SOME CHEMICAL STUDIES ON THE PROCESSING OF COCOA WITH SPECIAL EMPHASIS ON FLAVOUR CONSTITUENTS

SUBMITTED IN FULFILMENT OF THE
REQUIREMENT OF THE DEGREE OF
MASTER OF PHILOSOPHY,
UNIVERSITY OF COLOMBO
SRI LANKA.

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B.Sc. (Hons).

SUMMARY

The thesis deals with some aspects of processing of *Theobroma Cocoa*. In this study, plant material was collected from Wariapola estate, Matale, which has a mixed plantation of forestero and criollo varieties - typical of cocoa plantations in Sri Lanka.

The selected aspects of processing were studied for samples taken both in the major and minor seasons - variations in the parameters measured in this study for these two seasons (which can be considered to be two possible extremes of sample material from any particular estate) was very slight.

The first aspect studied was the fermentation of cocoa, where measurements were taken (on both beans and pulp) on the following parameters: pH, temperature, acetic acid, reducing and total sugar, cocoa butter (fat), weight loss on fermentation and the cut-test. The following conclusions were reached.

- At least 3-4 days fermentation was needed
- It was possible to determine fermentation time for a batch of freshly fermented beans by the 'cut-test'.

Studies on the effect of processing and storage on the anthocyanin content showed that :

- Anthocyanin content declines (by ~70%) during 6 days fermentation and still further on roasting and storage (eg. roasting causes a loss of 90% of the anthocyanins).

- The decline in anthocyanin content can be related to the cut-test which in-turn could be used as a rough criterion for determining proper processing.

- Varying storage times complicates the results of the cut-test, but the test has some value especially on mixed criollo and forestero samples.

Next the effect of the maturation process (which is defined holding the fermented beans in layers of about 5cm at ambient temperatures) was studied. Results may be summarised as follows:

- A decline in amino acid content (46 to 35mg %)
- An increase in content of carbonyl compounds (0.09 to 0.21%)
- An increase in glucose, galactose and fructose content (2.2 to 2.8%)
- A slight decrease in sucrose content (0.32 to 0.27%)
- A decline in acetic acid content
- No major changes in non-volatile acid content (citric acid and oxalic acids)
- The ratio of pyrazines is relatively unaffected
- A decline in anthocyanin content (7.0 to 3.9 µmoles/L)
- A slight decline in xanthine content (3.7 to 3.0%)

Maturation therefore alters the levels of at least some flavour components and flavour precursors. Carbonyl formation appeared to be a complete process connected to the loss of amino acids but complicated by other processes eg. the oxidation of fatty acids.

The GC/MS profile of cocoa volatiles was studied next. A number (27) of peaks were identified corresponding approximately to 75% of the volatiles. The volatile profile showed that maturation differs from 2 additional days fermentation and these studies predicted that matured cocoa (4 day fermented - 2 day matured) would differ from 6 day fermented cocoa organoleptically.

The final part of the study was sensory analysis. The flavour score had a statistically significant linear relationship with fermentation time. These studies also showed that the present grading system of the cocoa bean had no relationship to its flavour properties.