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ON THE METHOD OF ORTHODOX MANUFACTURE AND ITS EFFECT ON GRADE OUTTURNS AND MADE TEA CHARACTERISTICS

2—THE INFLUENCE OF HARD ROLLING AND HIGH DRYING TEMPERATURES

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Some tea-growing areas renowned for the production of high-quality and flavoury teas are known to use air at temperatures ranging from 82°C (180°F) to the relatively high temperature of 104°C (220°F) in ECP driers to dry dhools from hard-rolled leaf.

In our experiments green leaf withered to a 43/47% outturn of made tea to withered leaf, was rolled four times for 30 min. and then dried at an inlet air temperature of 88-91°C (190-195°F). This tea was used as a standard for comparing teas withered, rolled and dried differently, to determine whether, and if so to what extent, hard rolling and high inlet air temperatures in ECP driers affect made tea characteristics.

This work was done under the conditions prevailing in the Dimbula District of Sri Lanka during the high quality season and also off season.

It was found that teas produced by the treatment combinations of withering, rolling and drying were not superior to the standard. On taking main grade outturns into consideration the standard treatment of 4 x 30 min. rolls on medium-withered leaf dried at 88-91°C (190-195°F) turned out to be the most suitable process under the conditions prevailing in Dimbula.

INTRODUCTION

Drier inlet air temperatures of 85 to 93°C (185 to 200°F) and exhaust temperatures of 49 to 54°C (120 to 130°F) represent the normal range of temperature used in ECP* and tilting tray driers in Sri Lanka. It is, however, possible to dry tea satisfactorily without detectable disadvantage using inlet temperatures ranging from 71 to 99°C (160 to 210°F) provided that the period of drying, the rate of spread of dhool and the volume of air fed are suitably adjusted to discharge the tea with an acceptable moisture content (Keegel 1965). In the Darjeeling, district of north-east India where flavoury and high quality teas are seasonally produced, inlet air temperatures range from a low of 82°C (180°F) to a high of 104°C (220°F) depending on the method of manufacture and the degree of wither (Choudhury 1967).

It has also been reported that inlet air temperatures exceeding 93°C (200°F) which represents the upper limit of temperature used for drying of quality teas in ECP and tilting tray driers in Sri Lanka, but under 99°C (210°F), can produce teas of recognized merit under certain conditions (Barbora 1962). In our experiments green leaf withered to a 43/47% outturn of made tea to withered leaf (MT/WL) was rolled

* Endless Chain Pressure

four times for 30 min. and then dried at an inlet air temperature of 88-91°C (190-195 °F). This tea was used as a standard for comparing teas withered, rolled and dried differently, to determine whether, and if so to what extent, hard rolling and high inlet air temperatures in ECP driers affect made tea characteristics.

EXPERIMENTAL

The experimental design and procedure were the same as that given by Thevathasan & Kirtisinghe 1974 except that treatments 1 to 10 were dried in a miniature drier at an inlet temperature of 99-102°C (210-215°F). The standards 1 and 2 were dried at an inlet temperature of 88-91°C (190-195°F) and an exhaust temperature of 49-52°C (120-125°F). The period of drying in every instance, was 21 min.

RESULTS AND DISCUSSION

Analysis of variance carried out on the evaluations made by the Colombo panel of tasters on the samples manufactured between March and May 1970, revealed no significant differences in made tea characteristics and overall valuations between the control and any of the treatments for the BOP grade. The differences in infused leaf appearance of the BOPF grade between the standard and the extra-hard withered leaf with an outturn of 53-57% MT/WL rolled on a 3 x 30 min. programme (Treatment 6) was significant, and are given in Table 1. No differences were, however observed in liquoring characteristics or valuations between these treatments.

TABLE 1 — *Effect of degree of wither, type of rolling and drying temperature on the infused leaf appearance of BOPF*

Treatment	Wither (% outturn MT/WL)	Rolling	Drying Temperature (°C)	Infused leaf appearance (rating 0-10)
No. 2	43–47	3x30 min.	99–102	3.95
No. 6	53–57	3x30 min.	99–102	3.44
Standard 1	43–47	4x30 min.	88–91	4.58
LSD (P=0.05)				0.62
LSD (P=0.01)				0.85

No significant differences were observed in the infused leaf appearance or in valuations of the BOP and BOPF grades, in soft withered teas manufactured between October and November 1971, but significant differences turned up in the colour of liquor. These results are shown in Table 2.

TABLE 2 — *Effect of degree of wither, type of rolling and drying temperatures on the colour of liquor of the BOP and the BOPF grade evaluated by the Colombo Panel of tasters*

Treatment	Wither (% outturn MT/WL)	Rolling	Drying Temperature (°C)	Colour of liquor (rating 0–10) BOP	BOPF
No. 8	43–47	3x30 min.	99–102	5.92	ns
No. 9	38–42	2x45 min.	99–102	ns	5.38
No. 10	38–42	3x30 min.	99–102	ns	5.58
Standard 2	43–47	4x30 min.	88–91	5.38	6.17
LSD (P=0.05)				0.51	0.51
LSD (P=0.01)				—	0.70

The corresponding BOPF samples showed no differences in made tea characteristics and valuation except in respect of the colour of liquor.

Analysis of variance carried out on the TRI tasters' reports of the BOP samples manufactured between October and November 1971, revealed significant differences in respect of the infused leaf appearance and the strength of liquor, and these are given in Table 3.

TABLE 3 — *Effect of degree of wither, type of rolling and inlet air temperature for drying on some tea characteristics*

Treatment	Wither (% outturn MT/WL)	Rolling	Drying Temperature (°C)	BOP infused leaf appearance	BOP strength of liquor	BOPF colour of liquor
No. 7	43–47	2x45 min.	99–102	5.50	ns	ns
No. 9	38–42	2x45 min.	99–102	5.71	5.17	5.67
No. 10	38–42	3x30 min.	99–102	5.83	5.50	ns
Standard 2	43–47	4x30 min.	88–91	6.37	5.96	6.67
LSD (P=0.05)				0.50	0.37	0.62
LSD (P=0.01)				0.76	0.51	0.84

The difference in the colour of liquor of the BOPF grade detected by the TRI taster in the BOPF samples manufactured in October/November 1971 were significant (Table 3). He reported no significant differences in any of the other made tea characteristics or in overall valuations.

BOP Grade

The Colombo panel of tasters could detect no significant differences ($P<0.05$) in the made tea characteristics of the brightness of infusion, colour of liquor, strength of liquor, quality of liquor and also in overall valuation between treatments 1 to 6, and standard 1 manufactured during the 1970 Dimbula season. Off season in 1971 no significant differences were observed by the Colombo panel between treatments 7 to 10 and their corresponding standard except in respect of the colour of the liquor from treatment 8 which was preferred ($P<0.05$) to that of standard 2.

The TRI taster to whom only the second set of samples T 7 to T 10 and standard 2 were referred, preferred standard 2 to treatments 7, 9 and 10 in respect of the brightness of infusion and reported adversely on the strength of liquor in treatments 9 and 10 in comparison. These differences did not however, result in differences in overall valuations. It can be concluded, therefore, that medium, hard and extra-hard withered leaf given hard rolls of 2 x 45 min. or 3 x 30 min. dried at an elevated temperature of 99 to 102°C inlet did not produce a tea which was superior to that given a medium wither, rolled on a 4 x 30 min. programme and dried at an inlet temperature of 88 to 91°C.

BOPF Grade

The Colombo panel of tasters could detect no significant difference in the made tea characteristics including overall valuations between treatments 1 to 6 and standard 1 manufactured during the 1970 Dimbula season, except in respect of the brightness of infusion of standard 1. These infusions were preferred ($P<0.05$) to that of treatments 2 and 6. In the off season of 1971 no significant differences were observed by the Colombo panel between treatments 7 to 10 and the corresponding standard, except that the colour of liquor of standard 2 was preferred ($P<0.05$) to that from treatment 9. The TRI taster to whom only the second set of samples T 7 to T 10 and standard 2 were referred, arrived at the same conclusions as the Colombo panel.

In respect of the BOPF grade it can be concluded, therefore, that medium, hard and extra-hard withered leaf given hard rolls of 2 x 45 min. or 3 x 30 min. dried at an elevated temperature of 99 to 102°C did not produce a tea which was superior to that given a medium wither, 4 x 30 min. rolls and dried at an inlet temperature of 88 to 91°C under Dimbula season conditions. This is in contradiction to the position in Darjeeling District where hard rolling and high inlet air temperatures are considered preferable during the quality season. In the Dimbula District of Sri Lanka, both in the high quality season, as well as off season, high inlet air temperatures and hard rolling produced no advantage. A further consideration that may arise in deciding which method of manufacture is the most advantageous is the relative outturn of various main tea grades. This work has been undertaken and appears to indicate that the standard methods are in now way inferior to the other treatments in respect of the relative outturns of main grades (Thevathasan & Kirtisinghe 1974).

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