

FLUORIDE IN BLACK TEA

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Fluoride analyses of tea liquors prepared from 30 different black teas indicate that a person drinking six to nine cups of tea (prepared by infusing one teaspoonful of tea in one cupful of boiling water) daily, will obtain the quantity of fluoride necessary for the prevention of dental caries.

The leaves of tea (*Camellia sinensis* L.) and other species of *Camellia* are known to possess an unusual ability to accumulate large quantities of fluoride (Singer, Armstrong & Vatassery 1967), and may, therefore, be used in the prevention of dental caries (Gershon-Cohen & Mc Clendon 1957). Most dry teas contain 100 to 200 ppm of fluoride, and analyses of four samples of Ceylon black tea, (Bhavanandan 1969), showed a range of 150 to 175 ppm. Instant teas prepared from coarsely-plucked leaf showed levels of fluoride closer to 200 ppm, and this is due to the fact that coarse leaf contains a higher content of fluoride than the tender flush (Zimmerman, Hitchcock & Gwirtsman 1957). Although dry black tea contains high levels of fluoride, it is the quantity extracted into the tea liquor after brewing which is of practical significance in the prevention of dental caries. Warren, Weinbaum & Allen (1968) analysed samples of Uva and Nuwara Eliya teas and found that these contained 154 and 111.2 ppm respectively of fluoride. On infusion, however, they found that the 'chemically available' fluoride in the brew was 32.9% in the case of the Nuwara Eliya tea and 68.3% in the Uva tea. The present investigation was carried out using a range of low-, mid—and high-grown teas, and determining the fluoride contents in the brew liquors after different periods of infusion. No analyses were made of the dry black teas.

MATERIALS AND METHODS

A total of 30 black tea samples, 15 of which were BOP and 15 BOPF grades, were used in this study. Of these, eight were low-grown, ten mid-grown and 12 high-grown; further details of these samples are given in Table 1.

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TABLE 1 — *Fluoride content of tea liquors after brewing for 3, 5 and 10 min.*

<i>Estate or Group</i>	<i>Fluoride content (ppm) after brewing</i>		
	<i>3 min.</i>	<i>5 min.</i>	<i>10 min.</i>
<i>Low Grown</i>			
Halwatura	1.2	1.2	2.0
	1.4	1.8	2.4
Mahawela	1.0	1.0	1.6
	0.8	1.0	1.6
Opatha	1.2	2.2	2.0
	0.8	1.2	2.0
Halgolla	0.4	1.4	1.8
	1.8	2.0	2.0
<i>Mid Grown</i>			
Craighead	0.4	0.8	2.4
	1.4	1.8	2.0
Hope	0.8	1.2	2.4
	1.6	1.6	2.2
Hantane	1.1	2.0	2.0
	1.2	1.8	2.4
Pussatenne	0.8	1.4	1.2
	2.0	2.2	2.0
Bellwood	1.6	1.6	1.8
	1.6	1.8	2.0
<i>High Grown</i>			
Galkandewatte	0.6	1.6	1.6
	1.2	1.2	2.0
Castleriegh	1.4	1.4	1.6
	1.2	1.4	1.4
Moray	1.2	1.2	1.4
	0.6	1.0	2.0
Delmar	1.2	1.4	1.4
	1.6	2.0	2.0
Fordyce	0.8	1.6	1.6
	1.6	1.6	1.6
Heidri	1.4	1.6	1.8
	1.2	2.0	2.0

(For each estate or group, the first set of values refers to BOP and the second to BOPF)

Fluoride determinations were made according to the following method. Three 2.5 g samples of each of the 30 different tea were infused in 125 ml of boiling double-distilled water for 3, 5 and 10 min. respectively. The supernatant liquor was filtered from the infused leaf and treated with 15 ml concentrated sulphuric acid, and sufficient silver sulphate to precipitate the chloride present. The solution was then steam distilled according to the procedure described by Boltz (1958): 250 ml. of steam

distillate were collected, and the fluoride content in an aliquot of the distillate estimated by the method of Megregian (1955), but using the improved reagent of Lim (1962). The intensity of colour developed with this reagent, Acid-Zirconium-Alizarin Reagent, was measured at 525 m μ , using an EEL spectrophotometer. The fluoride content in ppm was then obtained by reference to a standard curve.

RESULTS AND DISCUSSION

The contents of fluoride in liquors obtained after infusion for 3, 5 and 10 min. together with the description of the tea samples are given in Table 1. All of the teas were of orthodox manufactures, and each pair of BOP and BOPF grades was obtained from the same invoice. As expected, the quantity of fluoride in the BOPF liquors was generally greater than that in the BOP liquors. It is also seen that a five-min. brew has a higher level of fluoride than the three-min. brew. Extension of the brewing time from 5 min. to 10 min. resulted in a significant increase in the quantity of fluoride extracted from low grown teas, but to a lesser increase in mid—and high-grown teas.

The fluoride contents of the tea liquors analyzed in this investigation are higher than those reported on by Warren, Weinbaum & Allen (1968). The main reason for this difference are that the strength of infusion used here was greater than that used by the previous workers. Using a liquor prepared by infusing one teaspoonful (5 g) of unblended Ceylon black tea in one cupful (160 ml) of boiling water for 5 min., the results of the present investigation indicate that a person drinking 6 to 9 cups of tea per day will obtain the quantity of fluoride necessary for the prevention of dental caries. The effect of the addition of milk on the availability of fluoride is now being investigated.

SUMMARY

- 1—The results are given of analyses of fluoride in liquors prepared from 30 different black teas.
- 2—The time of brewing is an important factor in the extraction of fluoride into the liquor.
- 3—A tea liquor prepared in the recommended manner contains 2 to 3 ppm of fluoride.

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