

A COMPARISON OF THE PERFORMANCE OF THE SAVAGE TEA CUTTER, TARRY NIPPER BREAKER AND THE NARA TEA GRANULATOR FOR THE SIZE REDUCTION OF PARTICLES OF BLACK TEA

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The performance of a new machine, the Nara Tea Granulator was compared with the Savage Tea Cutter and the Tarry Nipper Breaker in respect of reducing the size of oversized dhool and big bulk particles. The effect of two passes, with and without intermediate sorting was investigated.

It was found that the Savage Tea Cutter and the Tarry Nipper Breaker were equally good, and that both were preferable to the Nara Tea Granulator in reducing dhool particle size. The Savage Tea Cutter and the Nara Tea Granulator were, however, preferable to the Tarry Nipper Breaker in reducing the size of big bulk particles from leaf of a good plucking standard.

INTRODUCTION

The degree of cutting of made tea affects its sale price. Ideally, the main tea grades should not contain any cut leaf. While roll-breaking, well-rolled particles are sorted out, but in practice some large particles would not be eliminated. These large particles need to be reduced in size in order to make a particular grade more even in particle size and also to increase its quantity. The size reduction operations involve some mechanical handling which may result in the greying of teas, which detracts from appearance (Sastri 1931; Keegel 1965). It is therefore necessary that these operations be kept down to a minimum.

Various machines are used for achieving a reduction in the size of tea particles. The commonest are the Savage Tea Cutter and the Tarry Nipper Breaker. A newer machine called the Nara Tea Granulator is also available and this was evaluated in comparison with the Savage Tea Cutter and the Tarry Nipper Breaker.

The Nara Tea Granulator consists essentially of a stator and rotor which are directly involved in the size reduction process. When the tea is fed into the Granulator it falls into the central portion of the machine and is crushed by striking pins. It is possible to change the performance of the machine by changing the speed of the rotor shaft. In the present work the rotor shaft was operated at a speed of 4200 rpm.

EXPERIMENTAL

Teas were graded on a Mitchie Sifter with interchangeable meshes the average perforation size of which were 3.0, 1.6 and 1.3 mm. The BOP grade was extracted through a 3 mm mesh and over a 1.6 mm mesh, the BOPF grade through a 1.6 mm mesh and over a 1.3 mm mesh, and the Dust grade through a 1.3 mm mesh and over a mesh the perforations of which were less than 1 mm. After sifting the 1st, 2nd, 3rd and 4th dhools the fractions passing over the 3 mm mesh were divided into six equal parts. Two parts were passed into each machine. One of the parts was subjected to intermediate sorting (Treatment 1) whereas the other was not (Treatment 2). In the case of the 'big bulk' the oversized particles passing over a 2.5 mm mesh were divided into three equal parts, one being assigned to each machine and only the first method of size reduction, namely intermediate sorting, was adopted.

The experiment was repeated 12 times and was conducted during the period March/May 1972. On each day the effect of each of these machines on fired dhools as well as big bulk was studied. A split-treatment statistical design was used. Graded samples were evaluated by the TRI Taster on the basis recommended by Keegel (1959).

The grades* obtained by passing the oversized particles from the dhools through the Savage Tea Cutter and Tarry Nipper Breaker were BOP, BOPF, Dust and BM. Similar treatment in the Nara Tea Granulator gave BOPF, Dust and BP grades. The grades obtained from oversized particles of the big bulk by processing in the Savage Tea Cutter and Tarry Nipper Breaker were Dust, BP, BM and F2. The corresponding grades obtained with the Nara Tea Granulator were BP, Dust and F2.

RESULTS

The percentage by weight of each grade of tea obtained from oversized dhool and big bulk particles for each machine are given in Tables 1 & 2 respectively.

- * BOP —Broken Orange Pekoe
 BOPF —Broken Orange Pekoe Fannings
 BM —Broken Mixed
 BP —Broken Pekoe
 F2 —Fannings No. 2

TABLE 1 — *The percentage by weight of each grade of tea obtained from oversize (>3mm) dhool particles with each machine*

Weight of tea grades from oversize particles (%)					
Grade	Treatment 1	Treatment 2	(P = 0.05)	LSD (P = 0.01)	
Savage Tea Cutter Tarry Nipper Breaker Nara Tea Granulator	BOP	53.39	48.39	3.10	4.39
		55.92	49.19	3.10	4.39
		—	—	—	—
Savage Tea Cutter Tarry Nipper Breaker Nara Tea Granulator	BOPF	4.33	4.29	NS	NS
		7.48	8.26	NS	NS
		18.97	18.08	NS	NS
	LSD (P = 0.05)	3.72	3.72		
	LSD (P = 0.01)	5.08	5.08		
Savage Tea Cutter Tarry Nipper Breaker Nara Tea Granulator	DUST	4.93	5.68	NS	NS
		9.13	12.76	2.08	2.83
		44.08	51.37	2.08	2.83
	LSD (P = 0.05)	3.89	3.89		
	LSD (P = 0.01)	5.30	5.30		
Savage Tea Cutter Tarry Nipper Breaker Nara Tea Granulator	BM	36.85	42.13	2.20	3.10
		26.53	29.79	2.20	3.10
		—	—	—	—
	LSD (P = 0.05)	3.70	3.70		
	LSD (P = 0.01)	5.23	5.23		
Savage Tea Cutter Tarry Nipper Breaker Nara Tea Granulator	BP	—	—	—	—
		—	—	—	—
		33.68	27.79	2.14	2.86

No BOP and BM grades were obtained from oversized dhool with the Nara Tea Granulator, but significantly more BOPF and Dust were produced. Only the Nara Tea Granulator produced the BP grade. The percentage of BOPF and Dust produced by the Savage Tea Cutter was independent of the size reduction treatment, whether intermediate grading was carried out or not.

TABLE 2 — *The percentage by weight of each grade obtained from oversize (>2.5 mm) big bulk particles with each machine*

Weight of tea grades from oversize big bulk particles (%)				
Grade	Dust	BM	F2	
Savage Tea Cutter	5.56	46.53	4.35	
Tarry Nipper Breaker	5.97	42.66	5.30	
Nara Tea Granulator	31.69	—	17.58	
LSD ($P = 0.05$)	2.83	NS	3.58	
LSD ($P = 0.01$)	3.85	NS	4.88	

The percentage of Dust and F2 obtained from oversized big bulk particles with the Nara Tea Granulator was significantly higher than that with the Savage Tea Cutter or the Tarry Nipper Breaker. No BM grade was obtained with the Nara Tea Granulator.

The evaluation of the made tea characteristics of the BOPF and Dust grades from oversized dhool particles from each machine are given in Table 3.

TABLE 3 — *Made tea characteristics of the main grades derived from oversized (>3 mm) dhool particles obtained from each machine*

Ratings (Kcegel 1959)						
Grade	Appearance	Brightness of infusion	Colour of liquor	Strength of liquor	Valuation Cents (Kg ⁻¹)	
Savage Tea Cutter	BOPF	3.42	5.72	4.67	4.44	415
Tarry Nipper Breaker		4.60	4.79	4.79	4.63	398
Nara Tea Granulator		1.60	5.46	3.73	3.69	374
LSD ($P = 0.05$)		0.23	0.28	0.50	0.62	6
LSD ($P = 0.01$)		0.31	0.39	0.68	0.84	9
Savage Tea Cutter	DUST	3.67	5.65	5.58	5.35	366
Tarry Nipper Breaker		5.10	4.79	5.69	5.70	372
Nara Tea Granulator		2.19	4.98	5.52	5.73	355
LSD ($P = 0.05$)		0.72	0.44	NS	NS	5
LSD ($P = 0.01$)		0.98	0.62	NS	NS	7

The valuation and made tea characteristics of the BOP grade obtained with the Savage Tea Cutter and Tarry Nipper Breaker were not significantly different. The valuations and all made tea characteristics of the BOPF grade were significantly different with the three machines. In the case of the Dust grade, the valuations, appearance and brightness of infusion differed significantly with each machine but not the colour and strength of the liquor.

The mean valuations of all the tea grades taken together and taking into account the weight of each grade obtained from dhools and big bulk with each machine are given in Table 4.

TABLE 4 — Mean valuation of all tea grades taken together and taking into account the weight of each grade obtained from dhools and big bulk with each machine

	Mean valuation (Cents Kg ⁻¹)	
	Dhools	Big Bulk
Savage Tea Cutter	381	355
Tarry Nipper Breaker	379	344
Nara Tea Granulator	354	358
LSD ($P = 0.05$)	5	8
LSD ($P = 0.01$)	7	10

The Nara Tea Granulator gave generally lower-valued grades from oversized dhool and higher-valued grades from oversized big bulk.

DISCUSSION & CONCLUSIONS

The percentage BOPF and Dust produced by the Nara Tea Granulator by the reduction of oversized dhool particles was significantly higher than that from the other two machines. This can be expected because BOP and BM grades were not obtained with the Nara Tea Granulator. This increase in percentage of BOPF and Dust resulted in the appearance of these grades being poor and contributed to their lower valuations.

The weighted mean valuation of all grades taken together obtained by the reduction of oversized dhool particles from the Nara Tea Granulator was significantly lower than that from the Savage Tea Cutter or Tarry Nipper Breaker. Further, the percentage loss was significantly greater with the Nara Tea Granulator than with the other two machines. It can therefore, be concluded that the Savage Tea Cutter and the Tarry Nipper Breaker are preferable to the Nara Tea Granulator for reducing oversized dhool particles in teas which are sold in markets where the appearance of the made tea is of importance.

There were significant differences, between the percentage of BOPF, Dust and BM grades obtained from the Savage Tea Cutter and the Tarry Nipper Breaker. The percentage BOPF and Dust produced by the Tarry Nipper Breaker was significantly higher than that from the Savage Tea Cutter. This results in the latter producing a higher percentage of BM than the former. There was no significant differences seen in the percentage BOP grade produced by both machines. Although there were differences in some made tea characteristics of individual grades, the weighted mean valuation of all grades taken together, obtained from the Tarry Nipper Breaker and the Savage Tea Cutter were not different.

The percentage Dust and F2 obtained with the Nara Tea Granulator from big bulk particles was higher than that with the other two machines. This is as expected because there was no BM produced with the Nara Tea Granulator and also because all three machines produced the same proportion of EP. The weighted mean valuation of all tea grades taken together obtained with the Nara Tea Granulator and the Savage Tea Cutter were, however, significantly better than that obtained with the Tarry Nipper Breaker. The Nara Tea Granulator and the Savage Tea Cutter are, therefore, preferable to the Tarry Nipper Breaker for reducing big bulk particles provided that the big bulk does not contain unusually large quantities of stalk in which case the results could well be different when plucking standards are poorer.

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REFERENCES

- KEEGEL, E. L. (1959). Tea made from clones. *Tea Quarterly* 30, 139-141.
KEEGEL, E. L. (1965). Tea manufacture in Ceylon. Monograph on tea production in Ceylon Tea Research Institute of Ceylon pp 107.
SASTRI, B. N. (1931). Some aspects of tea manufacture. *Tea Quarterly* 4, 124-138.

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