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Optimization of Health Beverage Prepared from Sugarcane Juice Blended with Spinach and Lime Juice

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ABSTRACT
Maintance of optimal nutrition and positive health of population through assured nutrient in take continues to be a national priority for nation to be healthy strong and productive. The nutritional status of its people must be good in the millennium we are placing the upward trained in nutritional and health awareness which are increased the consumer demand for functional food. The present study was carried out to prepare health beverage by using Sugarcane Juice Blending with Spinach and Lime Juice with the objective to assess the sensory acceptability of the product and chemical properties four beverage formulations were prepared by blending of Sugarcane juice, Spinach juice, and lime juice in ratio: (100:00:00)% (v/v) ; (70:25:5)% (v/v) ; (60:30:10)% (v/v) and (50:35:15)% (v/v) and they were marked as Tσ, T1, T2, and T3 respectively. Each treatment was replicated five times. Sensory evaluation of the product was carried out under the criteria of 9 point Hedonic scale. The data obtained during the study was analysed statistically using variance and critical difference techniques. All the control and experimental treatments were also analysed chemically using AOAC procedure. On the basis of analysis, it was concluded that T2 (60% sugarcane juice, 30% spinach juice and 10% lime juice) was found to be best among the four treatments in case of organoleptically, chemically and micro-biologically point of view.

Keywords: Health Beverage, Sugarcane juice, Spinach juice, Lime juice, Physcio-chemical.

I. INTRODUCTION

The fruits and vegetable based nutritious beverage are popular in good demand in urban areas for the preparation of ready to serve (RTS) beverages. During the off seasons, the pulp or juice of these can be preserved for preparing RTS beverages. Fruit juices processed under hygienic condition could play important role in enhancing consumer's health. Apart from nutritional quality improvement, beverage can be improved in its sensory and flavor characteristics according to their raw materials. **(Akin et al., 2004) .**

100% fruit juices are a smart addition to any well balanced diet, providing vitamins and minerals like folate, potassium, vitamin C. Fruit juices is also a convenient way for adult children to help reach the recommend of daily serving of fruit and vegetables. Juice is a liquid that is naturally contained in fruit and vegetables.

The largest fruit juice consumers are New Zealand (nearly a cup, or 8 ounces, each day) and Colombia (more than three quarters of a cup each day). Fruit juice consumption on average increases with country income level. **(Stephen et al.,2015) .** Fruits juices and its juices constitute one of the most important foods for human beings. Their regular consumption maintains health and make up for the losses in the human diet.

The blending of different fruits juices increases the nutritional profile and the viability of the product **(Okworiet al., 2017)**.

SUGARCANE - is a tropical, perennial grass of the genus Saccharumthat forms lateral shoots at the base to produce multiple stems, typically three to four meters high and about five cm in diameter. The stems grow into cane stalk, which when mature constitutes approximately 75% of the entire plant.Sugarcane juice is the juice extracted from pressed sugarcane. It is consumed as a beverage in many places.Thus it helps in fighting various types of cancer such as prostate and breast cancer and it is proven remedy for Jaundice, helps to maintain a good digestive system. It is the best choice to rehydrate the body and regain lost sugar levels.

SPINACH - (Spinaciaoleracea) is a leafy green flowering plant native to central and western Asia. Its leaves are common edible vegetables consumed either fresh or after storage using preservation techniques by canning, freezing, or dehydration .The nutritional food value of spinach and other green leafy vegetables is greater than the nutritional food valueof almost any other food.

Spinach is also great for helps to stay healthy. While the nutritional food value of spinach is extremely high.Spinach can help to build stronger bones, improve the cardiovascular system within

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body, help improve gastrointestinal system, help eyesight and provide body with iron, which gives energy. These vitamins and nutrients can help body in a lot of different ways.

LIME -(Citrus aurantifolia) juice has been shown to have both medicinal and cosmetic values. The juice contains a high quantity of citric acid giving them their characteristic sharp (tart) flavor. Citrus fruits are notable for their fragrance, partly due to flavonoids and limonoids contained in the rind, and most are juice-laden. **(Colker C.M. 2012).**Limes are good source of magnesium and potassium and help to improve digestion, lower blood presser and reduce inflammation and helps with weight loss.In cooking lime is valued both for acidity of its juice and the floral aroma of its zest.

II. MATERIALS AND METHODS

The ingredients and chemicals used for this work were purchased from the a local market at Gaughat, Prayagraj,UP.

RAW MATERIAL –
Sugarcane juice
Spinach juice
Lime juice
CHEMICAL –
Sodium Benzoate
EQUIPMENTS–
Weighing balance
Grinding machine
MISCELLANEOUS –
Measuring cyclinder, beaker, strainer
PLAN OF WORK –

TREATMEANT COMINATION

	Sugarcane juice (SC)	Spinach juice (SJ)	Lime juice (LJ)
T𝜎	**100**	**00**	**00**
T1	**70**	**25**	**05**
T2	**60**	**30**	**10**
T3	**50**	**35**	**15**

Plan of layout –
Number of replication - 5
Number of treatment – 4

METHOD OF PREPARATION OF SUGARCANE JUICE

Sugarcane
↓
Washing
↓
Peeling
↓
Milling
↓
Filtration/straining
↓
Sugarcane juice

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METHOD OF PREPARATION OF SPINACH JUICE

Spinach leaves

↓

Washing

↓

Cutting

↓

Grinding

↓

Pulping

↓

Filtration/straining

↓

Spinach juice

Flow diagram adopted for preparation of control and experimental health beverage juice.

Control (T_0)	Experimental
Sugarcane	Sugarcane juice
↓	↓
Washing & Peeling	Addition of sodium benzoate (0.3mg)
↓	↓
Milling	Addition of spinach juice and lime juice
↓	↓
Filtration/straining	(T_1= 70:25:05), (T_2= 60:30:10), (T_3= 50:35:15)
↓	↓
Addition of Sodium benzoate (0.3mg)	(SC) (SJ) (LJ), (SC) (SJ) (LJ), (SC) (SJ) (LJ)
↓	↓
Mix properly (Blending)	Mix properly (Blending)
↓	↓
Bottling	Bottling
↓	↓
Pasteurization 63^0C for 30 min (by water bath)	Pasteurization 63^0C for 30 min (by water bath)
↓	↓
cooling	cooling
↓	↓
Storage (5 ± 1^0C)	Storage (5 ± 1^0C)

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Average of data obtained on different parameters of control and experimental health beverage

Parameter	Tσ	T1	T2	T3
1.Physico-chemical analysis				
Carbohydrate%	**13.11**	**10.06**	**9.38**	**9.20**
Protein%	**0.16**	**0.87**	**1.03**	**1.2**
Fat%	**0.40**	**0.39**	**0.36**	**0.37**
Fiber%	**0.56**	**1.02**	**1.28**	**1.47**
Ash%	**0.23**	**0.52**	**0.59**	**0.61**
Total solid%	**14.46**	**12.86**	**12.65**	**12.85**
Moisture%	**85.54**	**87.14**	**87.36**	**87.15**
TSS%	**18.5**	**19.0**	**19.5**	**20.0**
Iron%	**1.12**	**1.49**	**1.60**	**1.55**
Acidity%	**0.95**	**0.33**	**0.28**	**0.28**
pH	**5.0**	**4.8**	**4.7**	**4.58**
Ascorbic acid%	**6.73**	**13.16**	**15.34**	**17.53**
2. Organoleptic score				
Colour& Appearance	**8.20**	**6.60**	**6.40**	**5.80**
Consistency	**4.80**	**5.80**	**7.40**	**4.80**
Flavor	**7.80**	**8.20**	**8.20**	**5.80**
Overall acceptability	**6.93**	**6.87**	**7.33**	**5.47**
3. Microbiological analysis				
SPC(x10^{-3} cfu/ ml)	**6.80**	**13.40**	**14.60**	**8.28**
Coliform	**Nil**	**Nil**	**Nil**	**Nil**
4. Cost of product				
Health Beverage (Rs./Liter)	**100**	**92.5**	**89**	**85.5**

III. RESULT AND DISSCUSSION

Carbohydrate - The highest mean of Carbohydrate percentage was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in Tσ (13.11) followed by ,T1(10.06) ,T2 (9.38) and T3(9.20). It is therefore concluded that there was significant difference between the all treatments which may be ascribed to addition of different level of treatments.

Protein - The highest mean of protein percentage was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in T3 (1.20) followed by T2 (1.03), T1 (0.87) ,Tσ (0.16). It is therefore concluded that there was significant difference between the all treatments which may be ascribed to addition of different level of health beverage.

Fat - The highest mean of fat percentage was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in Tσ (0.40) followed by, T1 (0.39) ,T3(0.37) and T_2(0.36). It is therefore concluded that there was non-significant difference between the all treatments which may be ascribed to addition of different level of treatments.

Fiber - The highest mean of Fiber percentage was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in T3 (1.47) followed by ,T2 (1.276) ,T1 (1.02) and Tσ (0.56). It is therefore concluded that there was significant difference between the all treatments which may be ascribed to addition of different level of treatments.

Ash - The highest mean of Ash percentage was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in T3 (0.61) followed by ,T2 (0.59) ,T1 (0.52) and Tσ (0.23). It is therefore concluded that there was a non- significant difference between the T2 -T3 and all treatments was significant which may be ascribed to addition of different level of treatments.

Total solids - The highest mean of Total solids percentage was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in Tσ (14.46) followed by ,T1(12.86) ,T3 (12.85) and T2(12.636). It is therefore concluded that there was non- significant

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difference between the T1-T3 and all treatments was significant which may be ascribed to by the different level of health beverage.

Moisture -The highest mean of Moisture percentage was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in T2 (87.364) followed by ,T3 (87.15) ,T1 (87.14) and Tσ (85.54). It is therefore concluded that there was non- significant difference between the T1-T3 and all treatments was significant which may be ascribed to addition of different level of treatments.

TSS - The highest mean of TSS percentage was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in T3 (20.0) followed by T2 (19.5), T1 (19.0), Tσ (18.5). It is therefore concluded that there was significant difference between the all treatments which may be ascribed by different level of health beverage.

Iron - The highest mean of Moisture percentage was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in T_2 (1.60) followed by T_3 (1.55), T_1 (1.49) and Tσ (1.12). It is therefore concluded that there was non- significant difference between the T_1-T_3, T_2-T_3 and all treatments was significant which may be ascribed to addition of different level of treatments.

Acidity - The highest mean of TSS percentage was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in Tσ (0.95) followed by T1 (0.33), T2 (0.28), T3 (0.28). It is therefore concluded that there was non-significant difference between the T_1-T_2, T_1-T_3,T_2-$T_3$and all treatments was significant which may be ascribed to addition of different level of treatments.

Ph - The highest mean of pH was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in Tσ (5.0) followed by, T1 (4.8), T2 (4.7) and T_3 (4.58). It is therefore concluded that there was significant difference between the all treatments which may be ascribed to addition of different level of treatments.

Ascorbic Acid - The highest mean of Ascorbic Acid percentage was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in T3 (17.53) followed by T2(15.34), T1 (13.16), Tσ (6.73). It is therefore concluded that there was significant difference between the all treatments which may be ascribed by different level of health beverage.

Organoleptic parameter

Colour& Appearance – The highest mean of Colour& Appearance score was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in T$_\sigma$ (8.20) followed by T_1(6.60), T_2 (6.40) and T$_\sigma$(5.80). It is therefore concluded that there was non-significant difference between the T_1-T_2, T_1-T_3, T_2-T_3 and all treatments was significant which may be ascribed by different level of health beverage.

Consistency - The highest mean of Consistency score was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in T_2 (7.40) followed by T_1 (5.80), T_3 (4.80) and T$_\sigma$(4.80). It is therefore concluded that there was non-significant difference between the T$_\sigma$-T_1, T$_\sigma$-T_3, T_1-T_3 and all treatments was significant which may be ascribed by different level of health beverage.

Flavor - The highest mean of Flavor score was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in T_2 (8.20) followed by T_1 (8.20), T$_\sigma$(7.80) and T_3 (5.80). It is therefore concluded that there was non-significant difference between the Tσ-T_1, Tσ-T_2, T_1-T_2 and all treatments was significant which may be ascribed by different level of health beverage.

Overall acceptability - The highest mean of Overall acceptability score was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in T_2 (7.33) followed by T$_\sigma$(6.93), T_1(6.87) and T_3 (5.47). It is therefore concluded that there was non-significant difference between the Tσ-T_1, Tσ-T_2, T_1-T_2 and all treatments was significant which may be ascribed by different level of health beverage.

Microbiological parameters

SPC - The highest mean of SPC was recorded in the health beverage prepared from Sugarcane juice blended with Spinach and Lime juice in T3 (15.00) followed by T2 (14.60), T1 (13.40), Tσ (6.80). It is therefore concluded that there was non-significant difference between the T_1-T_2, T_1-T_3, T_2-T_3 and all treatments was significant which may be ascribed by different level of health beverage.

Coliform - The coliform count in control and experimental sample were found to be absent.

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