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Effect of Physico-chemical changes of RTS beverage bottle gourd juice blends with mint and lemon

Suhani Agarwal and Vishal Kumar

Abstract
Studies were conducted on different blends based on the proportion of juice of bottle gourd (*lagenaria siceraria*), mint (mentha) and lemon (citrus lemon) to find out best blends among those samples and analyzed the vitamin C, protein, total soluble solid and titrable acidity content. Three blends of bottle gourd -mint juice were taken in the ratio of 150:20; 150:30, 150:40 and proportion of lemon were same in all blends. Sensory analysis was carried out for all the three samples. it was found that the sample having the ratio 150:30 had the best acceptability. The juice was processed and filled in hot sterilized glass bottles and thermally processed over a temperature range 65-85 ^{o}C for 15- 30 minutes. The blended juice formed had vitamin C (4.03 mg/ml), protein (0.24%), TSS (8.0 ^{o}brix), titrable acidity (2.2%) and protein was 0.24%. This juice is beneficial for health and is useful for curing various types of diseases due to presence of the nutritional value and some functional properties.

Keywords: bottle gourd, mint, lemon, rts, beverage and storage

Introduction
Bottle gourd is one of the excellent vegetable having most of essential nutrients that are required for a healthy life. Bottle gourd (*Lagenariasiceraria*) belongs to Cucurbitaceous family and commonly known as lauki, dudhi or ghiya in India. Bottle gourd has been cultivated since time immemorial and it is most probably one of the earliest vegetable cultivated by man. This is one of the most important summer season cucurbitaceous vegetable but cultivated in India almost round the years. It is reported to have originated in Africa and widely cultivated throughout the tropics, especially in India, Sri Lanka, Indonesia, Malaysia, Philippines, China, Tropical Africa and South America**.**

In addition to this, the fiber portion helps in preventing constipation and other digestive disorders like flatulence and piles. Ghule e*t al.*, 2006 [9] reported anti-hyperlipidemia and anti-inflammatory activity from extracts of bottle gourd. The fresh juice of the fruit also has antiulcer activity K. Joshi *et. al.*, 2002 [5], hepato-protective, free radical scavenging activity J. R. Deshpande 2007 [4], immuno-modulatory and cardio protective activity J. R. Deshpande 2008 [3] in different animal model systems.

Kiran and Aradhita, 2014 [6], among all the plants of cucurbitaceous family, Legendaria species is the most popular. The bottle gourd belongs to the genus legendaria that is derived from the word Lagena, meaning the bottle. In older literature, it is often referred to as Legendaria Vulgarius (common) or legendaria leucantha (white flower gourd), but it is now generally agreed that the correct name is Legendaria Siceraria (Mol.) sandl. It seems that bottle gourd originated from India because its wild races are still found in Dehradun (high humid area) and malabar costal area, reported of Parle Milind, 2011 [7].

Bottle gourd is rich in thiamin, vitamin C, zinc, iron and magnesium thus helping in improving overall health. The fruit is a good source of B vitamins and a fair source of ascorbic acid. The Gourd fruit juice is used in the treatment of insanity, epilepsy and other nervous diseases. The juice of the fruit is used in the treatment of stomach acidity, indigestion and ulcers. Bottle Gourd helps in constipation. Bottle gourd is not only rich in essential minerals, iron, protein and trace elements; it is also rich in fibre. The bottle gourd contains many healing and medicinal properties. The cooked vegetables is not only easy to digest but also contains cooling, calming (or sedative), diuretic properties.

It contains low calories also has iron, vitamin C and B complex. Regular consumption of this vegetable provides relief to suffering with digestive problems, diabetics and convalescents.

Blending of juice is a way of utilization of under-utilized vegetables, fruits, and spices. This may be attributed to change in dietary habits, taste preferences, and the way of life of present-day consumers. During the last few years the demand for blended juice has been increasing. Therefore, to improve the taste, aroma, palatability, storability and nutritive value of bottle gourd juice, it was thought to be convenient to blend it with highly nutritive juice namely mint. Low thermal processing is an important process enables retaining more color, consistency, fresh flavor, and ascorbic acid content of blend juice products. Acidification may convert low acid juice to an acidic juice and allow the use of milder thermal process conditions. To prepare such natural form of low acid juices, it can be blended with mint and lemon fruits. Both fruits juice have lower pH values and are famous for excellent quality with pleasant flavour, rich in vitamins 'C' and minerals (Ramesh. and Joshi, 2014) [8].

Mint as *Minta Spacata* is a plant that has been long used in diverse cultures, such as India, Middle East and Europe. Mint has a sweet flavour, with a cooling after-sensation. Both, fresh and dried mint are used in preparing a large number of recipes, including curries, soups, chutneys, salads, juices, and ice creams. Mint leaves are rich in minerals and vitamins. They contain Calcium, Phosphorus, Iron, a good amount of vitamin C. Vitamins D and Vitamin E too, and some amount of vitamin B complex. Mint leaves stimulate the appetite, promote digestion, relieve flatulency and biliousness. They are a good tonic for the stomach and liver. They eliminate thread worms in children and relieve them of colic. The lemon is both a small evergreen tree native to Asia, and the tree's oval yellow fruit their medicinal properties are never ending and they add abundant flavor to a variety of dishes. Lemon juice is an excellent source of vitamins C and Vitamin B, proteins, carbohydrates, and phosphorous.

Material and Methods

The present study on "To standardized Ready- To- Serve (RTS) bottle gourd juice blend with mint juice " was carried out in the research laboratory, Department of Food processing, Vaugh School of Agriculture Engineering and Technology, Sam Higgin bottom Institute of Agriculture, Technology, and Sciences, Allahabad.

Blanching and juicing

The bottle gourd was peeled and then cut it in to small pieces using stainless steel slicer machine. It was blanched at 75-80º C temperature for 2-3 minutes to stop enzyme activity. Juice from mint leaves was also extracted after blanching of mint leaves. Lemon was cut into two halves and juice was extracted by squeezing. All the juice samples were filtered with the help of muslin cloth to remove the pulp.

Straining

Juices always contain varying amounts of suspended matter consisting of broken fruit tissues, seed, skin, pectic substances and pieces of pulp were removed by straining through a thick cloth or sieve.

Standardization of Bottle gourd juice

The bottle gourd juices were standardized by using and mixing of different ingredients (Mint juice and lemon juice, black salt and salt) which was used at different proportions as follows and data show in table 1.

Table 1: Formulation of Bottle gourd juice

Parameters	T_1	T_2	T_3
Bottle gourd (ml)	150	150	150
Mint Juice (ml)	20	30	40
Lemon (ml)	05	05	05
Black Salt (g)	0.5	0.5	0.5
Salt (g)	0.5	0.5	0.5

Storage

Thermally processed cooled bottles were stored under ambient conditions (32±2) for 30 days at room temperature which had been analyzed at every 10 day's interval for one month.

Result and Discussion

The study was conducted to prepare the bottle gourd juice by adding mint juice and lemon juice at different proportions for the consumer's acceptance in the laboratory of the Department of Food Processing Engineering, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad (U.P).

Effect on vitamin C

Table 2 shows that the vitamin C content of the nine samples which varied from 3.58 to 4.03 mg/100ml and it was shows that the RTS beverage was acceptable to consumption. The sample T_5 shows the higher amount of Vitamin C content that was 4.03 mg/100 ml and T_6 shows lowest amount of Vitamin C content that was 3.58 mg/100ml. During refrigerated storage of the juice (4ºC) the vitamin C content was decreases after 30 days. Losses of vitamin C during storage of tomato, amla, carrot, carrot-spinach, carrot-pineapple and carrot-beetroot juice have been reported by various authors (Vishal *et al., 2*013) [10].

The vitamin C of the RTS beverage had lost during storage of 30 days. Loss of vitamin C content could be due to thermal degradation during processing and subsequent oxidation during storage period as it is highly sensitive to heat, oxidation and light (Brock *et al.,* 1998) [1]. ANOVA at 5% showed significant results.

Table 2: Effect of Vitamin C content during storage period

Samples	Vitamin C (mg/100ml)			
	0 days	10 days	20 days	30 days
(T_1) 65°C,15 min.	4.01	3.89	3.78	2.80
(T_2) 75°C,15 min.	3.98	3.92	3.86	3.68
(T_3) 85°C,15 min.	3.89	3.78	3.66	3.47
(T_4) 65°C,20 min.	3.72	3.64	3.58	3.49
(T_5) 75°C,20 min.	4.03	3.92	3.75	3.12
(T_6) 85°C,20 min.	3.58	3.42	3.36	2.93

(T_7) 65°C,25 min.	3.64	3.55	3.43	3.28
(T_8) 75°C,25 min.	3.76	3.63	3.48	3.32
(T_9) 85°C,25 min.	3.98	3.65	3.42	3.10

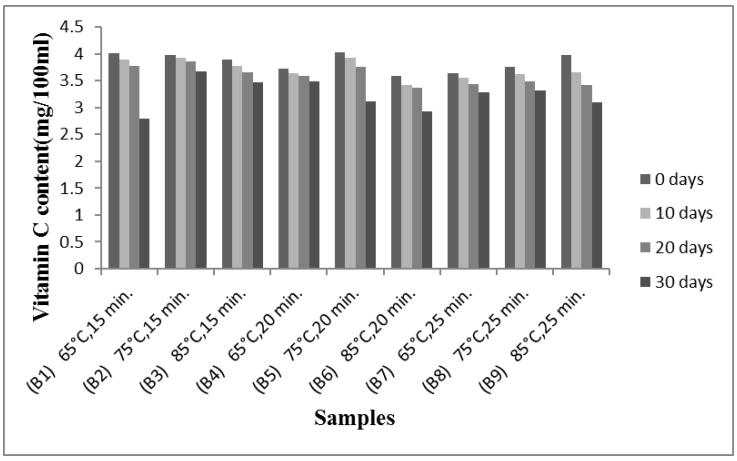

Fig 2: Effect of Vitamin C content changes during storage period of 30 days

Effect on TSS

Table 3 shows the total soluble solid content of the nine samples which was proceeding at different time and temperature. The TSS content of the juice was range from 7-8.5 °Brix and shows that the juice was fit for consumption and has the appropriate amount of the TSS and showed Ready-To-Serve (RTS) product. ANOVA at 5% showed significant results.

The nine samples were proceeding at different time and temperature. The sample T_5 shows the higher amount of TSS and the sample T_3 shows lowest amount of TSS. Total soluble solid increased during the storage period of 30 days this was may be due to the partial hydrolysis of complex carbohydrates (Ghorai and Khurdiya, 1998) [2].

Table 3: Effect of Total soluble solid during storage period

Product	Total soluble solid (^{0}Brix)			
	0 days	10 days	20 days	30 days
(T_1) 65°C,15 min.	7.8	8.2	8.5	8.6
(T_2) 75°C,15 min.	7.4	7.7	7.8	8.0
(T_3) 85°C,15 min.	7.2	7.5	7.6	7.8
(T_4) 65°C,20 min.	7.6	7.9	8.0	8.2
(T_5) 75°C,20 min.	8.0	8.3	8.4	8.6
(T_6) 85°C,20 min.	7.3	7.6	7.7	7.9
(T_7) 65°C,25 min.	7.5	7.7	7.9	8.1
(T_8) 75°C,25 min.	7.4	7.6	7.8	7.8
(T_9) 85°C,25 min.	7.6	7.9	8.0	8.4

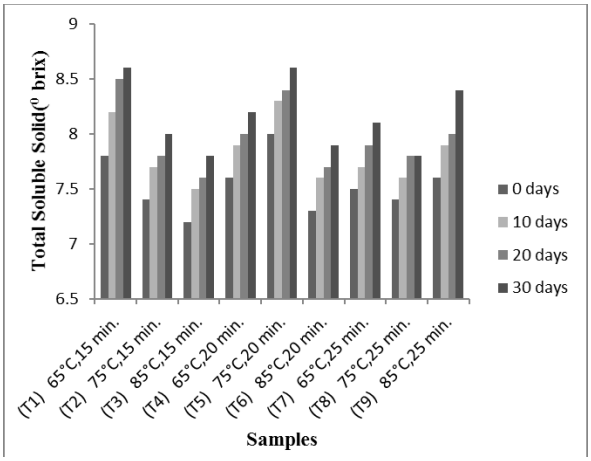

Fig 3: Effect of total soluble solid during storage of 30 days

Effect on Acidity

Table 4 shows the tritable acidity of all nine samples was observed at different time and temperature. The sample T_5 shows higher amount and sample T_6 shows lowest amount of tritable acidity on 0 day. ANOVA at 5% showed significant results.

Tritable acidity was increases during storage period due to the growth of microorganism or conversion of lactose to lactic acid due to mild fermentation and formation of the organic acid inherently present in the RTS beverage during storage of 30 days.

Table 4: Effect of acidity during storage period

Product	Titrable acidity (%)			
	0 days	10 days	20 days	30 days
(T_1) 65°C,15 min.	1.8	2.1	2.4	2.6
(T_2) 75°C,15 min.	1.9	2.0	2.2	2.4
(T_3) 85°C,15 min.	1.7	1.9	2.0	2.2
(T_4) 65°C,20 min.	2.0	2.1	2.3	2.6
(T_5) 75°C,20 min.	2.2	2.3	2.5	2.8
(T_6) 85°C,20 min.	1.7	1.9	2.0	2.2
(T_7) 65°C,25 min.	2.0	2.2	2.3	2.5
(T_8) 75°C,25 min.	2.1	2.3	2.4	2.6
(T_9) 85°C,25 min.	1.9	2.2	2.6	2.7

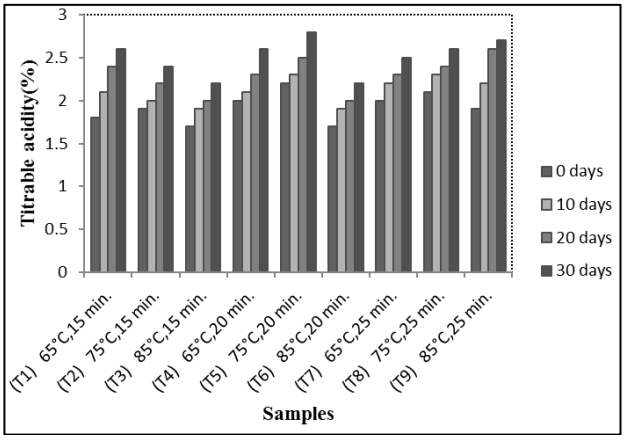

Fig 4: Effect of titrable acidity during storage period of 30 days

Effect on protein content

Table 5 shows the protein content of nine samples which varied from 0.19 to 0.24 %, this was shows the RTS beverage

was poor source of protein. The sample T_5 shows the higher amount of protein that was 0.24 % and the sample T_9 shows lowest amount of protein that was 0.19 %. The decrease in amount of protein may be due to the increase in time and temperature.

The protein content of the RTS beverage was found decrease during storage period. It was shown that bottle gourd blended juice is poor source of protein. ANOVA at 5% showed significant results.

Table 5: Effect of Protein content during the storage period

Product	Protein (%)			
	0 days	10 days	20 days	30 days
(T_1) 65°C,15 min.	0.21	0.20	0.17	0.16
(T_2) 75°C,15 min.	0.219	0.208	0.201	0.19
(T_3) 85°C,15 min.	0.217	0.206	0.203	0.20
(T_4) 65°C,20 min.	0.22	0.216	0.212	0.19
(T_5) 75°C,20 min.	0.24	0.22	0.20	0.18
(T_6) 85°C,20 min.	0.21	0.18	0.17	0.15
(T_7) 65°C,25 min.	0.207	0.165	0.14	0.12
(T_8) 75°C,25 min.	0.203	0.18	0.13	0.11
(T_9) 85°C,25 min.	0.19	0.16	0.12	0.10

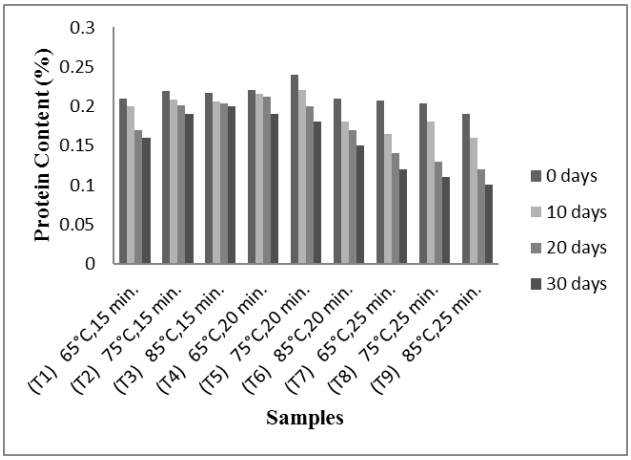

Fig 5: Effect of protein content during the storage period of 30 day

Conclusion

The mint juice adding at different proportion in the bottle gourd juice for the preparation of RTS beverage. Then the developed RTS beverage was juice was processed at 65 °C, 75°C and 85°C for 15 and 20 and 25 minutes respectively and filled hot in sterilized glass bottles. A quality bottle gourd based blend juice could be prepared through blending mint and lemon juices with an application of thermal processing and without adding any chemical and preservatives. the blended juice so prepared was stable and safe for consuming up to 30 days of storage at an ambient condition(32+-2). The process will enable production of quality and stable RTS bottle gourd blend juice as a natural health drink as it satisfied the sensory and physico-chemical criteria.

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