▼ Journal of Research (Science), Vol. 32, No. 3-4, December 2021, pp. 54-60
ISSN 1021-1012

Innovative Nutraceutical Ginger Splash-Development and Characterization

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Abstract

The need for production of more health-promoting, nutraceutical properties and affordable drinks prompted the idea of establishing ginger-based beverages. This study is aimed to produce a new innovative ready to drink splash of ginger. Standard methods were applied for sensory analysis and physicochemical (proximate) analysis. Among the various combinations, the newly developed ginger-based beverage containing 2.0g/10ml ginger extract was found to be better for its nutritional quality and sensory evaluation. Both of the products, control and newly established ginger-based beverage have been found highly acceptable according to sensory evaluation. The acidity, pH, brix, ascorbic acid, antioxidant activity and IC50 of newly developed ginger-based beverage were found to be 26%, 3.0, 9.4%, 18.1%, and 85.65ppm respectively. On the sensory and microbiological point of view, the presently developed ginger-based beverage was found highly acceptable. Analysis during storage for a period 60 days shows good quality attributes of ginger splash. A reducing trend was observed in ascorbic acid and in acidity content during storage. The pH has been observed increased by the passage of time. Ascorbic acid content of ginger splash was observed to be changes significantly during storage period. The newly developed ginger splash also has the market competent price therefore the product is likely to gain the attraction of consumer and improves the market trends.

Keywords: ginger-based beverage, ginger, lemon, spices, splash

Introduction

Splash is kind of cocktail in which two or more ingredients have been mixed to form a refreshing beverage. It is not common in the beverage classification as tea, coffee or fruit juices but it can give a healthy gulp in order to cater quenching thirst with a boost of refreshing taste and flavor. Ginger-based beverages are preferred to be utilized by the consumer due to their nutraceutical properties and energy value. These ginger-based beverages have been useful for providing proper nutrition and health benefits (Anand 1970, Singh, Singh *et al.* 2004). To value added nutraceutical/functional food products help in improving consumer health and the socio-economic status of the region (Bakhru 1998).

Ginger (*Zingiber officinale)* is very useful in appropriate release of bile and for the treatment of gallstone. Ginger is reported to be useful in the cardiovascular treatment due to its cholesterol lowering and blood thinning properties. It is also reported to decrease the danger of arthritis (Connell 1969). Ginger-based beverages are found useful to reduce the diseases caused by nutritional deficiency. Lemon is used as a natural preservative as addition of acid in food lowers the availability of oxygen on the surface of food. As a result, no oxygen will be available for microbes. Acid also destroys protein of microbes. Sweet lemon juice was fermented to produce a probiotic juice (Hashemi, Khaneghah *et al.* 2017). The black salt contained less sodium level and impose antioxidant activities. Presence of calcium, iron and magnesium make the black salt very beneficial as far as human health is concern and it is also more suitable to be used than the sodium chloride (Chander, Tewari *et al.* 2020).

Received 18 November 2021; Revised 03 December 2021; Accepted 12 January 2022

Cumin (*Cuminumcyminum*) has a different aroma and is used for culinary purpose. Presence of cymene, pinene, terpinene, oleoresin, cuminaldehyde and thymol make cumin very efficient in improving immune system, and protects human against various diseases (Fatima, Beenish *et al*. 2018). The cardamom has been used in various food to impart special aroma and mouthfeel. It is reported to have positive affects against cardiovascular diseases, diarrhea, depression, nausea and vomiting (Sengottuvelu 2011). The black pepper (*Piper nigrum L*) used for culinary purposes is proven to improve the functions of digestive system. It is also reported to possess antimicrobial properties. The black pepper contains antioxidants and piperine and found impose beneficial effects on nervous system (Singletary 2010). Cinnamon has excellent anti-fungal properties. Cinnamon has been reported to reduces blood sugar levels, improve stability against insulin hormone and protect against HIV as well as it lower risk of heart diseases (Singletary 2008).

A drink was developed by the consolidation of ginger and carbon dioxide. In chemical analysis of the final product the pH of non-carbonated sample A contain least acidic because it was non carbonate and other sample contain different ranges od pH which show presence of carbon dioxide. Both chemical and microbiology characterization of the ginger drink developed falls within the acceptable standard value and the final product contain no harmful microorganisms. The result obtains from different samples indicate that the production of carbonated drink from ginger and carbon dioxide is moderately possible and has various advantage as compare to other carbonated drinks (Abdulkareem, Uthman *et al*. 2011).

Keeping in view the health benefit of various ingredients, the aim of study is to prepare ginger splash with all natural ingredients without using artificial color or preservatives to enhance shelf life. It will use to cure so many diseases i.e. cancer, digestive issues, nausea, diabetes, menstrual pain, inflammation, heat stroke and controls cholesterol levels. In future honey can be used instead of sugar to make a product help in weight loss. Other packaging techniques such as tetra pack can also be used to enhance shelf life of the ginger-based beverage.

Materials and Method

Chemicals and Glassware

Analytical grade chemicals were used for analysis. All glassware was pre-rinsed with 10% HCl followed by deionized water.

Ingredients

Ginger and lemon were purchased from an A-grade fruit and vegetable store, and powdered cumin (Locally available), powdered cinnamon (Shan Foods Pvt. Ltd.), powdered black salt (Locally available.), powdered black pepper (Shan Foods Pvt. Ltd.), powdered cardamom (Shan Foods Pvt. Ltd.) and sugar (locally available) were purchased from local market located at Karachi.

Preparation and Formulation of Ginger Splash

The recipe for preparation of ginger splash is shown in Table-1. Ginger (10 gm) was washed, peeled and pulped. The pulp was filtered through vacuum filter to get the extract of ginger. lemon juice was then added to the ginger extract. Powdered cumin, cinnamon, cardamom and black pepper were mixed with black

salt to make a fine powder. Then sugar was added to the powdered mixture. Spices, ginger and sugar were added in 175 ml water in order to get the clear ginger-based beverage.

Table 1: Formulation of Ginger Splash

S.No	Ingredients (g)	Control	Sample1	Sample2	Sample3
1.	Ginger extract (g/10ml)	Nil	1.0	1.5	2.0
2.	Lemon Juice	6.25ml	6.25ml	6.25ml	6.25ml
3.	Sugar	13.33g	13.33g	13.33g	13.33g
4.	Cumin Powder	0.025g	0.025g	0.025g	0.025g
5.	Cinnamon Powder	0.025g	0.025g	0.025g	0.025g
6.	Cardamom Powder	0.025g	0.025g	0.025g	0.025g
7.	Black pepper Powder	0.025g	0.025g	0.025g	0.025g
8.	Black Salt Powder	1.25g	1.25g	1.25g	1.25g

Organoleptic Evaluation

Standard 9-point hedonic scale procedure was used to carry out the sensory (organoleptic) evaluation of the finally produced ginger splash (Amerine, PANGBORN *et al.* 1965). The mean score of each quality parameter such as overall acceptability, colour, texture, flavor and taste was recorded which was analysed by 20 trained/and semi trained panelist.

Packaging Material and Storage

The prepared beverage was filtered and filled in previously sterilized glass bottles (200 ml) leaving 2.5 cm head space and sealed airtight by crown corking. Then in bottle sterilization was done at 105°C for 10 min and cooled to room temperature and stored at 7 ± 1°C for storage studies according to method prescribed earlier (Anand 1970). Samples were drawn at a regular interval of 15 days and evaluated for various quality attributes.

Proximate Analysis

Proximate analysis of the final product such as pH, acidity, brix, ascorbic acid, antioxidant activity IC50 and phytochemical analysis were carried out according to the standard methods of AOAC (Chemists and Horwitz 1975).

Microbial Analysis

Standard Plate Count (SPC) method was used to record microbial counts. Petri dishes with Potato Dextrose Agar (PDA) as the cultivation medium were kept for incubation at 37 ± 5° C for 2 days. The colonies were counted by colony counter.

Results and Discussion

Table 2: Standardization of Ginger-based Beverage Recipe

Parameters (%)	Control	Sample1	Sample2	Sample3
Colour	7.9±0.02	8.1±0.01	7.5±0.02	8.7±0.02
Mouth Feel	8.0±0.04	8.2±0.03	7.7±0.04	8.6±0.02
Flavour	7.9±0.03	7.9±0.02	7.6±0.03	8.8±0.03
Taste	8.0 ±0.04	8.1 ±0.03	7.5 ±0.04	8.7±0.02
Consistency	7.9±0.01	8.0±0.02	7.7±0.01	8.6±0.01
Overall acceptability	7.94±0.04	8.06±0.03	7.6±0.02	8.68±0.02
Remarks	Control	Not Selected	Not Selected	**Selected**

The sensory score of freshly prepared ginger-based beverage with respect to color, mouth feel, flavor, taste, consistency and overall acceptability has been summarized in Table 2. The sensory analysts recommended the sample3 on the

basis of overall acceptability, which was found to be above average. The sample3 contains the highest amount i.e 2g/10ml of ginger extract.

The colour was observed to be 7.9 and 8.6 for control and sample3. The score for mouth feel for control and sample3 was 8.0 to 8.6. Flavour score for control and sample3 was found to be 7.9 to 8.8. The taste scores for control and sample3 was observed as 8.0 and 8.7. Sample3 was found to be more consistent then the corn based control sample. Both of the products, control and sample3 were found to be highly acceptable.

Proximate Analysis of Ginger Splash

Table 3: Proximate Analysis of Ginger Splash

Parameters	**Controlled sample**	**Sample 3**
pH	3.5 ± 0.05	3.0 ± 0.05
Acidity(%)	4.0%± 0.002	9.4%±0.001
Brix (°)	17.3	26
Ascorbic Acid (ppm)	4.8 ± 0.1	18.1 ± 0.04
Antioxidants IC50 (ppm)	210.76 ± 0.05	85.65 ± 0.04
Microbial Analysis		
Standard Plate Count (CFU/ml)	$3.2x10^7$	$2.8x10^7$

Proximate analysis of ginger splash (ginger-based beverage) have been summarized in Table-3. The results indicate that pH, ascorbic acid, acidity and overall acceptability of ginger splash were affected significantly by changing the ingredients. Antioxidant activity as IC50 was observed to be higher 210.76ppm in control sample than 85.65ppm in freshly prepared ginger-based beverage. It has been reported in the literature that the total phenolic content is an indicator to determine the hydrophilic activity of antioxidants. The more the phenols present in the product, the lower IC50 antioxidant activity will be (Priecina and Karlina 2013). The lower IC50 values show better antioxidant activity of the ginger-based beverage produced in the current study. Plate count value was found to be within the limit i.e. $3.2x10^7$CFU/ml for control and $2.8x10^7$CFU/ml for the sample3 of ginger splash. Ginger based food products are generally resistant to bacterial growth.

Table 4: Phytochemical screening of Ginger Splash

Phytochemical substances	**Tests**	**Results**
Alkaloids Test	Mayer's	+
	Wagner's	+
Cardiac Glycosides Test	Modified Borntrager's	+++
Saponins Test	Froth test	-
	Foam test	-
Triterpenes Test	Salkowski'sTest	++
Steroids Test	LibermannBurchard's test	-
Resins Test	Acetone-water Test	+++
Phenols Test	Ferric Chloride Test	++
Tannins Test	Gelatin Test	++
Flavonoids Test	Alkaline Reagent Test	++
	Lead acetate Test	++

+++: appreciable amount, ++: moderate amount, +: trace amount, - : absence

The presence of various active secondary plant metabolites as revealed by the phytochemical screening (Table 4) supports the resourcefulness of the plant and can justify medicinal properties of ginger-based beavarage. For example, flavonoids are known to be synthesized by plants in response to microbial infection. Tannins have antibacterial and antiseptic properties whereas triterpenes and steroids have analgesic and anti-inflammatory effects (Duke and Allen 2006).

Effect of Storage on Physico-Chemical Parameters of Ginger Splash

A reducing trend was observed in ascorbic acid and in acidity content during storage (Figure-1). The pH of the freshly prepared ginger splash was observed to be 3.0 in first week that increases by the passage of time. On 60 days the pH was observed to be 4.6 indicating acid sugar conversion by acid hydrolysis. Significant change was observed in ascorbic acid content of the samples during 60 days of storage. The titratable acidity of sample reduces from first week to 60 days as 9.4% to 7.9% represent the decrease in tiratable acidity, that may be due to the formation of reducing sugars from non-reducing sugars by the acid hydrolysis through polysaccharides. Decrease in per cent acidity might be due to the slight growth of micro-organism in the beverage (Gomez and Khurdiya 2005, Singh and Kumar 1995).

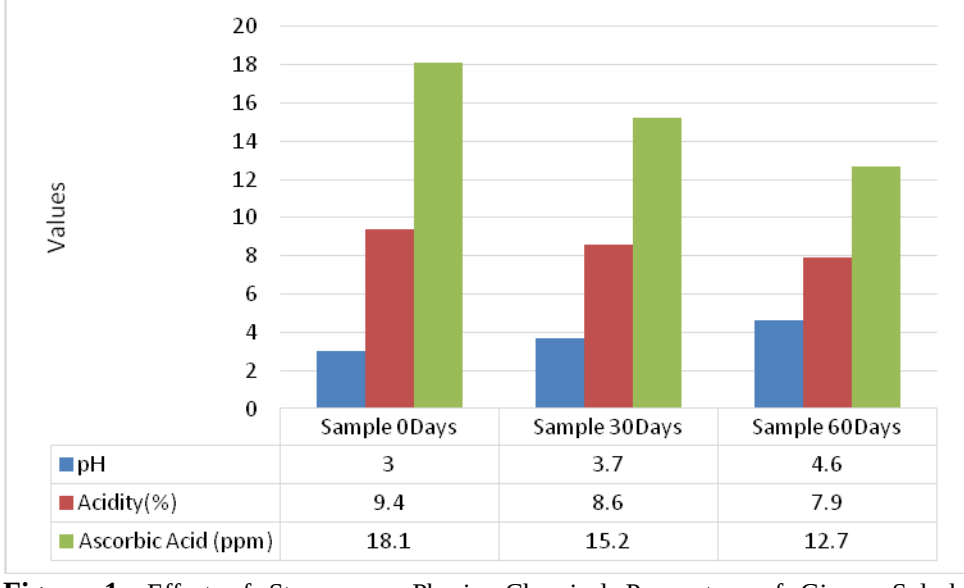

Figure 1: Effect of Storage on Physico-Chemical Parameters of Ginger Splash

Conclusion

The need for production of more health-promoting, nutraceutical properties and affordable drinks prompted the idea of establishing ginger-based beverages. This study is aimed to produce a new innovative ready to drink splash of ginger. Standard methods were applied for sensory analysis and physicochemical (proximate) analysis. Among the various combinations, the newly developed ginger-based beverage containing 2.0g/10ml ginger extract was found to be better for its nutritional quality and sensory evaluation. Both of the products, control and newly established ginger-based beverage have been found highly

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