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Influence of black pepper on the sensory quality of guava RTS beverage

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Abstract
Black pepper (*Piper nigrum*) has a high therapeutic value. It has been used by people to cure fever, gastrointestinal infections, migrane and other health related problem. An experiment was conducted to formulate the black pepper spiced guava Guava RTS beverage so as to imbibe the medicinal and nutritional properties of both guava fruit and black pepper and offer a healthy and delectable substitute to the snack foods. The Experimental trials were performed by incorporating different proportions of black pepper into the guava pulp for preparation of RTS beverage. The trials were represented as B_0 (Control), B_1 (0.2% Black pepper powder), B_2 (0.4% Black pepper powder), B_3 (0.6% Black pepper powder) and B_4 (0.8% Black pepper powder). Sensory evaluation with a 9-point hedonic scale was used to judge the formulated guava RTS beverage incorporated with different proportions of black pepper to analyze the organoleptic properties. A significant difference ($p<0.05$) was found among different treatments in all the parameters. The mean sensory scores for color and appearance, Taste, Texture, mouthfeel and overall acceptability for the treatments B_0, B_1, B_2, B_3 and B_4 ranged from 7.5 to 8.3, 7.3 to 8.9, 7.2 to 8.0, 7.4 to 7.9 and 7.6 to 8.5 respectively. On the basis of the outcomes of sensory evaluation the treatment B_2 (0.4% Black pepper powder) was found to be more overall acceptable than as compared to other variants.

Keywords: Sensory, black pepper, guava, RTS beverage, pulp

Introduction
Guava (*Psidium guajava* L.) is a fruit of delectable taste belonging to Myrtaceae family. It is native to Asian, tropical and subtropical parts of the world and is commonly referred to as poor man's "Apple of Tropics" because of its low price and abundance of nutrients in comparison to other fruits [15]. It offers broad spectrum of phytochemicals, minerals and vitamins especially Vitamin C (Ascorbic Acid) and E which are all responsible for its antioxidant properties, medicinal and nutritional properties [16]. Escrig *et al*. [6] found out that most of the dietary fibre and polyphenols are present in the peel and pulp of guava fruit. The fruit can be helpful in eradication of microbial infections, cardiovascular and cancerous diseases [13]. Being a tropical fruit, it has shorter shelf life and rapid ripening which makes it necessary to transform it into useful products like squash, cheese, ice-cream, Read-to-serve beverages etc. to avoid its spoilage due to early deterioration [16]. This will help in accomplishing the Sustainable Development Goal 12 of minimization of food waste and creating a sustainable environment.
Black pepper (*Piper nigrum)* belonging to Piperaceae family is the most widely used spice worldwide and has been used as Ayurvedic medicine in India [12]. Various compounds like flavanoids, phenolic compounds, terpenoids, alkaloids, carotenoids etc. [5] are present in it which render the various medicinal properties like antimicrobial, immune boosting and modulating, antimutagenic, antithyroid, antitumor, antidepressant, free-radical scavenging, antimetastatic, antidepressant, antiapoptotic, anti- thyroid, hepatoprotective, anesthetic, anti-spasmodic and anesthetic [8]. The use of black pepper is just not limited as a flavor enhancer but also cures fever, migrane, muscular pain, gastrointestinal infection, malaria and other health problems [11].
The present study has been conducted to formulate a black pepper spiced Ready-to-Serve Beverages which can be nutritious and appealing to the consumers as well as minimize the post-harvest losses of guava fruit. The addition of black pepper will enhance the taste of Guava RTS beverage and make it more palatable for consumption as a healthy snack.

Materials and Methods
Fresh, ripe guava fruits and Black Pepper powder was procured from the local market in Dehradun. The guava fruits were cleaned thoroughly, sliced, boiled to soften and then passed through a pulper to extract the pulp.

The seeds were removed through filtration and the pulp was cooled and stored for further preparation of RTS beverage. For the preparation of black pepper incorporated guava RTS beverage, the sugar syrup was prepared with appropriate amount of sugar and citric added to the water for boiling and mixing it with the guava pulp such that the required TSS and Acidity is achieved. Later the black pepper powder was added and the RTS was filtered, bottled, sealed, pasteurized, cooled and stored at low temperatures. The formulated RTS beverages were subjected to 5 replications and all the variants were subjected to sensory evaluation by a 9 point hedonic scale as stated by Rangana [10] to judge the overall acceptability based on the sensory scores of color and appearance, texture, taste and mouthfeel. The data was analyzed using analysis of variance (ANOVA) technique and comparisons were made among different treatments using critical difference at 5%.

Table 1: Depicts the different variants of black pepper incorporated guava RTS beverage

S. No.	Variants	Guava and Black pepper based RTS blends
1	G1	Control (Guava RTS without Black pepper powder)
2.	GB1	0.2% Black pepper powder blended with Guava RTS
3.	GB2	0.4% Black pepper powder blended with Guava RTS
4.	GB3	0.6% Black pepper powder blended with Guava RTS
5.	GB4	0.8% Black pepper powder blended with Guava RTS
6.	GB5	1.0% Black pepper powder blended with Guava RTS

Table 2: Sensory evaluation of Black pepper incorporated Guava RTS beverage

Treatments	Sensory characteristics				
	Color and Appearance	Taste	Texture	Mouth feel	Overall acceptability
G1 (0.0%)	8.0	7.8	7.7	7.6	7.7
GB1 (0.2%)	8.1	8.4	7.9	7.8	8.0
GB2 (0.4%)	8.3	8.9	8.0	7.9	8.5
GB3 (0.6%)	7.8	7.5	7.6	7.7	7.8
GB4 (0.8%)	7.5	7.3	7.2	7.4	7.6
GB5 (1.0%)	7.4	7.0	7.1	7.2	7.3

Result and Discussion

Color and Appearance

The mean sensory scores for the parameters of color and appearance are depicted in Table 2. The mean scores for different treatments G1(0.0%), GB1(0.2%), GB2(0.4%), GB3(0.6%), GB4(0.8%), and GB5(1.0%) were 8.0, 8.1, 8.3, 7.8, 7.5 and 7.4 respectively with the treatment GB2 with 0.4% black pepper scoring the highest and the treatment GB5 with 1.0% black pepper scoring the least. A significant difference (p<0.05%) was found among the treatments in terms of color and appearance. The results revealed that increase in proportion of addition of black pepper powder enhanced the color and appearance of guava RTS beverage upto a certain extent, after which the sensory scores started to decline. Rahman [15] formulated papaya spiced RTS beverage with 1% black pepper, 4% cumin seed, 1.5% mint and 1.5% lemon added to papaya juice. The sensory scores of the different treatments ranged from 7 to 9 for color parameter. The scores decreased with increase in proportion of spices added to the papaya RTS. Similarly Srividya and Ramachandran [14] formulated papaya RTS beverage spiced with aniseed, pepper and ginger in ratio 5:2:1 and the sensory score for color and appearance were 4.3 and 4.7 respectively in a five point hedonic scale.

Taste

The mean sensory scores for taste as shown in Table 2 for different treatments G1(0.0%), GB1(0.2%), GB2(0.4%), GB3(0.6%), GB4(0.8%), and GB5(1.0%) were 7.8, 8.4, 8.9,7.5, 7.3, and 7.0 respectively. The treatment GB2(0.4%) scored the highest in taste while the scores started to decrease with increase in concentration of black pepper powder in RTS guava beverage. The decrease in scores might be due to strong piney flavor of black pepper which dominates with increase in concentration masking the flavor of guava fruit [2]. A significant difference (p<0.05%) was found among different treatments in terms of color. G & M.R. [7] formulated flavored papaya pineapple blended RTS beverage and reported the sensory score for taste to be 9 in a 9-point hedonic scale. Similarly Amaravathi [2] prepared spiced pineapple RTS beverage and on sensory evaluation with a 9-point hedonic scale the taste of the RTS beverage was found to be acceptable. Abrol *et al.* [1] reported the sensory scores for taste to be better in spiced bhamora fruit RTS beverage than as compared to bhamora fruit RTS without spices added.

Texture

The sensory scores of texture for different treatments G1(0.0%), GB1(0.2%), GB2(0.4%), GB3(0.6%), GB4(0.8%), and GB5(1.0%) were 7.7, 7.9, 8.0, 7.6, 7.2 and 7.1 respectively. The treatment GB3 with 0.6% black pepper scored the highest in texture while the treatment GB5 with 1.0% black pepper scored the least. There was a significant (p<0.05) difference among the treatments. The texture scores decreased with increase in concentration of black pepper in RTS which might be due to decrease in consistency. Srividya and Ramachandran [14] reported the consistency of spiced papaya RTS beverage to be quite favourable scoring 4.7 on a 5-pont hedonic scale sensory evaluation.

Mouthfeel

The sensory scores of mouthfeel for different treatments G1(0.0%), GB1(0.2%), GB2(0.4%), GB3(0.6%), GB4(0.8%), and GB5(1.0%) were 7.6, 7.8, 7.9, 7.7, 7.4, and 7.2 respectively. The mouthfeel scores decreased with increase in addition of proportion of black pepper powder to guava RTS drink. A significant difference (p<0.05) was found among the variants. The treatment GB2 with 0.4% black pepper scored the highest while the treatment GB5 scored the least. Boyapati [3] formulated quinoa based dairy beverage and the sensory scores of mouthfeel of the resultant beverage ranged from 7.60 to 8.2.

Overall Acceptability

The overall acceptability in sensory evaluation is the sum of all the sensory scores of color, flavor, taste, texture that depict the final acceptance of any product. The overall acceptability of different treatments G1(0.0%), GB1(0.2%), GB2(0.4%), GB3(0.6%), GB4(0.8%), and GB5(1.0%) were in the range of 7.7, 8.0, 8.5, 7.8, 7.6, and 7.3 respectively. The overall acceptability decreased with increase in concentration of black pepper in guava RTS beverage. A significant difference (p<0.05) was observed among the treatments. Dhiman *et al.* [4] reported the overall acceptability of black pepper flavored beetroot RTS for different treatments in the range of 2 to 7 in Hedonic scale ranking. Srividya and Ramachandran [14] reported papaya spiced RTS beverage to be overall acceptable with the rating of 4 in a 5 point hedonic scale. Similarly Amaravathi [2] found the spiced pineapple RTS beverage to be overall acceptable scoring 8.9 in a 9 point hedonic scale.

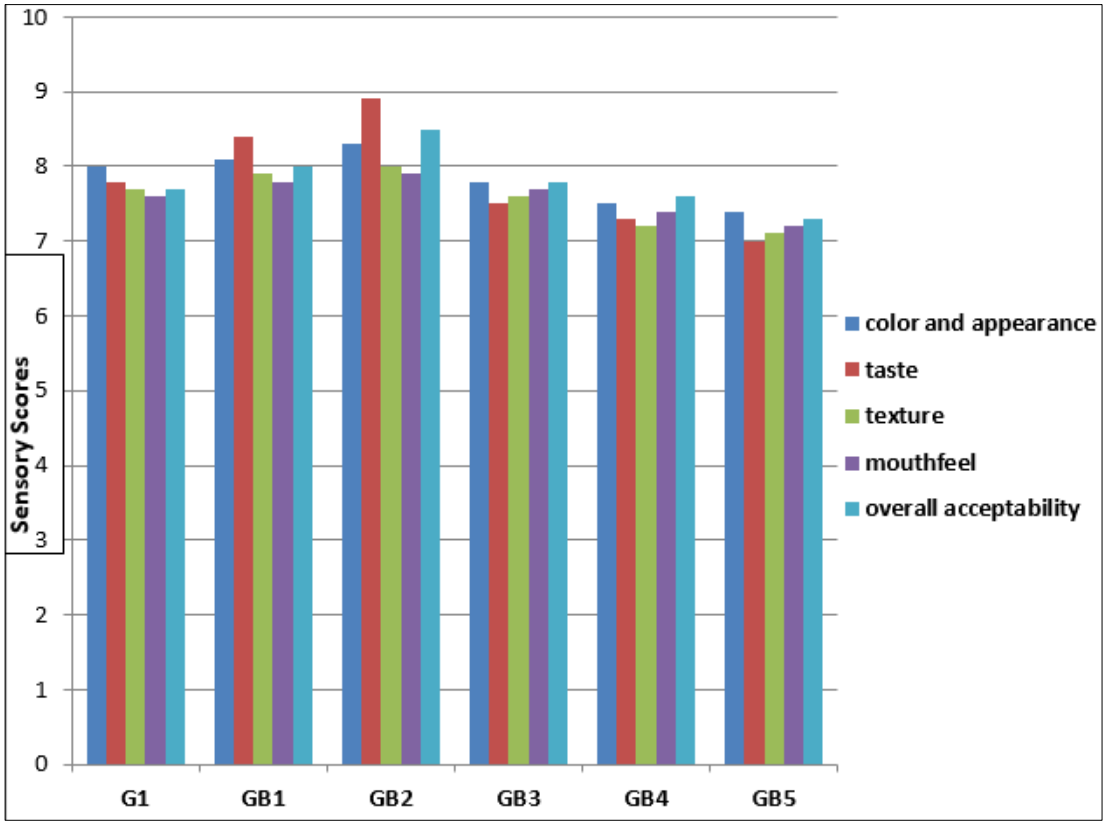

Fig 1: Sensory Quality of black pepper flavored guava RTS beverage

Conclusion

The most acceptable black pepper spiced guava RTS beverage can be prepared by incorporation of 0.4% black pepper powder. The guava RTS beverage incorporated with 0.4% black pepper had the highest sensory score for color and appearance, taste, texture, mouthfeel and overall acceptability which were 8.3, 8.9, 8.0, 7.9 and 8.5 respectively.

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