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TEA CONSTITUENTS AND EXPORT STANDARDS OF SRI LANKA TEAS*

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Recently UNCTAD/GATT discussed the concept of minimum export standards for tradeable teas. Since earlier work on Malawi teas (CTC manufactured, 'plain teas') showed that a good correlation was obtainable between the theaflavin (TF) fraction of black tea and market valuation, there was a proposal that TF content be included as a minimum export standard for all teas.

The theaflavin fraction of black tea is believed to make important contributions to the colour and 'mouthfeel' properties of its infusion. But TF as a criterion of quality/valuation may not be strictly correct for orthodox-manufactured Sri Lanka teas, because in these 'superior' teas, TF is only one of the many constituents contributing to valuation. An investigation was therefore undertaken to evaluate TF as an index of market price. The relationship of other constituents was also examined.

In attempting to relate TF content to market price, consideration has to be given to the fact that because of market trends, the value in monetary terms given to TF (or any other biochemical component) varies from sale to sale. This was overcome by taking a large range of teas (24 samples) of one grade sold at the Colombo auctions in one day by one broker. The teas were assayed for their theaflavin content, total colour and soluble solid content. The results were collected over 16 sales, and the data were used to examine in Sri Lanka teas, the influence of the different constituents on market valuation. None of the tea constituents examined, namely theaflavins, total colour or solids were correlated to market price, on any of the 16 sales.

INTRODUCTION

Tea is a commodity that is tradeable on international markets, and therefore there have been attempts to set up minimum marketing standards for tea.

The International Standards Organization (ISO) has defined certain physico-chemical parameters which have to be met for the material to be accepted as tradeable tea (see Table 1.) But in practice however, it has been found that even sub-standard teas could frequently satisfy the above requirements and qualify for sale on the international tea market.

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* Based on an address presented at Annual sessions of Sri Lanka Association for the Advancement of Science, December, 1982.

TABLE 1 — *Chemical requirements for black tea — ISO standards*

Characteristics	*Requirement*
Water extract, % (m/m) minimum	32
Total Ash, % (m/m)	
maximum	8
minimum	4
Water soluble ash, as percentage of total ash	
minimum	45
Alkalinity of water-soluble ash (as KOH), % (m/m)*	
minimum	1.0
maximum	3.0
Acid-insoluble ash, % (m/m)	
maximum	1.0
Crude fibre, % (m/m)	
maximum	16.5

*When the alkalinity of water soluble ash is expressed in terms of milli-equivalent per 100 g of ground sample, the limits are—

minimum	17.8
maximum	53.6

In an endeavour to correct this situation UNCTAD attempted to formulate a new set of parameters internationally acceptable as minimum quality standards for tea. The UNCTAD consultant, prompted perhaps by the results of earlier studies in which Malawi teas showed a good correlation between theaflavin (TF) content and market valuation, suggested the introduction of minimum levels of TF in the new set of parameters. This suggestion raised a controversy and a number of varying opinions were expressed about the proposal (Donahue, 1982; Owuor, 1982; Roberts, 1982; Davies, 1983; Mitra, 1983; Theobald, 1983).

We examined this proposal in our own interests and this paper reports our views and the results of our investigations on this subject.

Quality standards *vs.* Marketing Standards

Tea quality is assessed by tea buyers, each of whom will be well aware of his own needs. International buyers will tend to make different assessments of quality, dependent upon the detailed needs of the market for which each is responsible. For e.g. the buyer for the English market would seek teas with a light, brisk liquor with bright colour, while the buyer for the Middle East market would bid for teas with a strong thick liquor with dark colour. In both instances the buyers seek teas desirable for their customers.

Thus, although a 'quality tea' generally refers to a 'desirable tea', on an international platform the term 'quality' signifies different attributes. Hence in the area of international tea marketing, it would be more pertinent to refer to marketing standards (or export standards) rather than quality standards.

From this point of view, we would like to stress the following facts regarding the role of TF as a marketing standard: We do not contest the fact that TF is an important chemical constituent that contributes to the desirable characteristics of a cup of tea. But it is also a fact that there does exist a strong market for certain teas, well-made in their own sense, but with relatively low TF contents. This underlines the position that in the present discussion, we have to evaluate TF as a 'marketing standard' and not as a 'quality index'.

Theobald (1983) has discussed the subject of quality and chemical specifications very lucidly. He feels that the basic approach to the problem is wrong, and questions the wisdom of raising levels of chemical specifications to improve quality of tradeable teas.

Cash Valuation *vs.* Quality Rating

While assessing the cash valuation of a tea for any particular market, the tea taster takes into consideration mainly the liquor characteristics such as colour, strength, flavour brokness and the quality of these. Thus, the term 'quality' is rather an ambiguous attribute and conveys different meanings to different persons. In the widest sense, quality describes the appeal to the palate as a whole, but in a restricted sense, it is described as a particular liquor characteristic recognizable by the tea taster.

A study of these liquor characteristics show that they offer little scope of being translated at their face value into quantitative definitions. But it may be possible to draw some semi-quantitative correlations between individual liquor characteristics and the chemical constituents of the tea brew.

Strength and colour are characters developed during the fermentation process and therefore it is reasonable to ascribe these characters to the enzyme oxidation products of the polyphenols namely Theaflavins and Thearubigins (Roberts, 1962). The 'briskness' of a tea liquor has been described as a liveliness on the palate and has been related jointly to theaflavins and caffeine. Flavour is obviously related to the volatile constituents. Regarding the relationship of quality, Roberts (1962) offers the following observations, "When it is considered what an important part is played by the theaflavins in determining the colour, strength and briskness of a liquor it is not surprising that teas with a high content of theaflavins are frequently considered to be quality teas. However, there are by no means infrequent occasions when there is no correlation particularly when volatile constituents are of special importance.

These exceptions emphasize that polyphenols and their oxidation products are not the only factors determining liquors characters.....".

The total evaluation of black tea is thus seen to be determined by a complex combination of chemical parameters.

Chemical evaluation

Nevertheless attempts have been made to relate the valuation of a tea to certain chemical constituents in the tea. Probably in teas where the total character of the tea is dependent on just one constituent, a simple correlation may be found between such a constituent and the valuation of the tea. In fact such a direct correlation has been reported between theaflavin content and valuation for Malawi teas — which are known to be 'plain' teas (Hilton and Ellis, 1982).

But if the favourable attributes of the tea are due to a composite of chemical constituents, the above contention would most probably run into difficulties. This is true of any food item where the sensations of taste and smell are involved. In spite of the advances in analytical technology and the ultra-sophisticated instrumentation available throughout the world, certain food items are still evaluated by the human senses — may be following the adage, "the proof of the cake is in the eating".

It was our intention therefore to examine the correlations between tea constituents and market evaluations of Sri Lanka teas which are generally considered vantage teas.

Market evaluation

Ultimately the best assessment of a tea's commercial value is the price offered on a freely competitive auction. But this too is subject to certain considerations.

i.e. Market valuation = Cash valuation + Market factors.

Therefore in attempting to relate a chemical constituent or liquor characteristic to sale price, consideration has to be given to the fact that because of market trends e.g. demand for a particular grade or variety of tea at that auction or net weight of a particular tea being offered etc, the value in monetary terms associated with a particular liquor characteristic or chemical characteristic, may vary, from sale to sale. This difficulty may be overcome by adopting the workplan detailed below.

Workplan

We examined a large range of teas (one batch) sold at the Colombo auctions on one day. Each batch consists of 24 invoices of tea of

(i) One type of manufacture — orthodox

(ii) One variety — high grown, medium grown, etc.

(iii) One grade — BOP, BOPF.....etc.

(iv) Sold on one day

(v) Sold by one broker

(vi) To cover the highest to lowest price range fetched for that sale.

For each batch, correlations are worked out between market price and chemical constituent. Sixteen such batches i.e. sold on 16 different occasions are examined.

Justification

Other factors being constant, the sale price of a tea (of one variety, one grade, sold on one day.....etc.) would be more or less based on the 'quality rating' of the tea. Further if we exclude seasonal/flavoury/exotic teas from this experiment, this sale price would generally work out to be an average valuation accepted by a number of tasters each of whom would have evaluated this tea independently. Therefore it would be reasonable to assume that the market price or sale price would be an index of the *relative* quality rating of the tea offered for sale on that day.

EXPERIMENTAL

Teas were collected over 16 sales as detailed above and they were assayed for theaflavin content, total colour (Hilton and Ellis, 1982) and soluble solid content.

Linear regression correlations were worked out between each of the above chemical constituents and the market price for each sale. Thus 16 correlation coefficients (r) were obtained for each constituent.

RESULTS AND DISCUSSION

The results of the linear regression analyses presented in Table 2 show that none of the tea constituents namely, theaflavins, total colour or soluble solids were correlated to the market price, on any of the 16 sales.

This result is perhaps understandable, because in Sri Lankan black tea, the overall evaluation is a composite of a number of chemical parameters present in various proportions, and in particular the volatiles. Further it is the delicate balance of these factors that gives Sri Lankan tea the final 'bouquet'. This apparently is why attempts to quantify 'quality' has not been so far successful.

TABLE 2 — *Linear regression analysis — sale price vs constituents*

	r	r	r
	SP vs TF	SP vs SS	SP vs TC
1. High Grown BOP	0.30	0.50	0.04
2. High Grown BOPF	0.31	0.44	0.05
3. High Grown Dust No. 1	0.60	0.70	0.16
4. High Grown BP	—0.04	0.22	0.27
5. Medium Grown BOP	0.45	0.42	0.22
6. Medium Grown BOPF	0.26	0.15	0.06
7. Medium Grown Dust No. 1	—0.45	0.65	—0.23
8. Medium Grown BP	—0.13	0.01	—0.40
9. High Grown BOP	—0.06	0.54	—0.22
10. High Grown BOPF	0.08	0.33	—0.35
11. High Grown Dust No. 1	0.38	0.05	0.40
12. High Grown BP	0.03	0.51	—0.03
13. High Grown BOP	—0.27	0.69	—0.03
14. High Grown BOPF	—0.04	0.67	—0.15
15. High Grown Dust No. 1	0.03	0.19	—0.09
16. High Grown BP	0.39	0.16	—0.47

Note :

SP — Sale Price.
TF — Theaflavin Content.
SS — Soluble Solid Content.
TC — Total Colour.

Sri Lankan teas are mostly orthodox-manufactured, and would be associated with a relatively higher content of volatiles than CTC manufactured teas. Trace amounts of flavour could confer special characteristics to the tea and bring about a disproportionate increase in its valuation. This is specially true of our high-grown teas. In this context we are reminded of the Darjeeling teas which are valued highly despite the relatively lower TF they contain.

The above discussion supports the contention of Roberts (1982) that it is not possible to fix minimum values for TF as an export standard for Sri Lankan teas.

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