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Development of Nutraceutical Ready-to-Serve Blends of Ginger and Honey

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Abstract

In the present investigation, an effort has been made to prepare a therapeutic ready-to-serve (RTS) beverage using ginger juice/extracts and honey. The blended RTS was prepared by using different proportions of ginger juice and honeyT_1- 5% ginger extract + 10% honey, T_2- 5% ginger extract + 15 % honey, T_3- 10% ginger extract + 10 % honey, T_4- 10% ginger extract + 15 % honey and T_5- 10% ginger extract without honey (Control), which were stored under ambient conditions. The prepared RTS were analyzed for different biochemical parameters as well as sensory quality. Among the different blends, treatment (T_2) having 5% ginger extract + 15 % honey maintained the bio chemicals with the highest organoleptic quality throughout storage period for overall acceptability. The standardized blend could be an option to increase the consumption of health preventive honey and ginger in a modified form.

INTRODUCTION

Ginger (*Zingiber officinale)* is one of the important medicinal crops belongs to the family Zingiberaceae. It is extensively cultivated in the state of Karnataka, Kerala, Tamil Nadu, Maharashtra, West Bengal, Bihar, Uttar Pradesh, and Himachal Pradesh. Due to its medicinal properties it is broadly used to prevent from joint pain of arthritis, muscular aches, pains, sore throats, cramps, constipation, indigestion, vomiting, hypertension, dementia, fever and infectious diseases. It may also be used by those people who are suffering from gallstones. It contains effective antioxidants such as gingerols, zingerone and vitamin C contents, which has been inconsistent, and may have capacity to blood thinning and reduce cholesterol levels that may make it useful for treating heart disease (Fahlberg, 1969).

Honey is a sweet liquid produced by honey bee from nectar of flowering plants that require insect pollination by honey bee (*Apis mellifera*). It is produced in approximately every corner of the world and India has been known as 'land of honey'. It is used as direct intake sweetener, to promote higher mental efficiency, as an ingredient for cough mixtures, sedatives ayurvedic medicine etc. due to its great food value and several medicinal qualities. It also improves calcium fixation in bones, curing anemia, anorexia and used by diabetic patients as well. It also offers incredible antiseptic, antioxidant, and cleaning properties for our body and health from eye conjunctivitis to athlete foot. Its

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unique taste and aroma have sprung off many cooking ideas and recipes. Honey can be consumed fresh or stored by canning or bottling. Natural honey is available in all over the country and marketing of crude honey poses problems due to its unattractive appearance, presence of waxes, insect eggs etc.

In the general the direct consumption of honey as well as ginger is very less. The consumption of these natural antioxidants could be increased when they are used in the form of beverages. Incorporating both ginger juice and honey can improve the taste, aroma, palatability, and nutritive value. Honey-ginger beverage makes an exciting and refreshing drink. Therefore, the aim of the investigation was to standardize the healthy beverage with good storage stability for enhancing honey consumption, entrepreneurship development and dissemination of standardized technology.

MATERIALS AND METHODS

The investigation was conducted at the Department of Food Science and Technology, Bihar Agricultural University Sabour, Bhagalpur, Bihar. India.

Raw materials

The well-developed ginger rhizomes were procured from the local market, Bhagalpur, Bihar while honey was purchased from the production unit of Bihar Agricultural University Sabour, Bhagalpur Bihar and used for the RTS preparation.

Extraction of pulp

The ginger rhizomes were washed thoroughly in clean running water then peeled and cut in small pieces. In the cut pieces water was added in a ratio of 1:1 and grounded using mixer-grinder. The slurry was left half an hour for sedimentation to obtained clear juice (Ramachandra and Rao, 2008).

Preparation of RTS

Blended RTS were prepared with 5 to 10% ginger extract and 10 to 15% honey using standard method. The 10% ginger extract without honey treated as a control. Here, five treatment combinations were taken to identify best one among all blending ratios. These ratios were T1- 5% ginger extract + 10% honey, T2- 5% ginger extract + 15 % honey, T3- 10% ginger extract + 10 % honey, T4- 10% ginger extract + 15 % honey and T5- 10% ginger extract without honey (Control). The prepared blends were kept in glass bottle with three replications under ambient conditions.

Biochemical analysis

The biochemical parameters of prepared blends were assessed to know their quality at 0, 3, 6 and 9 month of storage. Total soluble solids was measured using ERMA company made hand refractometer at ambient temperature and corrected at 20°C using reference table (Rangana, 2010), whereas the acidity (as citric acid) was determined by using standard N/10 NaOH solution in the presence of phenolphthalein as an indicator, AOAC (2000). The TSS/acid ratios were also calculated with the value of TSS and acidity of different blends. The phenol content of RTS was analyzed during whole storage period using the method of Singleton and Rossi (1965).Sensory evaluation of the products was done by a panel of 10 people of different age groups at 9 Point Hedonic Scale in order to find out the consumer preference (Amerine et al., 1987).

Statistical analysis

All estimations were carried out in triplicate, determinations were made for each attribute and data pertaining to the biochemical and sensory evaluation were statistically analyzed by using the Statistical analysis of the data was done by the method described by Panse and Sukhatme (1978) using C.R.D. factorial experiment.

RESULTS AND DISCUSSION

The RTS were assessed for quality stability during storage following the biochemical and sensory parameters.

Total Soluble Solids

The data recorded on changes in total soluble solids of ginger honey RTS in different combinations during storage is presented in (Table 1). The highest mean TSS content was recorded in T2 throughout the storage. The total soluble solids tended to increase significantly after one month of storage that might be due to the hydrolysis of polysaccharides into monosaccharide and oligosaccharides. Similar results were also reported by Deka and Sethi (2001) in juice blends bael and guava blended RTS (Nidhi et al., 2007)and in guava and pineapple blended RTS (Singh et al., 2007) and Deka (2000) found an increasing trend in total soluble solids during storage at ambient and low temperature in lime - aonla and mango-pineapple spiced RTS beverages.

Acidity

Data pertaining to changes in acidity during storage of RTS is presented in Table 2, which indicates that acidity contents were significantly decreased throughout storage period. This might be due to conversion of acids into salts and sugars by enzymes particularly invertase (Kumar et al., 1992). Ginger juice also inhibits the conversion of acids into sugars and salts by enzymes (Bhardwa and Mukherjee, 2011). Deka (2000) found that the acidity of the RTS beverage prepared from lime- aonla, mango-pineapple, guava- mango blends decreased with addition of spices with advancement of storage period up to six months under different storage conditions. Similar results were found by Tiwari (2000) in guava and papaya blended RTS, and Dhaliwal and Hira (2001) in carrot juice blends.

TSS/ Acid ratio

The data recorded on changes in TSS/ Acid ratio of ginger honey RTS in different blends during storage is presented in Table 3. TSS/ Acid ratio is an important parameter to assess the quality of the product. When the TSS/ Acid ratio is high then product will be more acceptable than poor TSS/ Acid ratio during storage (Siddiqui et al., 2014). TSS/ Acid ratio is significantly higher in T2 than other treatments. It may be inhibitory effect of ginger juice which checked the microbial growth and responsible for higher metabolic rate (Bhardwa and Mukherjee, 2011). However, interaction between treatment and storage period was found non-significant.

Phenol

Data pertaining to changes in phenol contents during storage in ginger honey RTS prepared using different ratio is presented in Table 4. It is evident from the table that total phenols content decreased significantly in all treatment. The least changes were found in T3 and found significantly superior over other treatments. The phenol contents were decreased significantly after first month till the end of storage. Interaction between different treatments and storage period was found non-significant. The phenol compounds play an important role to determining the colour and flavour of a product, but its loss might be due to these compounds are highly volatile and easily oxidizable, which condensed in to brown pigments (Siddiqui et al., 2013). This may probably be due to greater movement of oxygen, water vapour and oxidation of ascorbic acid, organic acid and polyphenols during storage (Bhardwa and Mukherjee, 2011; Arogba et al., 1998). Similar result was also presented by Jain et al. (2003) in aonla juice.

Organoleptic evaluations

Organoleptic quality determines the storage stability of any prepared product (Siddiqui et al., 2013). In this investigation organoleptic scores were decreased gradually with increase in storage period at room temperature and acceptability of blended RTS under studies was maintained up to nine months (Table 5). Temperature plays an important role in biochemical changes that leads to development of off flavour as well as discolouration in the beverages. Reduction in organoleptic quality is obvious and similar result was also reported in storage of pomegranate juice (Waskar and Deshmukh 1995; Jakhar and Pathak, 2012).

Cost/Benefit Ratio

Results pertaining to cost: benefit ratio of blended beverages are given in Table 6. The maximum cost/ benefit ratio was recorded in treatment T5 .Variation in cost: benefit ratio is only due to variation in cost of honey.

Table 1: Changes in total soluble solid contents (° Brix) of ginger-honey RTS during storage

Storage period	Treatment					Mean
	T1	T2	T3	T4	T5	
D1	12.00	17.00	13.00	16.20	15.00	8.13
D2	12.50	17.30	13.50	16.61	15.35	8.36
D3	12.70	17.90	13.30	16.90	15.60	8.49
D4	12.60	17.70	13.50	17.40	15.80	8.56
Mean	12.45	17.48	13.33	16.78	15.44	8.39
CD at 5%						
Treatment (T)	0.3921					
Storage period (D)	0.2614					
Interaction of TxD	NS					

Table 2: Changes in acidity contents (%) of ginger-honey RTS during storage

Storage period	Treatment					Mean
	T1	T2	T3	T4	T5	
D1	0.30	0.30	0.30	0.30	0.30	0.17
D2	0.30	0.29	0.29	0.30	0.30	0.16
D3	0.28	0.28	0.27	0.28	0.27	0.15
D4	0.27	0.27	0.26	0.28	0.26	0.15
Mean	0.29	0.28	0.28	0.29	0.28	0.16
CD at 5%						
Treatment (T)	NS					
Storage period (D)	0.0043					
Interaction of TxD	NS					

Table 3: Changes in TSS/ Acid ratio of ginger-honey RTS during storage

Storage period	Treatment					Mean
	T1	T2	T3	T4	T5	
D1	40.00	56.71	43.36	54.05	50.00	27.12
D2	42.37	59.71	46.42	56.34	52.03	28.54
D3	44.87	63.98	49.29	60.40	57.56	30.68
D4	46.70	66.79	51.77	63.33	60.30	32.10
Mean	43.48	61.80	47.71	58.53	54.97	29.61
CD at 5%						
Treatment (T)	1.7853					
Storage period (D)	1.1902					
Interaction of TxD	NS					

Table 4: Changes in phenol contents (mg GAE/ 100 mL) in ginger-honey RTS during storage

Storage period	Treatment					Mean
	T1	T2	T3	T4	T5	
D1	17.89	19.32	23.13	25.21	15.32	11.21
D2	16.94	18.76	22.56	24.74	14.82	10.87
D3	16.04	17.68	21.89	23.87	13.67	10.35
D4	15.82	17.12	20.97	22.93	12.68	9.95
Mean	16.67	18.22	22.14	24.19	14.12	10.59
CD at 5%						
Treatment (T)	0.436					
Storage period (D)	0.291					
Interaction of TxD	NS					

Table 5: Organoleptic scores of ginger-honey RTS during storage

Treatment	Organoleptic score			
	Duration in Month			
	0	**3**	**6**	**9**
T1	5	5	4.5	4
T2	7.5	7	6	6
T3	6	6.3	5	4
T4	5	5	4.5	4
T5	6.5	6	5	5

Table 6: Cost/Benefit Ratio of ginger-honey RTS

Treatment	Cost				Recovery	Cost/Benefit Ratio
	Ginger Juice	Honey	Others	Total		
T1	3.00	23.00	22.00	48.00	75.00	1:1.56
T2	3.00	33.00	22.00	58.00	75.00	1:1.29
T3	6.00	23.00	22.00	51.00	75.00	1:1.47
T4	6.00	33.00	22.00	61.00	75.00	1:1.23
T5	3.00	3.50	22.00	28.50	50.00	1:1.75

CONCLUSION

Ginger and honey both have an excellent nutritional and medicinal property that is why the combination of both in right proportion makes highly nutraceutical refreshing drink. The data generated during the investigation revealed that TSS of RTS, irrespective of treatments, was increased being maximum in T2 while acidity and total phenol contents were decreased. The highest mean phenol contents were observed in T4. The highest organoleptic score was recorded in T_2 throughout the storage. The cost ratio of T2 was 1:1.29 which is quite lower than other treatments, however as per the sensory score the T2 was treated as the best among all the treatments.

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