TEA GRADING

By

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ABSTRACT

Tea is generally sold for its liquoring characteristics such as its colour, strength and flavour. However the primary buyers and blenders pay much attention to the appearance of tea which to a great extent is influenced by the size and uniformity of the particles of a particular grade. Tea factories endeavour to produce teas of good appearance by paying meticulous attention to tea grading in tea manufacture.

This study has investigated in detail some factors that have a bearing on grading such as the influence of particle size distribution of the dhools prior to grading and the relationship between the input and throughput streams of a sifter.

Sieve analysis was identified as one of the cheapest and most reliable methods of determining the size spectrum of particles of tea. The data of the sieve analysis were analysed statistically by regression analysis, variance analysis or where necessary, by a method of nested linear model analysis.

It was found that there were some variations in the particle size distribution of the ungraded tea dhools of Orthodox-Rotorvane munufacture but not in the case of L.T.P. dhools.

There were no day to day variations found among the

particle size distribution of the throughput on an experimental sifter and this was found to be independent of the type of dhools and the feed rates.

A linear relationship was obtained between the actual weights of the input and the throughput streams when considered separately for various size ranges. However the slopes of these lines did not show any regular pattern for the two type of dhools.

A detailed study of the throughput of the sifter in relation to the input was carried out after a suitable modification to the experimental sifter to collect the throughput stream in smaller compartments which divide the sieving area into equal portions length-wise. This indepth study on L.T.P. dhools has resulted that the input and the throughput of different particle size ranges could be represented by a set of straight lines which pass through the origin. Gradients of these sets of lines were found to decrease with increase in particle sizes.

The data obtained have been used to formulate a mathematical model for the input and the throughput of the experimental sifter and led to the definition of a parameter "Separation Coefficient" which is a function of the sieve size and the particle size range. The model was varified using the measured throughput of a known input with the throughput estimated from the model.

The separation coefficients were determined for different particle size groups for two different sifters of mesh No 8 and 18. The values obtained are given below.

Particle Size (microns)	Separation Coefficients Mesh No.8 (2032 microns)	Mesh No.18 (1184 microns)
1400	0.0146	---
1200	0.0234	---
1000	0.0323	---
850	0.0389	0.0022
710	0.0451	0.0144
600	0.0500	0.0240
500	0.0540	0.0328
420	0.0579	0.0398
355	0.0608	0.0455
300	0.0632	0.0503

The particle sizes and the corresponding separation coefficients are linearly correlated ($r = 0.99$) for the two meshes No 8 and 18, and are given by

$$\lambda = -4.4225 \times 10^{-5} X + 0.0765 \quad \text{and}$$
$$\lambda = -8.3378 \times 10^{-5} X + 0.0730 \quad \text{, respectively.}$$

Limiting values of 1730 and 875 microns for particle sizes and 0.0765 and 0.0730 for separation coefficients were obtained for mesh 8 and 18 respectively. These limiting values are referred to as mesh size in terms of equivalent aperture size of a standard sieve and maximum separation coefficient.

Using the above limiting values a common mathematical formula for mesh 8 and 18 was obtained, in relation to particle sizes of the group and the separation coefficient.

The equation is:-

$$\lambda = \lambda_{(max)} (1 - X/X_0)$$ where $\lambda_{(max)}$ is a constant = 0.0765 and X_0 "mesh size in terms of equivalent aperture size of a standard sieve" which is different for different meshes.

It was also established that the defined separation coefficient could be used to explain the behaviour of particles on the sifter. Further it could be used to predict the throughput of a sifter by knowing the input. Efficiency of sifters could also be compared by the use of this important factor "Separation Coefficient". Usefulness of the separation coefficient for designing a sifter was also discussed.