Tea Q. 50 (1), 11-15, 1981. Printed in Sri Lanka

METHODS TO INCREASE THE PRODUCTION OF SMALL LEAF GRADES USING EXISTING MACHINERY

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The reasons for the increased demand for small leaf grades are discussed. Of the methods available, experiments using existing machinery are reported. The results showed that it is possible to increase the percentage of small leaf grades by about 10% without adversely affecting the appearance and liquoring characteristics of the made teas. An alternative method of rotorvane-orthodox manufacture to obtain the normal grade percentages has been suggested.

INTRODUCTION

The consumption of tea in the form of tea bags is increasing in all the importing countries particularly so in the major countries such as the UK and the USA. Although the main reason for this change in consumption pattern is the convenience of preparation, the fact that this method retains almost all the characteristics of a traditionally brewed cup of tea is also an important consideration. In order to facilitate quick brewing, small leaf grades are essential and therefore BOPF, PF, Fannings and Dust 1 are generally preferred. The other requirement for tea bags is that the particle size of the teas should be uniform, as tea bags are filled by machines which work at incredible rates of 2000 - 3000 bags per minute and non-uniformity would impede the smooth operation of the machine.

Small leaf grades are becoming popular for economic reasons as well. With the increase in the cost of living, the consumer in both developing as well as developed countries, except the connoisseur, wants to extract more than one brew from the tea he uses and this is possible with small leaf grades.

Increase in production of small leaf grades could be achieved by using machinery such as C. T. C., L. T. P. or using existing machinery such as orthodox rollers, rotorvanes etc.

In this article, the latter method is discussed. Its advantage is that in addition to saving on capital, it also helps to retain the orthodox or traditional appearance and character of Sri Lanka teas. It is important to note that Sri Lanka is the largest producer of orthodox teas and for the good orthodox teas there is always a demand. It will also enable the switch-over from one process to another depending on the market preference quite easily.

The particle size of the tea could be reduced easily in the grading room by crushing and cutting. This however is not satisfactory as it alters the liquoring characteristics of the tea in addition to making the tea greyer. Tea becomes greyer due to excessive handling which removes the surface coating on the tea particles. When black tea particles are broken new surfaces are exposed which when dissolved produce different liquoring characteristics from those of the original particles. The best method therefore is to increase the percentage of small leaf grades by variations in the rolling room.

Investigations were carried out into the methods of increasing the out-turn of the Fannings grade by Keegel (1950) but his investigations were limited to orthodox rollers. Since then the rotorvane has become part of the rolling room machinery in most of the factories and it could be now advantageously used to increase the percentage of small leaf grades. A considerable amount of work (De Silva 1964, 1965 and 1966) has been carried out on the use of the rotorvane in Sri Lanka. Most of this work however was concentrated towards producing teas which are similar to those produced by orthodox rollers. In this work the use of the rotorvane to increase the percentage of small leaf grades has been discussed.

Preliminary investigations were first carried out on the simple method of passing the leaf several times (multiple pass) through the rotorvane. The aim being not only to increase the percentage of small leaf grades but also to see that the appearance and liquoring characteristics of all the teas are not affected by the new techniques.

EXPERIMENTAL

Preliminary investigations on multiple pass through the rotorvane

The following programmes of manufacture were carried out :—

Programme 1 (control) : Leaf was pre-conditioned in an orthodox roller for a period of 15 minutes under very light pressure. The pre-conditioned leaf was passed through the rotorvane once and dhool was extracted using a sifter fitted with Nos. 5 and 6 meshes. The bulk was given two 30 minutes orthodox rolls with dhool extraction in-between the rolls, using the same sifter. Pressure application in the two orthodox rolls was adjusted so as to reduce the big bulk to about 10%.

Programme 2 : Leaf was pre-conditioned as in programme 1 but the pre-conditioned leaf was passed through the rotorvane twice before dhool extraction using a sifter fitted with No. 7 mesh. The bulk was given two more rotorvane passes with dhool extraction in-between using the same sifter.

Programme 3 : Leaf was processed as in programme 2 except that the dhools were extracted by sifting the bulk twice (double roll breaking).

The experiment was repeated six times and the graded samples were evaluated by a Taster in Colombo.

Modified Experiments

The following treatments were carried out:—

Control: Leaf was pre-conditioned in an orthodox roller for a period of 15 minutes under very light pressure. The pre-conditioned leaf was passed through the rotorvane once and dhool was extracted using a sifter fitted with No. 6 mesh. The bulk was given two 30 minutes orthodox rolls with dhool extraction in-between the rolls, using the same sifter. Pressure application in the two orthodox rolls was adjusted so as to reduce the big bulk to about 10%.

Treatment I : Leaf was pre-conditioned as in control and the pre-conditioned leaf was passed through the rotorvane once. Dhool was extracted using a sifter fitted with No. 7 mesh. The bulk was given a 30 minutes orthodox roll and after dhool extraction, using the same sifter, the remaining bulk was passed through the rotorvane once more.

Treatment II : Same as Treatment I except that the dhools were extracted through No. 6 and 7 meshes.

In all three methods of manufacture a medium wither (44-46% OT MT/WL) was taken. The rotorvane was fitted with eight forward pitched vanes and one reverse pitched vane in the middle. It had an Iris end plate at maximum pressure position. The period of fermentation was kept at 2 hours 15 minutes with a range of one hour. The experiment was repeated six times during the period April - June 1978 and all the grades (BOP, BOPF, Dust, BM, BP and Fannings) were evaluated by a panel of five Tasters in Colombo. The main grades were obtained as follows: BOP through 12 and over 16, BOPF through 16 and over 24 and Dust through 24 and over 30. A certain amount of cut leaf was also included in the main grades.

RESULTS AND DISCUSSION

Preliminary Investigations

TABLE 1 — *Mean percentage dhool outturns*

	1st dhool	*2nd dhool*	*3rd dhool*	*Big bulk*
Programme 1	42.0	20.0	27.0	9.0
Programme 2	26.1	39.6	10.8	17.4
Programme 3	55.9	20.4	11.3	8.3

TABLE 2 — *Mean percentage grade outturns*

	BOP	*BOPF*	*Dust*
Programme 1	56.5	18.2	5.0
Programme 2	30.8	38.5	7.7
Programme 3	32.6	38.2	11.5

Table 1 shows that double roll breaking of the bulk in programme 3 has produced more dhools in the early rolls and has enabled the big bulk to be reduced to less than 10%. From Table 2 it is seen that multiple pass through the rotorvane combined with dhool extraction through smaller roll breaker mesh has increased the percentage of small leaf grades substantially. The Taster however found that this increase had adverse effects both on appearance as well as on liquoring characteristics of all the grades produced.

It was therefore evident that substantial increases in the percentage of small leaf grades would have adverse effect on the overall characteristics of the teas produced. Since a smaller increase too would help by meeting at least part of the demand, experiments were therefore modified to achieve this new objective.

Modified Experiments

Analysis of variance was carried out on the main grade outturns, average valuations of the main grades and the weighted average valuations of all grades and these results are given in Tables I, II, and III respectively.

TABLE I — *Mean percentage grade outturns of BOP, BOPF and Dust*

	BOP	*BOPF*	*Dust*	*Total main grades*
Control	45.3	22.0	7.6	74.9
Treatment I	33.0	34.1	8.4	75.5
Treatment II	39.3	28.0	8.4	75.7
LSD 5%	5.7	3.8	NS	NS
LSD 1%	8.0	5.4	NS	NS

TABLE II — *Mean valuation of BOP, BOPF and Dust as assessed by a panel of Colombo Tasters (Rs/kg)*

	BOP	*BOPF*	*Dust*
Control	9.78	10.58	7.57
Treatment I	9.77	10.61	7.88
Treatment II	10.04	10.84	7.79
LSD 5%	NS	NS	NS

TABLE III — *Mean weighted average valuations of all grades as assessed by a panel of Colombo Tasters*

	Rs/kg
Control	8.59
Treatment I	8.59
Treatment III	8.81
LSD 5%	NS

It is evident from the results in Table I that significantly higher percentages of BOPF are produced in both treatments I and II than that produced in the control. The results in Table II and III show that the higher percentage of BOPF produced by the methods adopted in the treatments have not had an adverse effect on the overall valuations of the individual main grades or the weighted average valuation of all the grades (main grades and off grades). The methods adopted in Treatments I and II are therefore acceptable as methods to increase the production of small leaf grades.

The important difference in the new method is the introduction of an orthodox roll between the two rotorvane passes, since it was shown in the preliminary investigations that consecutive passes through the rotorvane has adverse effect on the appearance as well as on the liquoring characteristics of the final product. The other important aspect is the use of smaller roll breaker meshes but this alone cannot produce the required effect using orthodox rollers. It would then necessitate more number of rolls to reduce the big bulk and extension of the period of fermentation. It is therefore the combined effect of rotorvane-orthodox rolls and the smaller roll breaker meshes which has brought about the required results.

Treatment I has produced significantly higher percentage of BOPF than both Control and Treatment II. The use of No. 7 mesh in Treatment I causes some difficulty but this could be easily overcome by double roll breaking of the bulk, as shown in the preliminary investigations. The method adopted in Treatment I is therefore recommended for the increase in production of small leaf grades.

The method adopted in Treatment II is also useful. This is an alternative to the currently accepted method of rotorvane-orthodox manufacture (Control). Upto now two passes through the rotorvane was found to be unsatisfactory due to adverse effect on the teas produced. This was caused mainly due to the consecutive passes through the rotorvane. This work has shown that the introduction of the orthodox roll between the two rotorvane passes overcomes this disadvantage and produces acceptable teas. This new method brings about a small increase in the BOPF percentage but this increase could be minimised, if required, by using roll breaker mesh No. 6 instead of No. 6 and 7.

There are two aspects to the work reported here. One was to achieve reasonable increase in the percentage of small leaf grades and this aspect has been achieved as discussed above. The second aspect was whether such a method would increase the weighted average valuation of all the grades produced; in other words, the revenue. It is seen from Table III that there is no significant difference in the weighted average valuation of the Treatments over the Control. The reasons for this could be that the increase in BOPF percentage was not large enough or the difference in prices of BOPF and BOP was not big enough or both

It is evident from the results of the preliminary investigations that the percentage of small leaf grades cannot be increased unduly without adverse effect on the teas produced. At the Colombo auctions currently there is a price difference between BOPF and BOP but this is small compared to that which exists in London, due to the greater demand for small leaf grades at the latter auction centre. The demand for small leaf grades is bound to increase at our local auction centre too due to the change in consuming pattern in most parts of the globe. Increase in percentage of small leaf grades should therefore bring in more revenue in the near future, provided of course the methods adopted have no adverse effect on the final product.

ACKNOWLEDGEMENTS

The authors wish to thank the panel of Tasters viz. Messrs C. P. R. Perera, M. H. Tissera, I. V. D. Seneviratne, D. Samarasinha and C. N. G. de Silva for their assistance. A special word of thanks is due to Mr. D. Samarasinha for taking personal interest in this study. Mr. V. Wickremasinghe is thanked for providing assistance in carrying out the experiments.

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