Development of a Multi-Ingredient Herbal Tea Blend

B. M. A. N. Bandaranayake , S. M. I. P. G Bandara , L. K. W. Wijayaratne
Uva Wellassa University, Badulla, Sri Lanka

and

N. Jayakody
Tea Tang (Pvt) Ltd., Colombo, Sri Lanka.

Introduction

At present, there is a higher consumer demand for herbal tea especially in Japan, North-East Asia and the Eastern Europe due to their medicinal properties. This research was conducted to develop a multi-ingredient herbal tea blend as a value added new product for the future Sri Lankan tea industry. The objectives of this research were:

- to develop a multi ingredient herbal tea blend using chamomile (*Matricaria recutita*), lemon grass (*Cymbopogon citratus*), ginger (*Zingiber officinale*) and green tea (*Camellia sinensis*)
- to determine the selected quality parameters of the developed herbal tea blend
- to determine the production cost of the developed herbal tea blend .

Materials and Methods

There were two experiments in this research. In experiment 1, the multi-ingredient herbal tea blend was prepared and sensory evaluated to select the best ingredient combination. Chamomile, ginger, lemon grass and green tea were used as main ingredients and each was used at two different levels. Accordingly there were sixteen treatment combinations in a four-factor factorial design. The prepared tea blends were sensory evaluated as two sets; eight treatment combinations in each set. There were seven experienced evaluators, and their response were obtained in a five-point hedonic scale. The data were analyzed by Kruskal-Wallis non-parametric test with 95% confidence interval. The mean separation was done by Conover-Inman method (Conover, 1999). The best four treatment combinations selected from each set (eight treatment combinations) were sensory evaluated again and selected for the best four treatment combinations. These four treatment combinations were considered as the set 4. A final sensory evaluation was conducted by using thirty untrained panelists using same evaluation criteria as previous. The data were analyzed by Friedman test at 95% confidence level. The mean separation was done by CD value to identify the best treatment combination. The significance was tested at P=0.05.

In experiment 2, the quality of the herbal tea blend found to be best in the sensory evaluation was determined, and the total cost for its production was calculated. The moisture content of the selected tea blend was determined by ISO 1573:1980 method for five weeks (oven drying method and the moisture analyzer method). The mean separation was done by Tukey's test and the significance was tested at P=0.05. The total polyphenols, Calcium, Magnesium, Iron, Copper and Zinc contents of the finally selected herbal tea blend were determined according to the standard procedures of ISO 14502, SLS 626:1983, AOAC 17th Edition, LCHE/TM/SOP/009, LCHE/TM/SOP/009 and LCHE/TM/SOP/009,

respectively. The total cost of the selected herbal tea blend was determined by considering the expenses made towards the ingredients and other steps.

Results and Discussion

There was a significant difference in the taste among different treatment combinations of in all four sets ($P<0.05$). According to the mean separation, the treatment combinations 245, 721, 647 and 452 showed higher values in the average rank difference than the Conover-Inman value (13.446) out of the eight treatment combinations that have been considered in set 01. Similarly, the treatment combinations 714, 216, 563 and 624 showed higher values in the average rank difference than the Conover-Inman value (14.265) from the eight treatment combinations of set 02.

Among the treatment combinations selected as set 03, the treatment combinations 714, 647, 245 and 624 showed higher values in the average rank difference than Conover-Inman value (13.530), revealing that they were highly different within the set 3. Among them, the treatment combination of 714 showed the highest average rank and the treatment combinations 245, 647 and 714 showed lower ranks.

Table 1: Weight and percentage of ingredients used in different treatment combinations.

Reference Number	Main Ingredients								Total Weight (g)
	Chamomile		Lemon grass		Ginger		Green tea		
	Quantity (g)	Percentage %	Quantity (g)	Percentage %	Quantity (g)	Percentage %	Quantity (g)	Percentage %	
721	1	20	1.5	30	1	20	1.5	30	5
245	1	15.38	2.5	38.46	1	15.38	2	30.76	6.5
452	1	16.66	1.5	25	1.5	25	2	33.33	6
647	1	14.28	2.5	35.71	1.5	21.42	2	28.57	7
624	2.5	35.71	1.5	21.42	1	14.28	2	28.57	7
714	2.5	31.25	2.5	31.25	1.5	18.75	1.5	18.75	8
563	2.5	35.71	1.5	21.42	1.5	21.42	1.5	21.42	7
216	2.5	31.25	2.5	31.25	1	12.5	2	25	8

In the set 04, the difference of the sum of ranks showed a higher value than critical CD value (26.40) in the treatment combination of 647 while all other treatment combinations showed lower values. Therefore, the treatment combination of 647 was selected as the best multi-ingredient herbal tea blend. It showed a lower average rank in the sensory evaluation of set 1 and a higher average rank compared to the treatment combination 245 in the sensory evaluation of set 4. The composition of the finally selected herbal tea blend is 14.28% of chamomile, 35.71% of lemon grass, 21.42% of ginger and 28.57% of green tea.

The mean moisture percentage of the finally selected multi-ingredient herbal tea blend determined according to the oven drying method and the moisture analyzer method was 9.117% and 8.283%, respectively. After five weeks, these levels were increased to 9.55% and 8.503%, respectively. Thus, the mean moisture percentage of the final product was

below 12%, the recommended moisture percentage for herbal tea blend at the final packaging.

The final tea blend contains higher quantities of Ca and Mg compared to Fe, Cu and Zn (Table 2). Calcium and Magnesium exist as Ca^{+2}, Mg^{+2}. Since these ions are alkaline in nature, they help to increase the pH of the solution, causing less acidity and consequently less sour (Nicholas, 2011). This may be remedial effects for gastro-intestinal disease conditions associated with low pH. Iron and Zinc are essential macro nutrients for growth and development, and Cu is important in the metabolism (Nicholas, 2011).

Table 2. The mineral composition of the selected herbal tea blend.

Mineral	Quantity (mg/100 g)
Ca	394.5
Mg	207.7
Fe	24.8
Cu	0.64
Zn	3.0

The total polyphenol content ranges from 21.02±1.54% to 14.32±0.45% of gallic acid equivalents (GAE) in green tea and 17.62±0.42% to 8.42±0.55% of GAE in black tea (Anesini *et al.*, 2008). However, this study reveals a total polyphenol content in the selected multi-ingredient herbal tea blend is 7.2% (w/w) and it is lesser than the polyphenol content of both green tea and black tea. The total cost of manufacturing of the 1 kg of the product was Rs.2349.82.

Conclusions

The treatment combination 647 with chamomile 14.28 %, lemon grass 35.71%, ginger 21.42% and green tea 28.57% was the best multi-ingredient herbal tea blend. The mean moisture levels of the selected tea blend, according to the oven-dry and moisture-analyzer method were 9.117% and 8.283%, respectively. These moisture levels were acceptable for a five week storage period. The selected tea blend contains higher quantities of Ca and Mg compared to the other elements, and thus may contain remedial effects for gastro-intestinal disease conditions associated with low pH. The low level of polyphenols compared to black tea and green tea is a concern that needs to be addressed in future research.

References

Anesini, C., Ferraro, G.E., Filip, R., 2008. Total polyphenol content and antioxidant capacity of commercially available tea (*Camellia sinensis*) in Argentina. Faculty of Pharmacy and Biochemistry, University of Buenos Aires, Buenos Aires, Argentina.

Conover, W. J., 1999. Practical non-parametric Statistics. Third Ed. Wiley.

Nicholas, E.A. De-Heer, 2011. Formulation and sensory evaluation of herb tea from Moringa oleifera, Hibiscus sabdariffa and Cymbopogon citratus. Department of Biochemistry and Biotechnology College of Science. Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.