Tea Q. 51 (2) 67-71, 1982. Printed in Sri Lanka

A SIMPLIFIED METHOD FOR THE RAPID MEASUREMENT OF THE DEGREE OF FERMENTATION DURING TEA MANUFACTURE

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The measurement of fermentation by the techniques available presently is unsuitable for routine use. A method has been devised where the EBC colour scale is used in a simple comparator to monitor the rate of fermentation. Data is presented to show that this method may be adapted for routine use in factories.

INTRODUCTION

The conversion of fresh tea leaves to Black tea is carried out by means of a process made up of four main stages, i.e. Withering, Rolling, Fermentation and Firing. The term 'fermentation' is applied to a process of enzymatically initiated oxidative and coupling reactions of polyphenols which are set off after the rolling (cell rupture) process. The fermentation of tea leads to the development of the characteristic liquor colour and taste of black tea. The final value of the tea is thus largely determined by correct fermentation. The development of colour and taste during fermentation is known to be primarily associated with the formation of dimeric and polymeric compounds collectively termed, the Theflavin (TF), Thearubigins (TR) and Thearubigin polymers (TRP) (Wickemasinghe, 1974).

The measurement of the progress of fermentation by measuring TF, TR and TRP has been described earlier (Takeo, 1974). The methods however cannot be easily adapted for routine use. The measurement of TF only as an index of fermentation has been successfully used in the case of teas manufactured in East Africa by the LTP and CTC processes (Ellis *et al.* 1981).

This paper describes a simplified method where comparator discs are used to directly measure the colour intensity of the liquid brewed from fermenting tea leaf (Dhools).

METHODS AND MATERIALS

Preparation of extracts

The fermenting leaf (commonly known as Dhool) is approximately weighed out (10 g) and immersed in boiling water (100 ml). The solution is allowed to stand with occasional mixing and filtered through a plug of cotton wool placed in a funnel. The clear extract is diluted twenty times with hot water (5 ml to 100 ml) and used for the measurement of colour.

Instrumentation

The solution was transferred into a 2.5 cm glass cell specified for use with the Lovibond 3 aperture comparator and the colour was measured against a set of

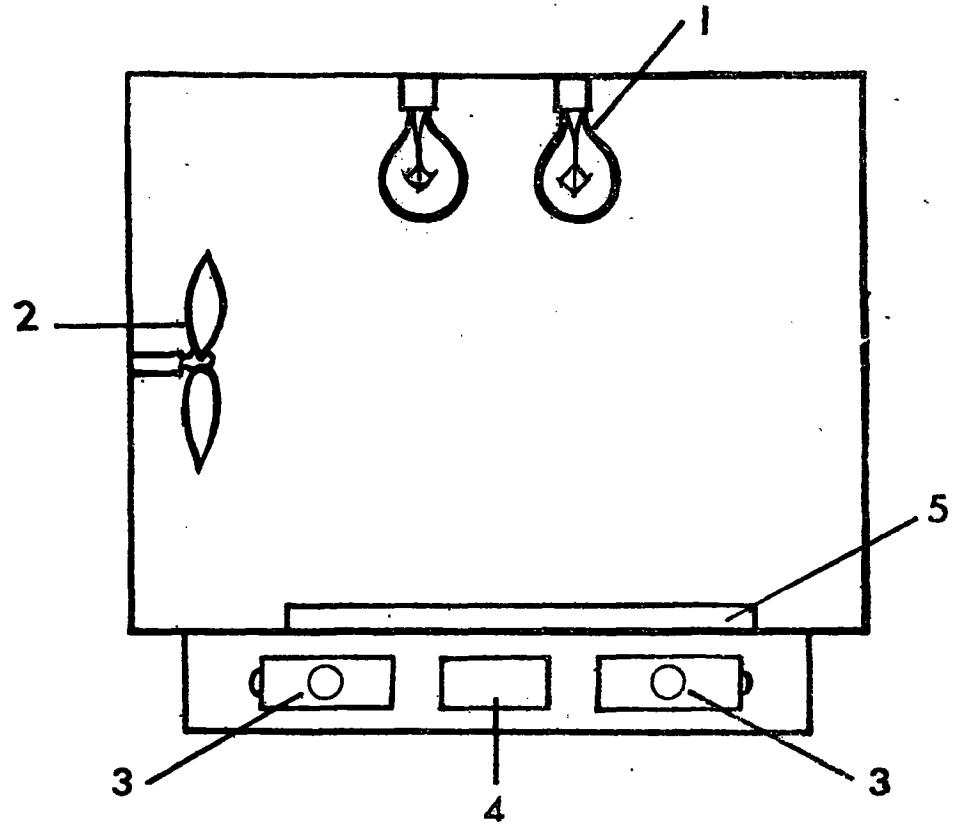

Fig. 1.—Schematic diagram of the Lovibond three aperture comparator. 1. Lamps 2. Cooler fan 3. Colour discs 4. Cell 5. Window

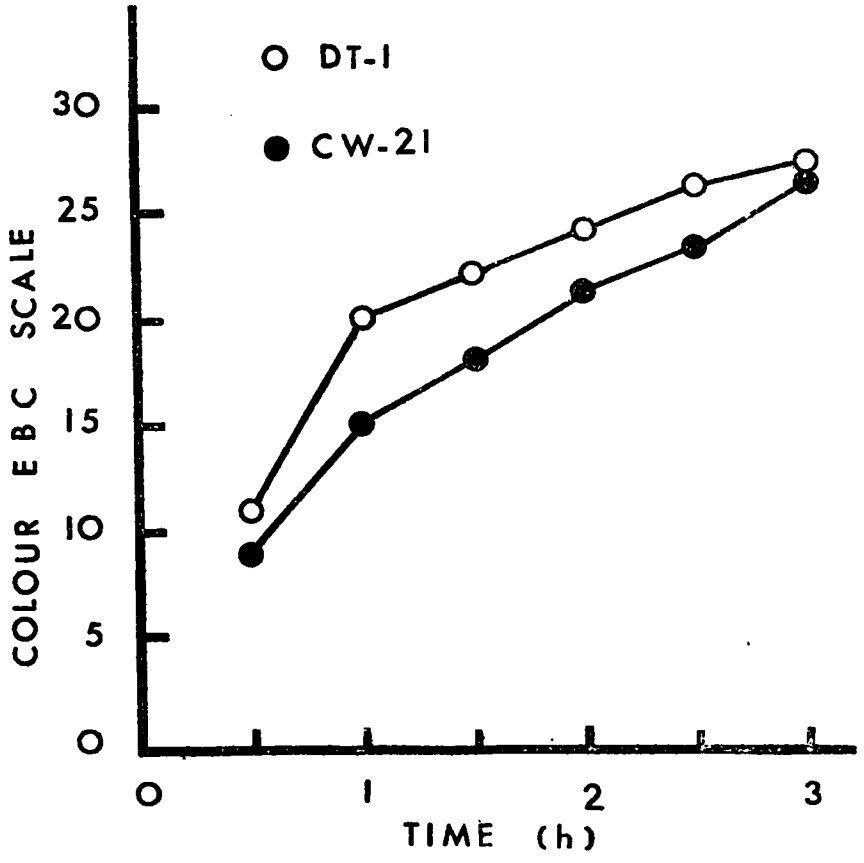

Fig. 2.—The increase in the liquor colour intensity on the EBC scale with increasing periods of fermentation (Laboratory manufacture of clonal leaf)

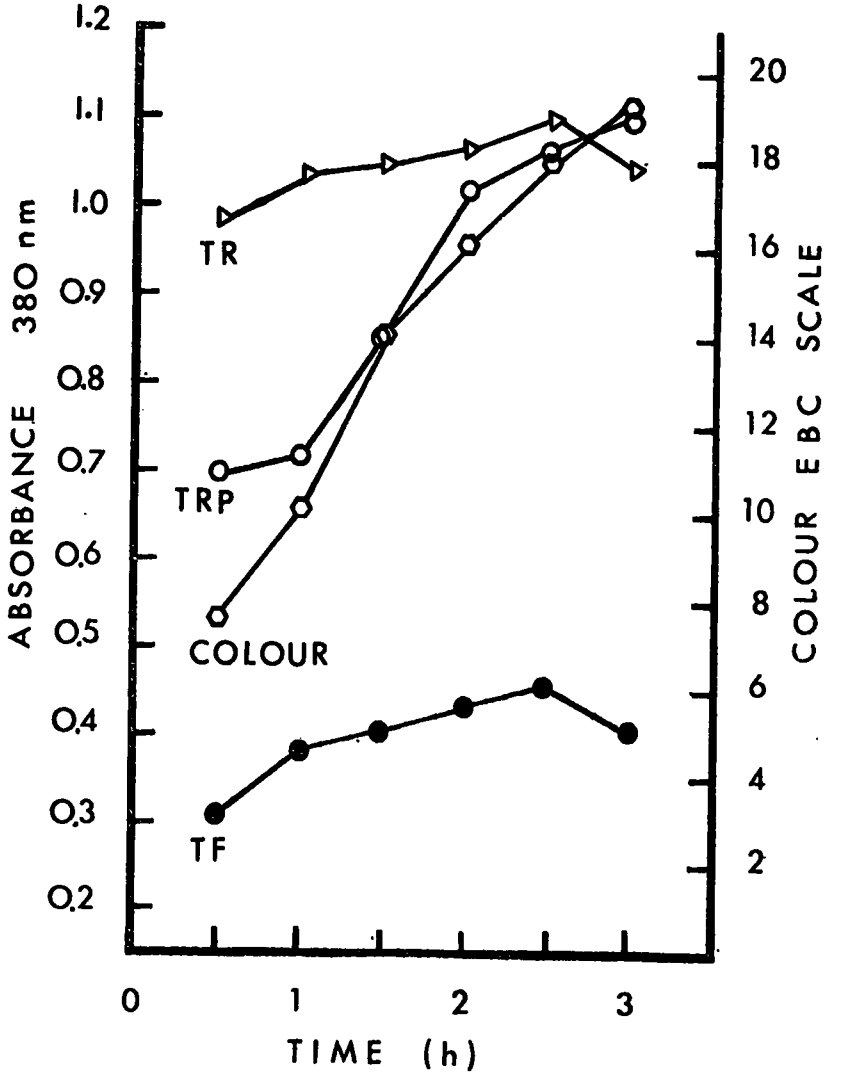

Fig. 3.—The increase in liquor colour intensity on the EBC scale compared with changes in TF, TR and TRP. (Samples from standard factory manufacture)

graded EBC colour discs manufactured and supplied by the Tinctometer Ltd., Salisbury, England. A schematic diagram of the apparatus is shown in Fig. 1.

RESULTS AND DISCUSSION

The development of colour with the progress of fermentation was found to exactly match the colour of the EBC scale. The results of an experiment using clonal leaf is shown in Fig. 2. The relationship of period of fermentation to the development of liquor intensity is clearly evident. The manufacture of clonal leaf was carried out on a miniaturised scale in the laboratory.

The measurement of colour on leaf fermenting in the factory is shown in Fig. 3. The progress of fermentation as measured by the increase in TF, TR and TRP is also shown in the same Figure. It is clear that the progress of fermentation as measured by this method closely follows the development of the TF, TR and TRP which are well known reaction products of fermentation.

The exact gradient of the curve will depend on the prevailing manufacture conditions, mainly the Type of Rolling, Rolling programme and temperature of the fermenting leaf.

CONCLUSION

The method described in this paper is a simple method of measuring the progress of fermentation. The instrumentation is easily adaptable for use in an ordinary tea factory.

The measurement of colour during fermentation can be carried out periodically and the process of colour measurement can be completed within five minutes once operator skill has been developed. Fermenting to a given liquor colour, to be fixed according to the season and factory location can provide a greater day to day consistency in the tea produced. The method has a further application in that it can be used to spot check the fermenting rates of clonal material.

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