Effect of Relative Humidity and Temperature on Melting of Flavor Granules Used in Tea

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Introduction

The story of Ceylon tea can be traced back over 200 years ago, when the country was a British colony. Ceylon tea as a beverage has been enjoyed by people all over the world for generations. It still has the value and interest as a beverage with many health benefits. Over a significant period of time, Sri Lankan tea industry has made a progress in expanding the value added tea products. At present, Sri Lanka's value added tea exports include instant tea, tea bags, iced tea, flavored tea, green tea, herbal tea, ready to drink tea and organic tea. However, according to the statistics of the Sri Lanka Tea Board (2010) more than 50% of the tea exports are still in the form of traditional bulk tea. The quantity exported as value added form amounted to 106.5Mkg, or 35.7% of the total exports resulted the corresponding revenue to SL Rs.57.8 billion, and that is a share of more than one third of total exports income in 2010(Sri Lanka Tea Board, 2011). There are several methods of value addition to tea. Flavor incorporation, herbal incorporation, fruit pieces incorporation are some of examples. Most of the time flavor addition is used as their main value adding method by the companies. Most of consumers are willing to consume different types of flavored teas rather than drinking pure black teas or green teas. As a value addition to teas, more than hundred flavors are added to teas by tea exporting companies .There are two types of flavors which are flavor liquids and flavor granules. Flavor granules which added to teas melt during packing, storage, transportation and this causes quality problems. Some tea bags cause difficulties when trying to take out from pouches because melted granules stick to pouch. And also the tea bags with melted granules look like fungus attacked tea bags. This causes rejection of shipments which means a huge loss to exporters. This research was focused to identify the behaviors of flavor granules at different environmental conditions.

Methodology

The current study was carried out at Amazon Trading (PVT) LTD (ATPL), Colombo 10. Laboratory analysis was done at ATPL laboratory. The study was designed as a two-factor factorial design experiment. The two factors were temperature, relative humidity which had five factor levels and seven factor levels respectively. The experiment was conducted with 35 combinations. Each combination was tested three times. A glass chamber was used to create a controlled environment. A water bath with a thermometer, a digital thermo-hygrometer was placed inside the glass chamber. Two sets of granule samples with 2 g weight each were put in to metal lids. Relative humidity inside the chamber was adjusted to desired levels by spraying water into chamber by using a spraying bottle. One granule sample was placed in the water bath while other sample was placed inside the chamber as a control. Temperature was controlled by placing a water bath. The flavor granules were placed at constant temperature and relative humidity for six hours. Physical state of flavor granules was observed whether they were melted or not. Data analysis was done by Minitab 15 (Minitab Inc., 2013) statistical software program. Multiple linear regression was used to determine the relationship between physical state of flavor granules and factors affecting on melting of flavor granules.

Results and Discussion

The results revealed that the relative humidity and temperature are positively related with melting of flavor granules.

Table 1. Regression analysis of factors affecting on melting of flavor granules.

Parameter	Co-efficient	p- value
Relative Humidity	5.5714	0.000
Temperature	0.034286	0.000

Table 2. Summary of Regression Analysis

Summary of Regression Analysis Model	S	R square	Adjusted R square
1	0.411750	69.2%	68.5%

Among those two factors, relative humidity causes a significant effect on melting of flavor granules. Moisture availability of air is increasing with high relative humidity. When exposed to air, the flavor granules absorb more moisture from the air at high relative humidity levels than low relative humidity levels and get melted easily. Therefore the flavor granules should not be exposed to air for longer periods and containers should always be sealed. Blending of flavor granules with teas and herbals should be done once the blends are ready to pack and tea bags should be stored in air sealed containers. Relative humidity of storing area should maintain at minimum levels. This can be done by using of de humidifiers. The experiment showed that flavor granules take more than 4 hours to get melted at high relative humidity levels with low temperatures while at high relative humidity levels and high temperatures melting periods were less than 4 hours.

Conclusion

Relative humidity has a positively significant effect while temperature has a positive effect on melting of flavor granules. Flavor granules should be stored in humidity levels less than 70% and temperatures less than 25 ^{0}C.

Reference

Tea Market Update, Sri Lanka Tea Board. (2011). Category wise tea exports and total tea exports during the year (2011/2010). Vol. 6:4.