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Optimization and evaluation of physico-chemical parameters of *Ocimum* based herbal RTS

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Abstract
The present investigation entitled "Effect of nutrition, elicitation, extraction intervals on essential oil production and value addition in holy basil (*Ocimum sanctum* L.)" was carried out at College of Horticulture, Venkataramannagudem, Dr. YSR Horticultural University, West Godavari district of Andhra Pradesh during *Kharif* 2018-19 to 2019-20. In the study on optimization of *Ocimum* based herbal RTS blends with *Ocimum*, ginger, lemon and sugar syrup in different ratios, the herbal RTS blend in the ratio 20:5:30:45 recorded the highest overall acceptability of like very much with the colour of the RTS graded as liked extremely, taste and flavour graded as liked moderately. Among the physico-chemical parameters, TSS, total sugars and titrable acidity had gradually increased with the advancement of storage period at ambient temperature conditions. It was observed that blended beverage of *Ocimum*, ginger, lemon and sugar syrup in the ratio of 20:5:30:45 had acceptable acidity at 30 days of storage. pH, carbohydrates, proteins had gradually decreased with the advancement of storage period at ambient temperature conditions. The optimal blended RTS beverage of *Ocimum* with ginger, lemon and sugar syrup in the ratio 20:5:30:45 can be stored for 30 days with acceptable quality as RTS beverage.

Keywords: *Ocimum*, RTS, herbal blends and TSS

Introduction
Tulsi (*Ocimum sanctum* L.) is an aromatic sweet smell scented herb omnipresent throughout India and is worshiped in temples and houses of Hindus. Within ayurveda, Tulsi is known as "The incomparable one" "The mother medicine of nature" and "Queen of herbs". Tulsi is also reversed as an "elixir of life" that is equal for both medicinal and spiritual properties. This considered a potent adoptogen with adaptation to stress and promotion of homeostasis, the herb has a unique combination of pharmacological action, that promote well-being and resilient.

Blending of *Ocimum*, lemon and ginger juices together will improve the nutritional value of the juices and also the antimicrobial effects. It has various health benefits. The researchers have proved that its beneficial effects are found across quite a few categories of medicinal activities, including anti-stress, anti-lipidemic, anti-diabetic and glycaemic lowering properties (Biswas and Chowdary, 2010). Ginger has strong antibacterial and to some extent antifungal properties. In vitro studies have shown that active constituents of ginger inhibit multiplication of colon bacteria. Ginger is also used in Chinese and Japanese medicines for cholesterol and blood glucose lowering effects (Hirdyani and Soni, 2015). Lemon juice is rich in vitamin C, responsible for a series of health benefits, it reduces the body heat and increases the appetite (Thamilselvi *et al*. 2015).

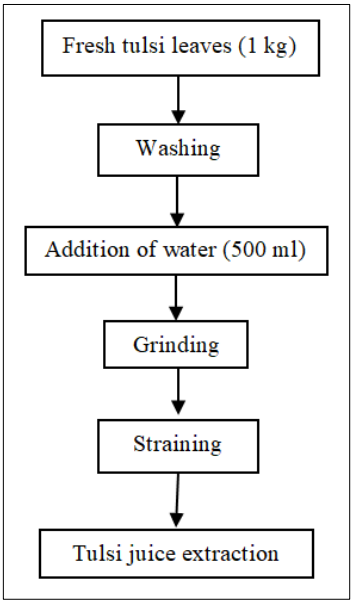
Materials and Methods
Studies on optimization of blends and sensory evaluation of *Ocimum* based herbal RTS beverage during storage was carried out at Post Harvest Technology Research Station, College of Horticulture, Venkataramannagudem, West Godavari district of Dr. Y.S.R. Horticultural University, Andhra Pradesh during the year 2018-19. The material and methods adopted during the course of investigation are presented here under.

Collection of material
The fresh and green *Ocimum* leaves bought from the field, where as ginger, lemon and sugar were procured from the local market.

Extraction from tulsi leaves

Fresh holy basil leaves were washed and then blended in pestle mortar, the thick paste was used to extract the juice with the help of distilled water and muslin cloth. Appropriate quantity of that juice was then used in different ratios in the preparation of the RTS drink.

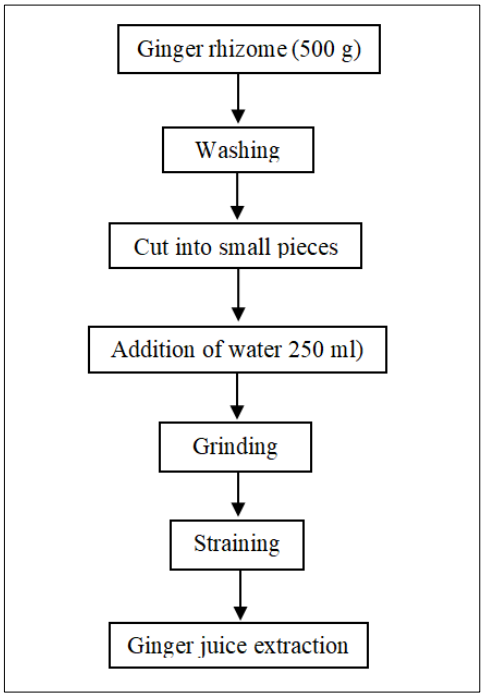
Extraction of tulsi juice



Extraction of ginger juice

Ginger was first cut into small pieces and then blended very finely in a pestle mortar. Juice was extracted using distilled water.

Extraction of ginger juice



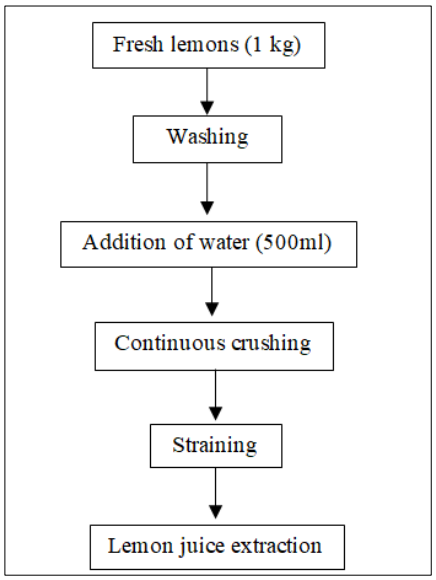
Preparation of sugar syrup

Sugar syrup was made using 100 gms of sugar and 50 gms of water heated to 102°C for 10 mins then filtered. The final brix was maintained at 15° Brix.

Extraction of lemon juice

Lemons were separately washed and the juice was extracted and strained to remove seeds and fibres usin Sg cheese cloth.

Extraction of lemon juice



Flow chart for processing of *Ocimum* based herbal RTS

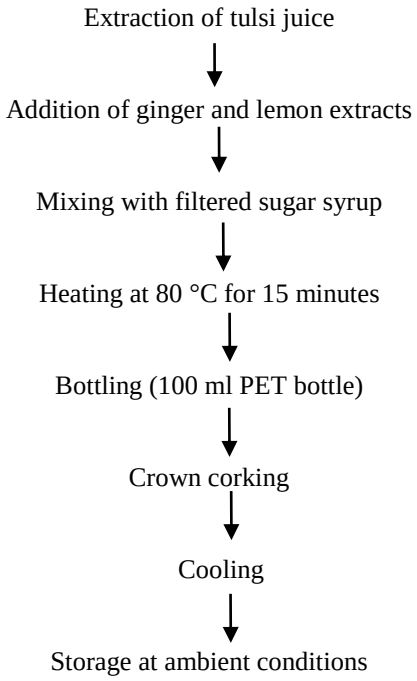


Table 1: Blending ratios of RTS beverage

Treatment	Tulsi extract	Ginger extract	Lemon juice	Sugar syrup	Total volume
T1	10 ml	5 ml	40 ml	45 ml	100 ml
T2	15 ml	5ml	35ml	45ml	100 ml
T3	20 ml	5ml	30ml	45ml	100 ml
T4	25 ml	5ml	25ml	45ml	100 ml
T5	5 ml	10ml	40ml	45ml	100 ml
T6	5 ml	15ml	35ml	45ml	100 ml
T7	5 ml	20ml	30ml	45ml	100 ml
T8	5 ml	25ml	25ml	45ml	100 ml

(RTS will be stored up to 3 months and data will be taken for every 15 days intervals).

Physico-chemical properties

Sensory evaluation

The sensory evaluation of *Ocimum* based herbal RTS was done immediately after preparation for optimizing the best blend.

Table 2: 9-point Hedonic scale

9 - Like Extremely
8 - Like Very Much
7 - Like Moderately
6 - Like Slightly
5 - Neither Like nor Dislike
4 - Dislike Slightly
3 - Dislike Moderately
2 - Dislike Very Much
1 - Dislike extremely

The RTS prepared from different blends were stored under ambient conditions and the sensory evaluation was done at 0, 15, 30, 45, 60, 75 and 90 days during storage.

The quality attributes such as colour, taste, and overall acceptance were assessed by a panel of 10 semi trained members who scored on a 9 point Hedonic scale (Amerine *et al.* 1965).

Total soluble solids (°Brix)

The total soluble solids were determined by using Hand Refractometer and expressed in °Brix as followed by Ranganna (1986).

Titrable acidity (%)

A quantity of 10 ml of sample was taken in a 100 ml volumetric flask and the volume was made up with distilled water. From this an aliquot of 10 m1 was taken into 100 ml conical flask and one or two drops of phenolphthalein indicator was added and titrated against 0.1 N NaOH until faint pink colour was obtained which persists at least for 15 seconds, as end point as followed by (Ranganna, 1986). For the preparations of 0.1 N NaOH, a quantity of 4 g of Sodium Hydroxide was dissolved in small quantity of water initially and the volume is made up to 100 ml by addition of distilled water.

$$\text{Titrable acidity (\%)} = \frac{\text{Titrate value} \times \text{Equivalent weight of acid} \times \text{N of NaOH} \times 100}{10 \times \text{weight of sample (g)} \times 100}$$

Total sugars (%)

Total sugars were determined following the method described by Lane and Eyon (AOAC, 1965). A quantity of 50 ml lead free filtrate was taken in a I 00 ml volumetric flask to which 5 ml of concentrated HCI was added, mixed well and then kept for 24 hours at room temperature. Acid was then neutralized with NaOH using a drop of phenolphthalein indicator till the pink colour persisted for at least few seconds. Then volume was made up to 100 mi. Total sugars were then estimated by taking this solution in a burette and titrating it against standard Fehling's solution mixture of A and B (1: 1) using methylene blue as an indicator taking brick red colour as an end point.

$$\text{Total sugers (\%)} = \frac{\text{Dilution factor} \times \text{volume made up} \times 100}{\text{Titrate value} \times \text{weight of sample taken}}$$

pH

The pH of the herbal RTS was recorded with the help of pH meter.

Statistical analysis

The data obtained during September to November, 2018 were analyzed statistically by following standard methods developed by Panse and Sukhatme (1985) for Complete Randomized Design (CRD). Statistical significance was tested by using 'F' value at 5 percent level of significance. Critical difference at 5 percent level was worked out for the effects which were found significant.

Results and Discussion

This RTS drink has been prepared by mixing *Ocimum* with ginger, lime and sugar syrup.

An optimal RTS beverage should have 10% fruit juice, 10% TSS and titrable acidity of 0.3% (www. fruitjuice fact.org)

The *Ocimum* based herbal RTS beverage are evaluated for optimization of blend and influence of storage for 90 days from September to November, 2018. The mean temperature during the period was 28.39 °C and Relative humidity was 76.30% and the results are discussed here.

Optimisation of blends through sensory evaluation

The optimization of *Ocimum* based herbal RTS beverage was under taken to know the suitability of tulsi for herbal RTS. Eight blends were prepared by mixing tulsi with ginger, lime and sugar syrup. The sensory evaluation of the *Ocimum* based herbal RTS beverage with respect to flavour, taste, colour, appearance and overall acceptability were carried out. Accordingly, results obtained are depicted in the tables 3 to 6.

Among the RTS blends the blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 20:5:30:45 recorded the highest overall acceptability (8.2-like very much) and also the colour of the RTS graded as liked extremely (9.1), taste and flavour (7.1, 7.8) graded as liked moderately.

In this experiment, the blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 20:5:30:45 is optimized as best blend because of its good colour, flavour and taste.

Influence of storage on overall acceptability

The *Ocimum* based RTS drink was kept at room temperature (Mean Temp. 28.39 °C and RH. 76.30%) for 90 days. The sensory evaluation was done at an interval of 15 days. The scoring was done using the 9 point hedonic rating test method (Ranganna, 1995) [9].

Taste

Taste of *Ocimum* based herbal RTS beverage had gradually decreased during storage (Table 3). Among the RTS blends, the blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 20:5:30:45 recorded the score of liked slightly after 15 days of storage (6.4) and continued till 30 days (6.0). All other blends were not liked by taste after 15 days of storage under ambient condition.

Flavour

The flavour of *Ocimum* based herbal RTS beverage had gradually decreased during the period of storage under ambient conditions (Table 4). The blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 20:5:30:45 recorded the score of like moderately (7.1) at 15 days of storage and had gradually decreased to like slightly (6.6) by

30 days of storage. This optimized blend was close followed in acceptance for flavour till 15 days by the blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 10:5:40:45 (6.5) and the blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 15:5:35:45 (6.2) till 15 days of storage. However none of the blends under study were liked for flavour after 30 days of storage. The decrease in organoleptic score of flavour might be due to degradation in biochemical constituents and of RTS during storage which leads to development of off-flavours.

Colour and appearance

Colour and Appearance of *Ocimum* based herbal RTS beverage had gradually decreased from initial day to 90 days after storage (Table 5). The blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 20:5:30:45 recorded the score of like very much after 15 days of storage and continued in the grade till 30 days of storage under ambient condition. The score of (7.6, 7.2, 6.5 and 6.1) colour and appearance for this blend have continued to be liked slightly to moderately at 45, 60, 75 and 90 days of storage.

Overall acceptability

The data on sensory score pertaining to overall acceptability of *Ocimum* based herbal RTS blends was tabularized in the Table 6. There was a significant decrease in the score given to the overall acceptability of *Ocimum* based herbal RTS beverage during storage period.

After 15 days of storage, the blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 20:5:30:45 was with a of scale from 7 to 8 indicating its acceptance from like moderately to like very much. This was closely followed by blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 10:5:40:45 (7.3) which scored to moderately liked after 15 days of storage.

After 30 days storage of blends, all the blends were liked slightly. The acceptable and maximum score (6.5) was recorded for the blend of Tulsi, ginger, lemon and sugar syrup in the ratio 20:5:30:45 at 30 days of storage. The score obtained through Hedonic scale (Ranganna, 1995) [9] indicated that RTS blends were not acceptable for consumption after 30 days of storage.

The decrease in score of overall acceptability might be due to degradation in biochemical constituents during storage. The consumer acceptance of *Ocimum* based RTS blends is influenced by its colour, flavour and taste properties. Reduction in overall acceptability score was observed by Bhavyasree (2010) in sweet orange RTS beverages prepared by blending with pomegranate and ginger.

Physico-chemical and sensory evaluation during storage

Total soluble solids (°Brix)

The TSS content of *Ocimum* based herbal RTS beverage has gradually increased with the advancement of storage period at ambient temperature conditions. The total soluble solids (TSS) were initially adjusted to 15°Brix in the final formulations. The highest TSS (16.68°Brix) was recorded with blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 20:5:30:45 after 90 days storage (Table 7). The lowest TSS (15.81°Brix) was recorded with blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 5:15:35:45 after 90 days storage.

This variation in TSS might be due to the breakdown of the complex carbohydrate into simpler soluble sugar during the storage. Similar results were also reported by Hirdyani (2015) in juice blends, Jan and Masih (2012) [6] and Deka and Sethi (2001) [3] found an increasing trend in total soluble solids during storage at ambient and low temperature in lime - aonla and mango pineapple spiced RTS beverages.

Titrable acidity (%)

Titrable acidity in all the blends of *Ocimum* based herbal RTS beverage had gradually increased with the advancement of storage period at ambient temperature conditions (Table 8).

Among all the treatments, 4 out of 8 *i.e.* 20:5:30:45, 25:5:25:45, 5:15:35:45 and 5:25:25:45 recorded (0.27, 0.25, 0.30 and 0.30%) acceptable acidity at 30 days of storage.

All other blends have recorded a Titrable acidity greater than 0.3% by 30 days of storage and hence cannot be accepted as RTS beverage. The increase in acidity may be because of release of H+ ions. Due to oxidation of some components in the drink the H+ ion release had taken place and had increased the acidity (Saeed Akhtar *et al.* 2013) [10]. This increasing trend in acidity was also observed by some previous researchers like Chauhan *et al*. (2012) [2], Biswas and Chowdhury (2015) [1] and Sandhu *et al*. (2001) [11].

Total sugars (%)

Total sugars of *Ocimum* based herbal RTS beverage had gradually increased throughout the storage period at room temperature (Table 9). Total sugars increased from 8.57 to 9.54% for blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 20:5:30:45 at 90 days storage. The increased level of total sugar was probably due to conversion of starch and pectin into simple sugars (Kesharwani *et al.* 2015) [8] and more increase might be due to the faster rate of reaction due to higher temperatures in ambient conditions. Similar trend of increase in total sugars have been reported by Kesharwani *et al.* (2015) [8] in Jamun RTS, Tiwari and Deen (2015) [13] in blended RTS from bael and aloe vera, Kannan and Thirumaran (2002) [7] in jamun RTS beverage.

pH

pH of *Ocimum* based herbal RTS beverage had gradually decreased throughout the storage period under ambient conditions (Table 10). It was observed that the minimum pH (3.23) was recorded in blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 20:5:30:45 after 90 days of storage. This might be due to increase in acidity, as acidity and pH are inversely proportional to each other. Sasikumar *et al.* 2013 [12] also reported that decrease in pH was due to increase in titrable acidity which affects the organoleptic quality of juice.

Carbohydrates (g $100g^{-1}$)

The carbohydrates content of the *Ocimum* based herbal RTS had gradually decreased with the advancement of storage period (Table 11). Maximum carbohydrates (7.46g $100g^{-1}$) content was found in blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 5:15:35:45 after 15 days which had gradually decreased (6.47 g $100g^{-1}$) at 90 days of storage.

Protein (g)

Protein content of *Ocimum* based herbal RTS had gradually decreased with the advancement of storage period (Table 12). It was observed that the maximum protein (3.06 g) was recorded with blended beverage of Tulsi, ginger, lemon and

sugar syrup in the ratio 20:5:30:45 had gradually decreased (2.76 g) after 90 days of storage.

Overall acceptability based on physio-chemical evaluation

An optimal RTS beverage should have 10% fruit juice, 10% TSS and titrable acidity of 0.3% (www.fruitjuicefact.org). Based on the physio-chemical parameters it can be concluded that blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 20:5:30:45 stored under ambient conditions for 30 days is acceptable for consumption as RTS beverage under mean temperature of 28.49 °C and 76.30% Relative Humidity.

Table 3: Effect of storage periods on taste of *Ocimum* based herbal RTS blends

Treatments	0 Days	15 Days	30 Days	45 Days	60 Days	75 Days	90 Days
T1:10:5:40:45	5.6	5.1	4.8	4.1	3.5	2.9	2.4
T2:15:5:35:45	5.2	4.9	4.5s	4.1	3.7	3.0	2.6
T3:20:5:30:45	7.1	6.4	6.0	5.6	4.6	4.5	3.1
T4:25:5:25:45	5.2	4.8	4.6	4.3	3.9	3.2	2.2
T5:5:10:40:45	4.8	4.4	3.9	3.2	2.9	2.3	2.1
T6:5:15:35:45	4.6	4.5	4.0	3.7	3.2	2.6	2.0
T7:5:20:30:45	5.8	5.6	5.5	4.0	3.5	3.1	2.6
T8:5:25:25:45	5.8	5.5	4.1	3.8	3.2	2.8	2.3

Table 4: Effect of storage periods on flavour of *Ocimum* based herbal RTS blends

Treatments	0 Days	15 Days	30 Days	45 Days	60 Days	75 Days	90 Days
T1:10:5:40:45	6.9	6.5	6.1	5.7	4.0	3.7	3.2
T2:15:5:35:45	7.2	6.2	5.1	4.1	3.7	3.5	3.3
T3:20:5:30:45	7.8	7.1	6.6	5.2	4.2	3.8	3.5
T4:25:5:25:45	6.4	6.0	5.3	4.2	3.4	3.2	3.0
T5:5:10:40:45	5.8	5.3	4.1	3.8	3.1	2.7	2.4
T6:5:15:35:45	5.8	5.2	4.1	3.6	3.0	2.5	2.3
T7:5:20:30:45	6.2	5.9	5.2	4.0	3.4	3.1	2.8
T8:5:25:25:45	6.0	5.7	5.1	3.4	3.1	2.9	2.8

9-Point Hedonic scale	
9-Like Extremely	4-Dislike Slightly
8-Like Very Much	3-Dislike Moderately
7-Like Moderately	2-Dislike Very Much
6-Like Slightly	1-Dislike Extremely
5-Neither Like nor Dislike	

Table 5: Effect of storage periods on colour and appearance of *Ocimum* based herbal RTS blends

Treatments	0 Days	15 Days	30 Days	45 Days	60 Days	75 Days	90 Days
T1:10:5:40:45	7.6	7.1	6.8	6.1	5.5	4.9	4.4
T2:15:5:35:45	7.2	6.9	6.5	6.1	5.7	5.0	4.1
T3:20:5:30:45	9.1	8.4	8.0	7.6	7.2	6.5	6.1
T4:25:5:25:45	7.2	6.8	6.6	6.3	5.9	5.2	4.2
T5:5:10:40:45	6.8	6.4	5.9	5.2	4.9	4.3	4.1
T6:5:15:35:45	6.6	6.5	6.0	5.7	5.2	4.6	3.9
T7:5:20:30:45	8.8	8.2	7.9	7.4	6.8	6.1	5.7
T8:5:25:25:45	8.2	7.5	6.7	6.5	5.9	5.5	5.1

Table 6: Effect of storage periods on overall acceptability of *Ocimum* based herbal RTS blends

Treatments	0 Days	15 Days	30 Days	45 Days	60 Days	75 Days	90 Days
T1:10:5:40:45	7.6	7.3	6.0	4.2	3.5	3.1	2.8
T2:15:5:35:45	7.2	6.8	6.1	5.0	4.7	4.2	3.7
T3:20:5:30:45	8.2	7.5	6.5	5.3	4.7	4.3	3.8
T4:25:5:25:45	7.7	6.1	5.8	5.0	4.6	4.2	3.8
T5:5:10:40:45	6.9	6.8	5.2	4.8	4.5	4.0	3.5
T6:5:15:35:45	6.5	6.3	5.0	4.7	4.2	3.9	3.2
T7:5:20:30:45	5.8	5.5	5.0	4.7	3.8	3.3	3.0
T8:5:25:25:45	5.0	4.7	4.2	3.9	3.5	3.1	2.9

9-Point Hedonic scale	
9-Like Extremely	4-Dislike Slightly
8-Like Very Much	3-Dislike Moderately
7-Like Moderately	2-Dislike Very Much
6-Like Slightly	1-Dislike Extremely
5-Neither Like nor Dislike	

Table 7: Effect of storage period on TSS of *Ocimum* based herbal RTS blends

Total soluble solids (°Brix)							
Treatments	**0 Days**	**15 Days**	**30 Days**	**45 Days**	**60 Days**	**75 Days**	**90 Days**
T1:10:5:40:45	15.00	15.22	15.34	15.40	15.66	15.85	16.05
T2:15:5:35:45	15.00	15.18	15.28	15.35	15.57	15.78	15.89
T3:20:5:30:45	15.00	15.34	15.55	16.05	16.23	16.44	16.68
T4:25:5:25:45	15.00	15.21	15.31	15.38	15.62	15.81	15.92
T5:5:10:40:45	15.00	15.15	15.26	15.32	15.46	15.62	15.85
T6:5:15:35:45	15.00	15.15	15.24	15.29	15.38	15.58	15.81
T7:5:20:30:45	15.00	15.25	15.47	15.81	16.01	16.22	16.45
T8:5:25:25:45	15.00	15.23	15.44	15.63	15.80	16.01	16.21
		S.Em ± 0.10	S.Em ± 0.02	S.Em ± 0.03	S.Em ± 0.03	S.Em ± 0.03	S.Em ± 0.03
		CD 0.03	CD 0.08	CD 0.09	CD 0.09	CD0.09	CD 0.11

Table 8: Effect of storage period on titrable acidity of *Ocimum* based herbal RTS blends

Titrable acidity (%)							
Treatments	**0 Days**	**15 Days**	**30 Days**	**45 Days**	**60 Days**	**75 Days**	**90 Days**
T1:10:5:40:45	0.24	0.35	0.38	0.41	0.43	0.47	0.49
T2:15:5:35:45	0.22	0.30	0.35	0.38	0.40	0.44	0.48
T3:20:5:30:45	0.18	0.24	0.27	0.31	0.34	0.38	0.41
T4:25:5:25:45	0.17	0.22	0.25	0.28	0.31	0.34	0.37
T5:5:10:40:45	0.26	0.30	0.33	0.34	0.38	0.40	0.42
T6:5:15:35:45	0.25	0.28	0.30	0.31	0.35	0.38	0.40
T7:5:20:30:45	0.21	0.33	0.34	0.37	0.40	0.43	0.45
T8:5:25:25:45	0.20	0.27	0.30	0.34	0.38	0.40	0.43
	S.Em + 0.007	S.Em + 0.012	S.Em + 0.010	S.Em + 0.011	S.Em + 0.009	S.Em + 0.012	S.Em + 0.022
	CD 0.021	CD 0.036	CD 0.029	CD 0.032	CD 0.027	CD 0.036	CD 0.066

	0-30 days; September, 2018	**45-60 days; October, 2018**	**75-90 days; November, 2018**
Mean temperature (°C)	28.09 °C	28.52 °C	28.17 °C
Mean relative humidity (%)	76.59%	77.06%	75.27%

Table 9: Effect of storage period on total sugars of *Ocimum* based herbal RTS blends

Total sugars (%)							
Treatments	**0 Days**	**15 Days**	**30 Days**	**45 Days**	**60 Days**	**75 Days**	**90 Days**
T1:10:5:40:45	7.88	8.02	8.20	8.52	8.64	8.79	8.93
T2:15:5:35:45	8.03	8.15	8.31	8.48	8.79	8.85	9.00
T3:20:5:30:45	8.57	8.66	8.83	9.07	9.25	9.36	9.54
T4:25:5:25:45	8.15	8.26	8.43	8.63	8.85	8.97	9.18
T5:5:10:40:45	7.80	7.93	8.17	8.32	8.53	8.68	8.89
T6:5:15:35:45	7.80	7.89	8.05	8.26	8.46	8.57	8.77
T7:5:20:30:45	8.26	8.38	8.58	8.77	8.95	9.06	9.28
T8:5:25:25:45	8.33	8.43	8.62	8.82	9.07	9.19	9.42
	S.Em + 0.042	S.Em + 0.037	S.Em + 0.035	S.Em + 0.043	S.Em + 0.043	S.Em + 0.036	S.Em + 0.023
	CD 0.126	CD 0.113	CD 0.105	CD 0.131	CD 0.130	CD 0.108	CD 0.070

Table 10: Effect of storage period on pH of *Ocimum* based herbal RTS blends

PH							
Treatments	**0 Days**	**15 Days**	**30 Days**	**45 Days**	**60 Days**	**75 Days**	**90 Days**
T1:10:5:40:45	4.92	4.78	4.64	4.45	4.22	4.12	4.03
T2:15:5:35:45	4.42	4.23	4.13	4.00	3.98	3.84	3.57
T3:20:5:30:45	3.98	3.87	3.74	3.52	3.52	3.37	3.23
T4:25:5:25:45	4.24	4.13	4.03	3.96	3.87	3.75	3.47
T5:5:10:40:45	4.74	4.62	4.52	4.32	4.17	4.03	3.88
T6:5:15:35:45	4.63	4.51	4.34	4.15	4.07	3.96	3.68
T7:5:20:30:45	4.16	4.07	3.93	3.73	3.73	3.59	3.40
T8:5:25:25:45	4.07	3.94	3.82	3.61	3.63	3.49	3.39
	S.Em + 0.017	S.Em + 0.016	S.Em + 0.022	S.Em + 0.018	S.Em + 0.016	S.Em + 0.022	S.Em + 0.025
	CD 0.050	CD 0.050	CD 0.065	CD 0.055	CD 0.047	CD 0.067	CD 0.077

	0-30 days; September, 2018	45-60 days; October, 2018	75-90 days; November, 2018
Mean temperature (°C)	28.09 °C	28.52 °C	28.17 °C
Mean Relative Humidity (%)	76.59%	77.06%	75.27%

Table 11: Effect of storage period on carbohydrates content of *Ocimum* based herbal RTS blends

Carbohydrates (g 100 g-1)							
Treatments	**0 Days**	**15 Days**	**30 Days**	**45 Days**	**60 Days**	**75 Days**	**90 Days**
T1:10:5:40:45	7.40	6.90	6.82	6.68	6.49	6.23	6.01
T2:15:5:35:45	7.60	7.11	7.04	6.86	6.67	6.45	6.27
T3:20:5:30:45	7.21	6.74	6.58	6.41	6.20	6.01	5.67
T4:25:5:25:45	7.53	7.02	6.88	6.74	6.58	6.31	6.07
T5:5:10:40:45	7.71	7.33	7.13	6.98	6.85	6.61	6.38
T6:5:15:35:45	7.78	7.46	7.31	7.09	6.97	6.62	6.47
T7:5:20:30:45	7.30	6.80	6.64	6.44	6.25	6.05	5.82
T8:5:25:25:45	7.37	6.85	6.74	6.48	6.35	6.18	5.95
	S.Em + 0.01	S.Em + 0.03	S.Em + 0.03	S.Em + 0.03	S.Em + 0.03	S.Em + 0.04	S.Em + 0.03
	CD 0.03	CD 0.10	CD 0.11	CD 0.09	CD 0.09	CD 0.13	CD 0.11

Table 12: Effect of storage period on protein content of *Ocimum* based herbal RTS blends

Protein (g)							
Treatments	**0 Days**	**15 Days**	**30 Days**	**45 Days**	**60 Days**	**75 Days**	**90 Days**
T1:10:5:40:45	2.88	2.84	2.80	2.77	2.71	2.66	2.62
T2:15:5:35:45	2.79	2.72	2.69	2.64	2.60	2.57	2.53
T3:20:5:30:45	3.06	3.00	2.96	2.91	2.85	2.80	2.76
T4:25:5:25:45	2.84	2.81	2.78	2.74	2.69	2.64	2.58
T5:5:10:40:45	2.75	2.69	2.66	2.62	2.59	2.55	2.49
T6:5:15:35:45	2.69	2.65	2.61	2.58	2.51	2.47	2.43
T7:5:20:30:45	2.98	2.95	2.91	2.87	2.82	2.78	2.74
T8:5:25:25:45	2.94	2.89	2.87	2.83	2.79	2.75	2.71
	S.Em + 0.052	S.Em + 0.049	S.Em + 0.048	S.Em + 0.048	S.Em + 0.046	S.Em + 0.044	S.Em + 0.046
	CD 0.157	CD 0.147	CD 0.145	CD 0.144	CD 0.138	CD 0.132	CD 0.139

	0-30 days; September, 2018	45-60 days; October, 2018	75-90 days; November, 2018
Mean temperature (°C)	28.09 °C	28.52 °C	28.17 °C
Mean Relative Humidity (%)	76.59%	77.06%	75.27%

Conclusion

- The blend of Tulsi with ginger, lemon and sugar syrup in the ratio of 20:5:30:45 has been optimised and concluded as the most accepted blend based on sensory and physio-chemical evaluations.
- The optimal blended beverage of Tulsi, ginger, lemon and sugar syrup in the ratio 20:5:30:45 stored under ambient conditions for 30 days is acceptable for consumption as herbal RTS beverage under coastal humid conditions.

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