EFFICACY OF BASIL OIL IN PRESERVATION OF ORANGE JUICE

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Abstract: *This study aims to investigate the effects and use of basil oil and honey as natural preservative, obtained from plants in preservation of orange juice. The physicochemical properties like pH, total soluble solids, acidity and ascorbic acid concentration of orange juice mixed with varying concentration of basil oil and honey were studied. Acidity increased from 8.93 to 10.26 mg/ml. The minimum decrease in pH was seen in aliquot F. Aliquots D to F shows gradual increase in stability of ascorbic acid with increase in basil oil concentration. However the minimum % decrease in ascorbic acid concentration was seen in aliquot G. At 8% basil oil concentration 56.62% decrease in ascorbic acid concentration was seen in comparison to 64.38% decrease in fresh squeezed orange juice.. Further increase in basil oil did not result in further decrease in ascorbic acid concentration. Among all the treatments aliquot G was most effective in maintaining nutritional quality during storage.*

Keywords: Orange juice, honey, basil oil, vitamin C and preservation.

1.0 INTRODUCTION

Awareness about health benefits associated with consumption of fresh fruits, vegetables & juices is increasing. This is due to their low content of sodium, cholesterol and fat and high concentration of vitamin C, polyphenols, and antioxidants that play important role in the prevention of heart diseases, cancer, and diabetes [1]. Juice extracted from fruits is acidic. The high moisture content is responsible for the growth of yeast and bacteria. The normal changes to be expected in raw fruit juices at room temperature are an alcoholic fermentation by yeast followed by the oxidation of alcohol and fruit acid by film yeast or mould growing on the surface if it is exposed, or the oxidation of alcohol acetic acid if acetic acid bacteria are present (Macrase, et al, 1997).

Juice is defined as unfermented but fermentable juice, intended for direct consumption, obtained by the mechanical process from sound, ripe fruits, and preserved exclusiely by physical means. The addition of sugars or acids can be permitted but must be endorsed in the individual standard [2-3]. Researchers have reported that artificial preservatives such as nitrates, benzoates, sulphites, sorbates, parabens, formaldehyde, BHT, BHA and several others cause serious health hazards such as hypersensitivity, allergy, asthma, hypersensitivity, neurological damage and cancer. [4]

As an alternative method for preservation of fruit juices, we are looking towards natural preservatives. Honey and Osimum basilicum are well known traditional medicine which are used in daily life.

The antimicrobial activity in most honeys is due to enzymatic production of hydrogen peroxide. However when hydrogen peroxide activity is blocked then to it displays anti bacterial effects. Its mechanism may be related to the low pH levels of honey and its high sugar content (high osmolarity) that is enough to hinder the growth of microbes. [5].

Essential oils (Eos) are aromatic oil liquids, obtained from plant materials, buds, seeds, leaves, twig bark, herbs, wood, fruits and roots, which can be obtained by fermentation, extraction or distillation [6-7]. EOs are constituted of a complex mix of various compounds, including terpenes, alcohols, chetones, phenols, acids, aldehydes, and esters [7]

Essential Oils are lipophiles, thus they can easily enter cells, disrupt the membrane and/or permeabilize it. The most important signs of membrane permeabilization are the loss of ions and the reduction of potential, the collapse of proton pump and the depletion of ATP pool. In eukaryotic cells, EOs cause depolarisation of mitochondrial membranes, influence Ca channels and reduce pH gradient, affecting the proton pump and the ATP pool. The membrane becomes abnormally permeable

resulting in leakage of radicals, cytochrome c, calcium ions, and proteins. Permeabilization of outer and inner mitochondrial membranes causes apoptosis and necrosis and finally cell death; in addition, EOs can cause the coagulation of cytoplasm and some damages to lipids and proteins [8].Comparative studies on the activity of basil--an essential oil from Ocimum basilicum L.--against multidrug resistant clinical isolates of the genera Staphylococcus, Enterococcus and Pseudomonas by using different test method shows the effectiveness of it [9].

The aim of this study is to investigate the effect of adding basil oil & honey in orange juice on its some physicochemical properties like vitamin C concentration, pH, titrable acidity and brix value.

2.0 METHODOLOGY

2.1Reagents:

Ascorbic acid p a, I_2 0.01 N, KIO_3 0.1 N, $Na_2S_2O_3$ 0.1 N, KI 10%, H_2SO_4 2N, 1% starch solution, distilled water and NaOH solution.

2.2 Fruit materials:

The oranges used in this work were obtained from the local market in Bharuch, Gujarat. The fruit leaves were removed out, followed by washing prior to juice preparation.

2.3 Juice preparation

Clean fresh oranges were peeled, followed by juice extraction using a manual juice extractor for orange. The juices were then filtered. The juice obtained was collected in a glass bottle.

The samples of study were A-Fresh squeezed juice, B- fresh squeezed juice with 10% raw honey (honey without any processing), C- fresh squeezed juice with 2% basil oil, D- fresh squeezed juice with 10% raw honey and 2% basil oil, E- fresh squeezed juice with 10% raw honey and 4% basil oil, F- fresh squeezed juice with 10% raw honey and 6% basil oil, G- fresh squeezed juice with 10% raw honey and 8% basil oil, H- fresh squeezed juice with 10% raw honey and 10% basil oil, I- fresh squeezed juice with 10% raw honey and 12% basil oil.

No synthetic preservatives were added to the juices and no thermal treatments applied to the juices. All juices were kept in closed glass containers at temperature 20 ^oC.

2.4 Honey:

Honey was purchased from a villager in Zamar Kotada, Udaipur, Rajasthan. He collected about 500ml of honey by breaking the bee hive. This raw honey was as such used in the research work.

2.5 Basil oil preparation

Leaves of Osimum basilicum were steam distilled to get the basil oil in the laboratory. The essential oil was collected, dried with anhydrous sodium sulfate, and stored at 4 ^oC until used.

2.6 Chemical analysis

- Acidity was determined by titrating against 0.01 N NaOH using phenolphthalein as indicator (Shrivastav & Sanjeev 2003)
- Digital pH meter (Zeal Tech) was used to calculate the pH values.

- The total soluble solids (TSS) were determined by using EMRE refractometer at room temperature (AOAC, 1984). The refractive indexes being corrected for citrous fruits to calculate total.

- Vitamin C content in fresh orange juice was determined using a direct iodimetric titration. An aliquot of 5 ml of fresh juice was placed in a 50 ml flask and then 2 ml of starch indicator was added. Sample was titrated with 0.01 N iodine solution which was previously standardized with sodium thiosulfate in the matrix of potassium iodide. Prior to using, the sodium thiosulfate solution was standardized with a primary standard solution of potassium iodate in acidic environment. A blank titration was performed prior to titration of each sample (n = 4). Each ml of 0.01 N iodine is equivalent to 0.8806 mg ascorbic acid [10]. Results were calculated as mg of L-ascorbic acid per 100 ml of orange juice. Each sample was prepared and analysed in duplicate.

3.0 RESULTS AND DISCUSSION

The activity of basil oil as preservative had significant effect on retention of ascorbic acid in orange in presence of honey. There was decrease in ascorbic acid concentration from 34.75 mg to 13.91 mg per 100 ml at 20°C over a period of 3 months. Result shows that minimum percentage decrease in ascorbic acid content was recorded in sample G and maximum percentage decrease in sample A . Sample B showed decreased vitamin C concentration on the 15th as compared to other samples. Most effective dose of basil oil appears to be 8% as we can see percentage decrease in ascorbic acid concentration from 64.38 to 56.62 (Table 1).

Acidity of samples (A to I) increased from 8.93 to 10.26mg/ml. Maximum percentage increase in acidity was seen on addition of honey. Addition of basil oil seems to compensate the increase in acidity due to addition of honey in the orange juice. The percentage increase in acidity from D to I is from 14.65 to 15.53.

The mean pH value decreased from 3.27 to 2.03 (Table 4). Total dissolved solids and pH did not show much effect on increase in basil oil concentration (Table 3).

4.0 DISCUSSION

Results obtained indicated that addition of basil oil and honey had a significant effect on stabilizing the vitamin C, the nutritional factor of fresh squeezed orange juice. There was a gradual decrease in mean ascorbic acid from 34.75 mg to 13.91 mg/100g. Most effective dose of basil oil appears to be 8% which showed reduction in ascorbic acid degradation from 64.38 to 56.62%.

5.0 CONCLUSION

From the study it can be concluded that 8% concentration of basil oil with 10% honey had significant preservation properties for fresh squeezed orange juice.

6.0 ACKNOWLEDGEMENT

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Table1. Effects of treatments and storage on ascorbic acid (mg/100g) of Orange juice

	Intervals (Days)							Mean	% Decrease
	1st	15th	30 th	45 th	60 th	75 th	90 th		
A	35.20	23.56	21.12	18.96	16.76	14.56	12.54	20.39	64.38
B	34.90	22.91	20.87	17.45	16.01	14.59	13.49	20.03	61.35
C	35.19	23.51	21.14	18.95	16.76	14.8	13.67	20.57	61.15
D	34.50	23.34	21.23	17.55	16.15	14.65	13.58	20.14	60.64
E	34.61	23.41	21.30	17.59	16.17	14.66	13.6	20.19	60.69
F	34.61	23.54	21.42	17.88	16.29	14.98	13.52	20.32	60.92
G	34.61	23.65	22.32	18.35	16.41	15.37	15.01	20.82	56.62
H	34.61	23.65	22.35	18.38	16.40	15.31	14.92	20.81	56.88
I	34.61	23.67	22.34	18.36	16.39	15..26	14.82	18.60	57.17
Mean	34.75	23.47	21.57	18.16	16.37	13.21	13.91		59.99

Table 2. Effects of treatments and storage on acidity (mg/ml) of Orange juice

	Intervals (Days)							Mean	% Increase
	1st	15th	30 th	45 th	60 th	75 th	90 th		
A	8.78	9.21	9.33	9.45	9.56	9.69	9.95	8.00	10.36
B	8.96	9.27	9.42	9.57	9.66	9.81	10.36	9.58	15.63
C	8.76	9.21	9.32	9.44	9.57	9.71	9.97	9.43	13.81
D	9.01	9.27	9.41	9.57	9.67	9.80	10.33	9.58	14.65
E	9.01	9.26	9.41	9.57	9.67	9.81	10.36	9.58	14.98
F	8.99	9.24	9.40	9.5	9.63	9.78	10.34	9.55	15.02
G	8.96	9.18	9.34	9.45	9.61	9.75	10.33	9.52	15.29
H	8.95	9.17	9.33	9.43	9.60	9.73	10.34	9.51	15.53
I	8.95	9.17	9.41	9.44	9.60	9.72	10.34	9.51	15.53
Mean	8.93	9.22	9.37	9.49	9.62	9.75	10.26		

Table 3. Effects of treatments and storage on TSS (Brix) of Orange juice

	Intervals (Days)							Mean	% decrease
	1st	15th	30 th	45 th	60 th	75 th	90 th		
A	11.1	10.79	10.54	10.23	10.12	10.8	9.76	9.08	12.07
B	18.00	16.65	14.23	13.34	12.56	11.64	10.89	12.35	39.50
C	11.11	10.78	10.53	10.23	10.13	10.81	9.77	9.08	12.06
D	18.03	16.62	14.24	13.43	12.65	11.34	10.78	12.33	40.21
E	18.03	16.62	14.24	13.43	12.65	11.34	10.78	12.33	40.21
F	18.03	16.62	14.24	13.43	12.65	11.34	10.78	12.33	40.21
G	18.03	16.62	14.24	13.43	12.65	11.34	10.78	12.33	40.21
H	18.03	16.62	14.24	13.43	12.65	11.34	10.78	12.33	40.21
I	18.03	16.62	14.24	13.43	12.65	11.34	10.78	12.33	40.21
Mean	16.49	15.33	13.42	12.71	12.08	11.25	10.57		

Table 4. Effects of treatments and storage on pH of Orange juice

	Intervals (Days)							Mean	% decrease
	1st	15th	30 th	45 th	60 th	75 th	90 th		
A	3.34	2.69	2.42	2.33	2.21	2.12	1.99	2.16	40.42
B	3.22	2.66	2.46	2.30	2.20	2.13	2.00	2.14	37.89
C	3.35	2.70	2.41	2.34	2.2	2.13	2.02	2.16	39.70
D	3.24	2.71	2.60	2.50	2.30	2.16	2.02	2.22	37.65
E	3.24	2.71	2.61	2.51	2.32	2.19	2.03	2.23	37.35
F	3.25	2.72	2.63	2.52	2.34	2.20	2.04	2.24	37.23
G	3.26	2.72	2.63	2.54	2.35	2.20	2.04	2.24	37.42
H	3.27	2.72	2.61	2.55	2.36	2.20	2.05	2.24	37.31
I	3.27	2.73	2.62	2.56	2.38	2.24	2.05	2.26	37.31
Mean	3.27	2.71	2.55	2.46	2.30	2.17	2.03		