# Value Addition to Black Tea by Supplying the Collected Volatile Compounds from Fermented Tea

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## Introduction

The tea plant, *Camellia sinensis*, is native to Southeast Asia. It is currently cultivated in more than thirty countries around the world, and is a popular beverage (Chaturvedula and Prakash, 2011). A cup of infusion of made tea is completely different from that of fresh tea flushes in color, taste and aroma. These characteristics are developed during the manufacturing process once the tea flushes are harvested (Chaturvedula and Prakash, 2011). The volatile compounds present in fermented tea are lost during tea drying with exposure to direct heat (Zoysa *et al.*, 2008). Resupply of those evaporated volatile compounds to black tea may increase the fresh and natural smell coming out of made tea, and thereby improve the smell of brewed tea liquor. Thus, it may enhance the consumer preference as well.

The objectives of this research were:

To collect the volatile compounds evaporated from fermented tea.
To incorporate the collected volatile compounds again into black tea.
To determine the smell, taste and colour of volatile-compound-incorporated black tea.
To determine the shelf life of the developed black tea blend.

## Methodology

Semi-processed Uva tea fermented for 2.5 hours under standard conditions was collected and dried. The compounds evaporated during drying were collected using a distillation unit. These collected volatile compounds with no head space were stored in opaque glass bottles. The liquid volatile compounds (LVC) collected were sensory evaluated for the smell and taste using fifteen experienced tea tasters to identify the differences after the incorporation of LVC to black tea. The experiment was arranged in four-factor factorial design with two levels for each factor. The four factors were the amount of LVC applied, particle size of tea, mesh type used for bagging of LVC-added tea and brewing method of LVC-added tea. These factors were selected by considering the consumer choices. There were sixteen treatment combinations, which were sensory evaluated using nine experienced tea tasters. All the treatment combinations were evaluated for changes in the appearance, smell and moisture content during a storage period of six weeks. Appearance and smell were evaluated using two experienced tea tasters. Moisture content was determined using a moisture meter. The responses of tea tasters were recorded according to five-point hedonic scale. Data for sensory evaluation of collected LVC were analyzed in Microsoft Excel-2007 and the data for sensory evaluation of LVC-added sixteen treatment combinations were analyzed using Kruskal-Wallis test (MINITAB version 14). The significance was tested at P=0.05.

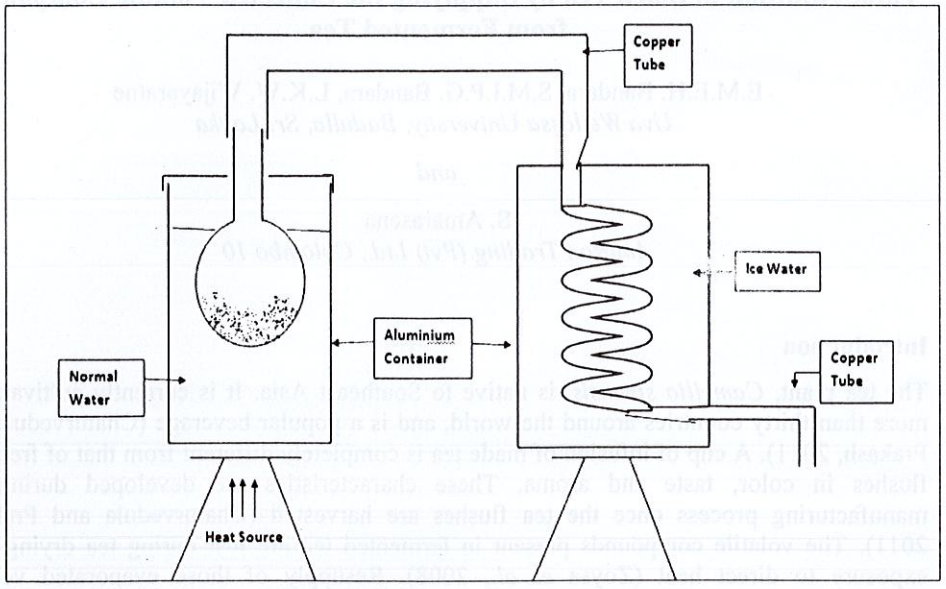


Figure 1: Distillation unit designed for the extraction of LVC.

**Results and Discussion**

The collected LVC had a good up country tea smell and was identified as very pleasant by 73% and pleasant by 27% of tea tasters. According to evaluators, the collected LVC did not possess a considerable taste.The specific treatment combination which offered the best smell and taste was PEKOE with 1% LVC, bagged with filter paper mesh and brewed with the lid closed. There was a significant difference between treatment combinations for smell ($H=127.61$, $n=144$, $P=0.00$) and taste ($H=121.84$, $n=144$, $P=0.00$) of brewed tea. Regarding the smell, BOPF (1%) and PEKOE (1%) packed in filter paper tea bags and brewed with open lid were found to be the best. From the point of view of evaluators, although the extracted LVC had a good smell, incorporation of them into black tea did not produce a similar degree of smell after brewed. Regarding the taste, BOPF (2%) and PEKOE (1%) packed in filter paper tea bags and brewed with open lid were found to be the best. However, no significant difference was found with respect to the colour of brewed black tea by the incorporation of LVC ($H=0$, $n=144$, $P=1.00$). No alteration in the appearance, smell or moisture content was detected during the storage period of six weeks. Furthermore, there was no fungal growth in the LVC incorporated tea during the six-week storage period. Since there has been no previous research conducted on the incorporation of LVC collected from fermented tea to black tea, the results obtained in this research could not be compared.

**Conclusions**

Volatile compounds can be extracted as liquids from fermented tea. The organoleptic properties of black tea can be improved by re-supplying the LVC evaporated from fermented tea during drying. However, the smell of brewed black tea could not be enhanced significantly by the incorporation of LVC. An alternative way to improve the smell in the brewed tea would be to increase the concentration of collected LVC and develop it as a commercially available flavouring liquid. Provision of constant heat during extraction and agitation of the mixture can be suggested to improve the extraction of LVC. Further

experiments need to be arranged to study the addition of ingredients such as standard flavouring liquids to the volatile compounds collected during drying process of fermented tea, and to determine the shelf life of LVC-added black tea.

Table1: Mean values for smell and taste obtained from sensory evaluation of sixteen treatment combinations using five-point hedonic scale.

| Treatment combination | Smell | Taste |
|---|---|---|
| Brewed lid open, Filter paper, BOPF, 1% | 5.000 | 3.7778 |
| Brewed lid open, Filter paper, BOPF, 2% | 4.000 | 4.7778 |
| Brewed lid open, Filter paper, PEKOE, 1% | 5.000 | 4.7778 |
| Brewed lid open, Filter paper, PEKOE, 2% | 4.000 | 3.8889 |

**References**

Chaturvedula, V.S.P., Prakash, I., 2011. The aroma, taste, color and bioactive constituents of tea. Journal of Medicinal Plants Research 5(11): 2110-2124.

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