ROTORVANE MANUFACTURE OF CHINA JAT LEAF AND THE EFFECTS OF THE FLORAL AND IRIS END PLATES

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This experiment was conducted chiefly to compare rotorvane manufacture with manufacture in conventional crank-type rollers, of low jat china leaf. Information has also been sought of the relative merits of the floral and iris end plates for processing this type of leaf.

The colour of the liquor of the rotorvaned tea was superior to that of the corresponding orthodox control. Other liquoring characteristics, including valuations, were not different from that of the control. It is possible that the improvement in the colour of the liquor by rotorvaning was offset by a loss of dry leaf appearance.

Total main grade outturn from the orthodox control was not different for either of the rotorvaned treatments. Dhool outturns, temperature of leaf during rolling, dhool temperatures and the liquoring characteristic of the teas were the same for the floral end plate and for the iris end plate operated in the full open position.

INTRODUCTION

Experiments previously carried out have revealed that a programme of mixed, orthodox-rotorvane manufacture had the potential of producing a superior tea from high jat leaf as compared to a straight 4 x 30-minute programme of orthodox rolling (de Silva and Sanderson 1964).

The large majority of the estates situated at high elevations in Ceylon have a sizeable acreage under low jat china seedling tea and these experiments were undertaken mainly to determine whether low jat leaf could be rotorvaned with as much success as has been observed earlier on high jat leaf.

MATERIALS AND METHODS

In this experiment, teas rolled in a 8-in. series-B model Rotorvane with two types of end plates were compared with tea rolled in conventional rollers.

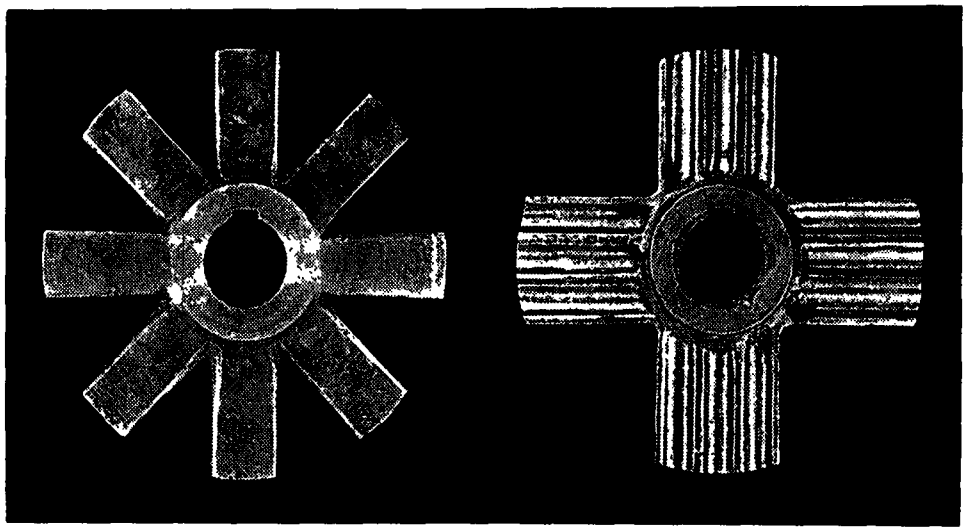

FIGURE 1 — *Types of end plates used in the investigation*
Right — Iris (minimum pressure position)
Left — Floral

The Rotorvane operated at a shaft speed of 36 rpm had eight forward-pitched vanes and a reverse-pitched vane placed centrally. The first Rotorvane treatment incorporated an Iris end plate in the full open position (minimum pressure) and a Floral end plate was fitted for the second treatment. Both end plates had apertures of 39% of the cross sectional area of the Rotorvane cylinder (Fig. 1). The process of manufacture of each of these treatments was briefly as follows:

Three hundred pounds of medium withered leaf was preconditioned under very light pressure for 10 minutes in a 45-in. Walkers S.A. roller having crescent battens and a medium Rettie cone. This leaf was then rotorvaned, passed through an Aerator and the fines extracted through No. 5 and No. 6, 18 gauge meshes on a vibratory roll-breaker. The bulk was given two orthodox rolls each of 30 minute duration with a 7 on 3 off method of (full) pressure application. The first of these rolls was done in a 34-in. Walkers S.A. roller having crescent battens and a medium Rettie cone, and a 34-in. CCC S.A. roller with M & S battens and a Keegel cone was used for the second rolls.

The orthodox control was manufactured in the following manner.

Three hundred pounds of medium withered leaf were given a 4 x 30-minute rolling programme with a 7 on 3 off method of application. Light pressure was used for the first roll and full pressure for the subsequent rolls. The following rollers were used for each of the four rolls.

(a) 1st Rolls — 45-in. Walkers single action roller having crescent battens and a medium Rettie cone.

(b) 2nd Rolls — 36-in. Marshall double action roller having M & S battens and a Keegel cone.

(c) 3rd Rolls — 32-in. Walkers single action roller having crescent battens and a medium Rettie cone.

(d) 4th Rolls — 34-in. C.C.C. single action roller having M & S battens and a Keegel cone.

All three treatments were given a 2½-hour period of fermentation with a 50 minute range which also corresponded to the charging interval. Firing was carried out in a Sirocco 3 ft, ECP drier and during this investigation the average inlet temperature was 195.6°F. Firing order for the rotorvane dhools was 1, 2, 3 and BB and for the orthodox control 1, 2, 3, 4 and BB. Teas were graded on a Michie sifter and also processed further in other machines used in standard commercial practice, *viz* electrostatic stalk extractor, winnower, cutter and nipper.

A randomized block design with nominated comparisons was used in this investigation. This experiment was replicated 15 times during the period August to December, 1965. The BOP and BOPF samples were evaluated by a panel of tasters in Colombo comprising of both Brokers and Buyers and was simultaneously evaluated in triplicate at the TRI. All evaluations were made on the basis recommended by Keegel (1959).

RESULTS

1. *Intake*

The rates of feed (intake) recorded for the two rotorvane treatments were not significantly different. Average intakes and the relative feed rates together with their 95% confidence limits are given in Table 1.

TABLE 1 — *Intakes and relative feeding rates for the 2 rotorvane treatments*

Treatment	Intake (lb/hr)	Relative feeding rate ϕ (lb/revolution)
Iris end plate	1440 ± 140	0.667 ± 0.065
Floral end plate	1380 ± 140	0.639 ± 0.065

2. *Dhool outturns*

The average dhool outturns recorded during this experiment are given in Table 2.

TABLE 2 — *Average dhool outturns (%) for the two rotorvane treatments and the orthodox control*

	Iris end plate (Minimum pressure)	Floral end plate	Orthodox
1st dhool	46.0	46.2	13.4
2nd dhool	21.7	20.8	25.9
3rd dhool	22.0	22.0	27.1
4th dhool	—	—	22.5
Big Bulk	7.7	8.1	7.4
Loss in rolling	2.6	2.9	3.7

Analysis of variance was carried out on the first dhool outturns for each of the two rotorvane treatments and it was found that these outturns were not significantly different.

3. *Temperatures*

The average dry bulb temperature in the rolling room while the experiments were being conducted was 66.6 °F, and the corresponding wet bulb average was 63.9 °F. Leaf and dhool temperatures observed after each of these treatments are given in Table 3.

TABLE 3 — *Average temperature of leaf after rolling and dhool temperature (°F)*

	Iris end plate (Minimum pressure)	Floral end plate	Orthodox
After preconditioning	76.1	76.6	—
After 1st roll (RV or orthodox)	83.5	84.1	79.4
After aeration	80.9	81.6	—
1st dhool	77.3	78.3	73.3
After 2nd roll (orthodox)	81.9	82.4	86.4
2nd dhool	75.3	75.0	76.4
After 3rd roll	85.4	85.6	87.2
3rd dhool	74.1	74.9	77.4
After 4th roll	—	—	80.3
4th dhool	—	—	76.3

4. *Grade outturns*

The main grade outturns observed for the three treatments are given in Table 4.

TABLE 4 — *Average main grade outturns for the two rotorvane treatments and the orthodox control*

	Iris end plate (Minimum pressure)	Floral end plate	Orthodox	Significant difference $P = 0.05$	$P = 0.01$
BOP	65.61	63.92	68.79	1.05	1.26
BOPF	13.41	13.67	11.91	0.56	0.68
D 1	6.88	7.27	5.36	0.38	0.46
Total main grade outturn	85.90	84.86	86.06	NS	

Analysis of variance carried on this data indicates that the total main grade outturns from each of these treatments were not significantly different from one another.

5. *Made tea characteristics*

The colour of the infused leaf from both rotorvane treatments was the same as that of the orthodox manufacture. The average evaluations of liquoring characteristics by the Colombo Panel of tasters and also by the TRI Taster are given in Table 5. Differences where significant are indicated.

TABLE 5 — *Average evaluations of 15 replicates for liquoring characteristics by the Colombo Panel and the TRI Taster*

Characteristic	Grade	Taster	Iris end plate (Minimum pressure)	Floral end plate	Orthodox
Infusion	BOP	TRI	5.09	5.05	5.16
		Colombo	5.48	5.39	5.40
	BOPF	TRI	5.31	5.36	5.31
		Colombo	5.53	5.39	5.51
Colour	BOP	TRI	4.98	4.81	4.82
		Colombo	4.79	4.90	4.44*
	BOPF	TRI	5.24	5.24	5.02
		Colombo	6.58	6.70	6.13**
Strength	BOP	TRI	4.53	4.52	4.69
		Colombo	4.82	4.88	4.70
	BOPF	TRI	4.93	5.10	5.09
		Colombo	6.23	6.39	6.19
Quality	BOP	TRI	4.89	4.95	5.00
		Colombo	4.89	4.73	4.98
	BOPF	TRI	5.00	5.02	4.98
		Colombo	5.23	5.18	5.33
Flavour	BOP	Colombo	1.01	0.86	1.20
	BOPF	Colombo	1.35	1.36	1.33
Valuation (in cents)	BOP	TRI	207.4	210.6	211.0***
		Colombo	224.4	221.8	224.6
	BOPF	TRI	233.3	236.4	233.9
		Colombo	243.6	241.3	242.2

	Significant difference (P=0.05)	(P=0.01)
*	0.21	0.28
**	0.23	0.31
***	3.2	4.2

DISCUSSION

It is evident from Table 5 that the TRI taster was unable to distinguish between the two rotorvane treatments and the orthodox control in any of the liquoring characteristics. There are indications, however, that the valuations of the rotorvane sample manufactured with the Iris end plate were not quite upto those of the teas produced with the Floral end plate or under orthodox rolling. The Colombo panel of tasters reported that both rotorvane treatments were better than the orthodox control in so far as the colour of the liquor was concerned. This improvement, however, was not reflected in the valuations. It is possible, that the TRI taster and the Colombo panel had both observed a loss of dry leaf appearance as a consequence of rotorvaning and that the latter had off-set the improvement in liquor colour and had shown no overall preference in valuations between any of these treatments.

Earlier experiments had shown (de Silva and Sanderson 1964) that rotorvaning would improve the liquor and that improved valuations could be expected by rotorvaning high jat leaf as compared with the orthodox rolling process of manufacture for high grown teas. It is now evident that while china jat leaf could be rotorvaned just as well as by the orthodox rolling process, that no improvement valuation-wise could be expected thereon. These experiments have been conducted with leaf of an average standard of plucking. It is possible that the loss of made tea appearance with china jat leaf of a low standard of plucking might be such that prices may even suffer adversely, in comparison with orthodox processing.

It is evident from Table 1 that the relative feeding rates are not different for the two treatments of rotorvane manufacture. As expected, the dhool outturns, grade outturns and rolling temperature are also very much the same (de Silva and Kirtisinghe 1970). It is also clear from Table 5 that the performance of the Floral end plate has been remarkably similar to that of the Iris end plate in the minimum pressure position. The Iris end plate which could be used to give pressure adjustment in rolling would, therefore, be more useful to an estate as its greater pliability could be of commercial advantage.

SUMMARY

It is concluded that low or china jat leaf could be manufactured by a Rotorvane just as well as by the orthodox process of rolling, provided that leaf is of a reasonable standard of plucking.

The Floral end plate and the Iris end plate in the minimum pressure position also behaved similarly with regard to dhool outturns, grade outturns, temperature of leaf during rolling and made tea characteristics.

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