Innovare Academic Sciences

International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 6, Issue 4, 2014

Original Article

HEALTH BENEFITS OF VARIOUS INDIAN CULINARY HERBS AND COMPARATIVE STATISTICAL ANALYSIS FOR ORGANOLEPTIC PROPERTIES OF INDIAN TEAS BY USING ANALYSIS OF VARIANCE (ANOVA)

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Received: 24 Feb 2013 Revised and Accepted: 01 Apr 2014

ABSTRACT

Objective: To statistically evaluate and compare the organoleptic properties of various Indian herbal teas (ginger, Tulsi, mint and cardamom).

Methods: The combination of various culinary herbs has been taken and formulated into drinks. The herbs chosen for the current study were Tulsi, ginger, mint, cardamom and other medicinally useful herbal families. The organoleptic properties of the herbal drinks were evaluated by sensory analysis and statistically compared using analysis of variance (ANOVA).

Results: Ginger mint tea was found to have the best overall rating and the best texture, color and other organoleptic properties, according to the data provided by the candidates of sensory analysis. Also, ginger mint tea has several health benefits which have been confirmed by the scientists. It can be used for the treatment of various digestive and cardiovascular diseases.

Conclusion: Owning to the above results, ginger mint tea can be used as a potent health and energy drink, as it does not have any side effect and provide several health benefits.

Keywords: Herbal drinks, Sensory analysis, ANOVA, tea, Ayurvedic, Organoleptic property.

INTRODUCTION

Herbal teas are often consumed for their physical or medicinal effects, especially for their sedative, relaxative, and stimulative properties. The medicinal benefits of specific herbs are often anecdotal, and in various countries makers of herbal teas are not allowed to make unsubstantiated claims about the medicinal effects of their products. Most herbal teas are safe for regular consumption, but some do have the allergenic or toxic effects. Herbal teas are mostly popular because of their fragrance, antioxidant properties and therapeutic applications. The antioxidant properties[1,2] of herbal teas from temperate plants of mainly *Lamiaceae* have been well-studied while those of tropical herbal teas are less well-studied.

Dried cloves are a key ingredient in Indian Masala tea, spiced tea, a special variation of tea popular in various regions of India. In Ayurvedic medicine it is considered to have the effect of increasing heat in system, hence the difference of usage by region and season[3]. Cloves are also said to be a natural antihelminthics[4]. Western studies have supported the use of cloves and clove oil for dental pain[5]. Clove reduces blood sugar levels[6]. Clove is used in traditional Chinese medicine to treat stomach issues, constipation, dysentery, and other digestion problems[7]. Stimulating to the digestion, pepper is seen primarily as a remedy for indigestion, bloating, gas and malabsorption[8]. Studies have shown that it not only increases the appetite and production of hydrochloric acid but improves digestion of many key nutrients such as the B vitamins, beta-carotene and selenium and various phytochemicals from other spices and green tea[9].

Ginger is good for the respiratory system[10]. It is good to fight against colds and flu[11]. Ginger offers substantial protection from stroke and heart attack because of its ability to prevent blood clotting[12]. Ginger, a multifaceted herb, is crucial in the battle against cardiovascular disease[13]. It relieves headaches, pains, and helps to clear sore throats[14]. It is very effective as a cleansing agent through the bowels and kidneys and also through the skin[15]. Mint is well known for its properties related to indigestion, stomach cramps, menstrual cramps, flatulence, upset stomach, nausea, and vomiting. Mint also can be used as an appetite stimulant[16]. It reduces hunger for a short time, but when the effects wear off the hunger returns stronger than before[17].

Tulsi is known to promote the longevity of life[18]. It is extensively brought to use for curing various diseases such as the common cold, inflammation, malaria, heart disease, headaches, stomach disorders, kidney stones, heart disorders, and many more[19]. Tulsi leaves are widely used due to their healing power. It is a tonic for the nervous system and thus, helps a great deal in sharpening the memory[20]. This aromatic plant supports the removal of phlegm and catarrhal matter from the bronchial tube[21]. It also works wonders in preventing stomach disorders. Tulsi has the ability to strengthen the kidneys functioning. For those suffering from the problem of renal kidney stones, the decoction prepared by mixing the juice of Tulsi leaves with honey, if taken sincerely for six consecutive months can oust these stones via the urinary tract. For maintaining healthy heart, Tulsi is of utmost value. It helps in lowering the level of cholesterol in blood. Thus, Tulsi plant serves as the most effective remedy to combat cardiac diseases and several renal malfunctions.

In the current research, the effort is to investigate the health effects of various Indian culinary herbs and choose the best herbs combination to prepare the herbal drink having several health effects. The combination of Ginger, Tulsi, Cardamom, Mint, Cloves, and other Indian herbs have been chosen upon the literature survey and further the organoleptic property have been evaluated by sensory analysis.

MATERIALS AND METHOD

Sample Collection

Green tea, Ginger, Tulsi, Cloves, Black pepper, Bay leaves, Honey, Cardamom, Mint leaves, Cinnamon powder, and milk were purchased from VIT Shopping complex.

Masala tea preparation

100ml of drinking water was taken. 1gm each of *Elettaria cardamomum* (Cardamom), *Piper nigrum* (peppercorn), *Syzygium aromaticum* (Cloves), and *Laurus nobilis* (bay leaves) was added and the content was boiled for 5 minutes at 100^{0}C. 50ml of milk was added to the mixture. Further, 5gm of green tea and 10gm of honey was added to the mixture and was again boiled at 100^{0}C for 3 minutes. The solution was served hot for sensory analysis of organoleptic properties.

Ginger Mint tea preparation

100ml of drinking water was taken. 1gm each of freshly chopped *Zingiber officinale* (ginger), 5gm of *Mentha* (Mint) leaves was added and the mixture was boiled for 5 minutes at 100^{0}C. 5gm of *Camellia sinensis* (green tea) and 10gm of honey was added and the solution was boiled for 5 minutes at 100^{0}C. The sample was served hot for the sensory analysis of organoleptic properties.

Tulsi tea preparation

100ml of drinking water was taken. 10gm each of Ocimum tenuiflorum (Tulsi) leaves, 2gm of Elettaria cardamomum (cardamom), 2gm of Syzygium aromaticum (cloves), and 1gm of Zingiber officinale (ginger) powder was added. The mixture was boiled for 5 minutes at 100^{0}C. 5gm of Camellia sinensis (green tea) and 10gm of honey was added to the mixture and heated for 5 minutes at 100^{0}C. The hot sample was served for sensory analysis of organoleptic properties.

Sensory analysis

Organoleptic properties taken into consideration of the current study are Flavour, Texture, Colour, and Taste. 50 candidates aged between 18 to 24 years of age were selected voluntarily. There were 25 male and 25 female candidates. The sensory analysis was based on 5 point hedonic scale, "excellent" being the 1st point and "bad" being the 5th point. The number of points given by the candidates to each herbal drink were added up and plotted in graphical representation to further compare and choose the best drink with best health effects.

RESULTS AND DISCUSSIONS

Analysis of Variance (ANOVA) was performed for the flavour, taste and colour of three herbal drinks, namely, Masala tea, ginger mint tea and Tulsi tea. Table 1, Table 2 and Table 3 shows the ANOVA results. The null hypothesis is rejected for all of the three organoleptic properties, stating that there is no similarity between the organoleptic properties of Masala tea, ginger mint tea and Tulsi tea. Further, sensory analysis was performed by voluntarily choosing 50 candidates aged between 18 to 25 years, with equal number of male and female participants. The sensory analysis was performed on 5 point hedonic scale. The point 1 was kept for excellent and point 5 was kept for bad organoleptic property. The points were added up and plotted as graphical representation. Figure 1, Figure 2. Figure 3, Figure 4, Figure 5, shows the graphical representation of the sensory analysis of herbal drinks. It can be concluded from the graph that ginger mint tea has excellent color and excellent texture. The Masala tea has the excellent flavour and excellent taste. The maximum overall rating for best organoleptic property by the candidates was given to ginger mint tea followed by Masala tea. Though Tulsi leaves have several health effects but the organoleptic properties are not preferred by consumers. Thus, ginger mint tea and Masala tea can be used as the herbal drink with potent antioxidant, anticarcinogenic and several other health benefits. Further, the Tulsi leaf dosages can be adjusted to formulate the herbal drink with best organoleptic property.

Table 1: It shows ANOVA for flavour: Null hypothesis is rejected. There is no similarity between the flavour of Masala tea, ginger mint tea and Tulsi tea.

		Sum of Squares	df	Mean Square	F	Sig.
Flavour of Masala tea	Between Groups	31.308	5	6.262	13.524	.000
	Within Groups	20.372	44	.463		
	Total	51.680	49			
Flavour of ginger mint tea	Between Groups	18.248	5	3.650	3.881	.005
	Within Groups	41.372	44	.940		
	Total	59.620	49			
Flavour of Tulsi tea	Between Groups	22.267	5	4.453	5.724	.000
	Within Groups	34.233	44	.778		
	Total	56.500	49			

Table 2: It shows ANOVA for colour: Null hypothesis is rejected. There is no similarity between the colour of Masala tea, ginger mint tea and Tulsi tea.

		Sum of Squares	df	Mean Square	F	Sig.
Colour of Masala tea	Between Groups	29.147	5	5.829	8.834	.000
	Within Groups	29.033	44	.660		
	Total	58.180	49			
Colour of ginger mint tea	Between Groups	10.167	5	2.033	2.644	.036
	Within Groups	33.833	44	.769		
	Total	44.000	49			
Colour of Tulsi tea	Between Groups	14.281	5	2.856	5.228	.001
	Within Groups	24.039	44	.546		
	Total	38.320	49			

Table 3: It shows ANOVA for taste: Null hypothesis is rejected. There is no similarity between the taste of Masala tea, ginger mint tea and Tulsi tea.

		Sum of Squares	df	Mean Square	F	Sig.
Taste of Masala tea	Between Groups	53.687	5	10.737	46.167	.000
	Within Groups	10.233	44	.233		
	Total	63.920	49			
Taste of ginger mint tea	Between Groups	21.108	5	4.222	4.058	.004
	Within Groups	45.772	44	1.040		
	Total	66.880	49			
Taste of Tulsi tea	Between Groups	18.931	5	3.786	3.144	.016
	Within Groups	52.989	44	1.204		
	Total	71.920	49			

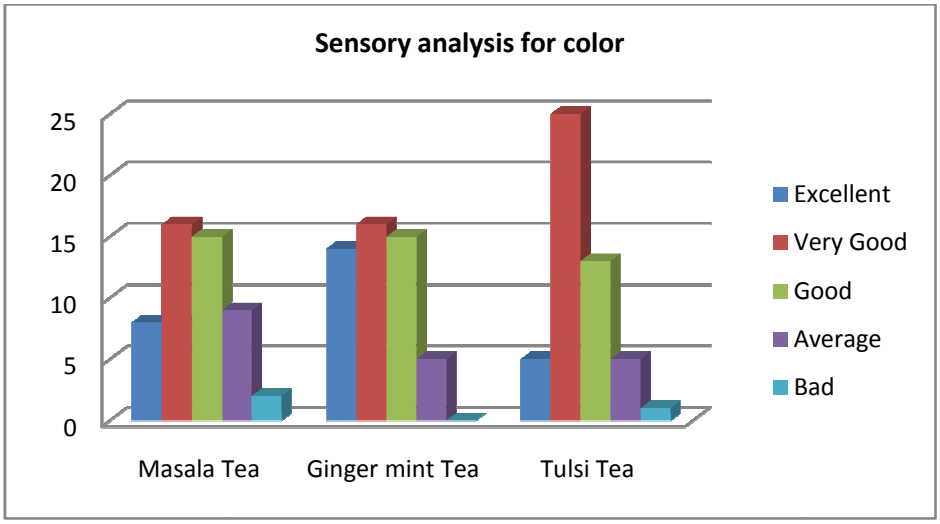

Fig. 1: Sensory analysis for Color of herbal drinks (Note: X-Axis shows the frequency of rating for various organoleptic properties and Y-Axis shows the sample under study)

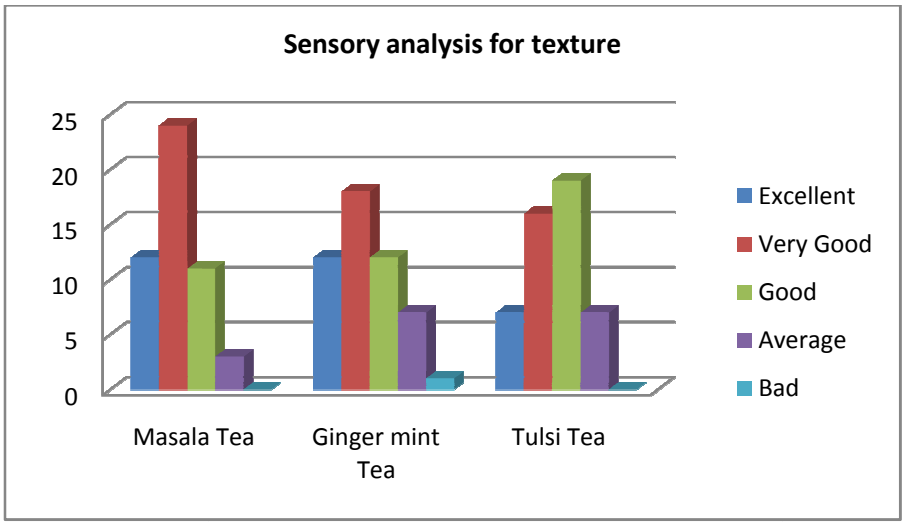

Fig. 2: Sensory analysis for texture of herbal drinks (Note: X-Axis shows the frequency of rating for various organoleptic properties and Y-Axis shows the sample under study)

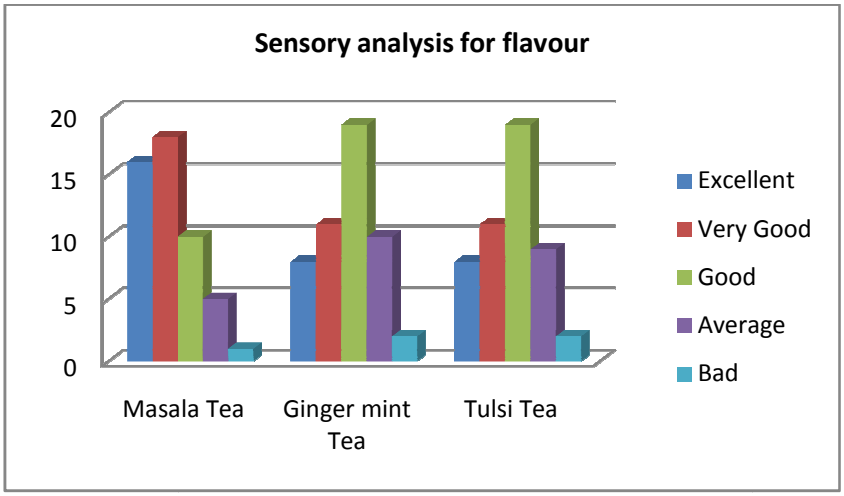

Fig. 3: Sensory analysis for flavour of herbal drinks (Note: X-Axis shows the frequency of rating for various organoleptic properties and Y-Axis shows the sample under study)

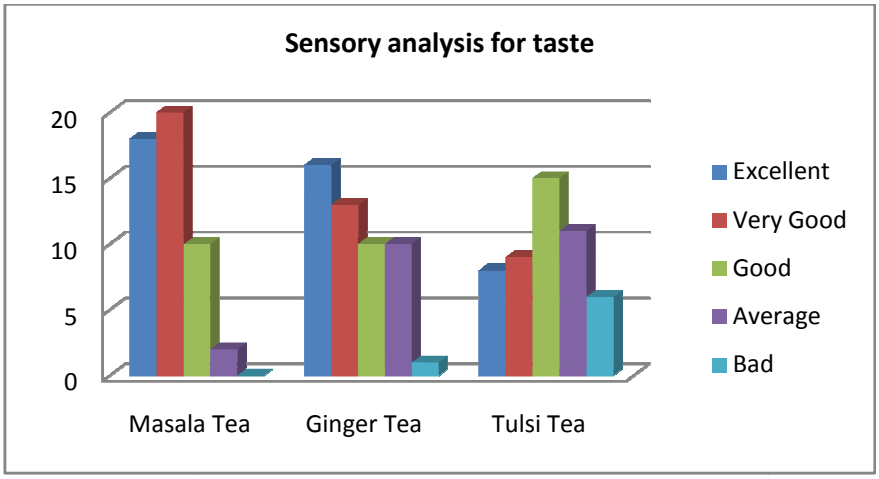

Fig. 4: Sensory analysis for taste of herbal drinks (Note: X-Axis shows the frequency of rating for various organoleptic properties and Y-Axis shows the sample under study)

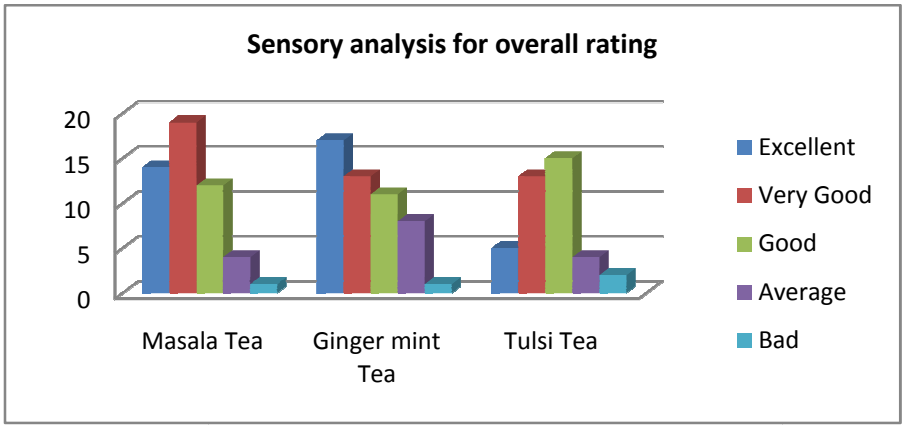

Fig. 5: Sensory analysis for overall rating of herbal drinks (Note: X-Axis shows the frequency of rating for various organoleptic properties and Y-Axis shows the sample under study)

CONCLUSION

The current study concludes to the fact that ginger mint tea has overall excellent rating and it is most preferred by the candidates. The organoleptic properties of the ginger mint tea has been preferred the most followed by Masala tea. Further, there is a need of optimisation of various organoleptic properties of ginger mint tea and Masala tea to make it more consumer health effective. Tulsi tea has not been preferred by the candidates and but it has several health effects as evident from the literature survey. Thus, there is a need for optimisation of Tulsi leaves dosage and preparation of a Tulsi tea which can be more preferred by the consumers.

ACKNOWLEDGEMENT

The authors would like to show their gratitude to the VIT management, specially our honourable chancellor, Dr. G Viswanathan for his motivation and support for research works in the University. Last but not the least the authors would extend their gratitude to one and all volunteers who joined for the sensory analysis and without whom the project would not have been successful.

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