peaked on day 3 of fermentation (estate), day 4 of fermentation (control) and day 2 of fermentation (inoculated). Aerobic microbes decreased during initial 4 days of fermentation (estate) and 3 days of fermentation (control and inoculated), then increased. During physicochemical monitoring it was observed that cotyledon pH decreased and testa pH increased as all fermentations progressed. Temperatures peaked (51.1ºC) on day 3 of fermentation (estate), (51.0ºC) on day 4 (control) and (49.0ºC) on day 4 (inoculated).

Assessment of cocoa liquors made from 7-day fermented beans revealed that estate fermentation yielded liquor that was scored highest for acid, fruity and floral attributes. Results also showed that fermentation duration significantly affected the flavour of cocoa liquors ($P \leq 0.05$), since some flavour attribute trends transcended differences in

fermentation regime such as general decreases in scores for astringency, bitterness and raw/beany/green attributes as fermentation progressed.

Chocolates were assessed via hedonic testing and results revealed that samples made from the zero-time inoculated fermented beans were preferred over samples made from other beans. However, average scores for the inoculated and control chocolate samples were very similar and a triangle test yielded <0.1% significance. Therefore, the chocolates possessed insignificant flavour differences. The inoculated and estate fermentations possessed differing flavour profiles whereas the control and inoculated fermentations possessed similar flavour profiles. Therefore, the zero-time inoculation did not significantly affect the resultant flavour attributes of the beans.

Keywords: Naailah Aminah Ali; cacao; cocoa; fermentation; time; microorganisms; flavour.