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Research Article

Formulation of a Carbonated Herbal Health Drink with Hemidesmus indicus root extract

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Abstract

The study was done to formulate a drink from an old medicinal herb and retain all the potential benefits with a new taste and flavor. For this an herbal drink was formulated and its quality ascertained. In the first part of the study, syrup was prepared from the raw roots of the herb with addition of acids and flavors. Then this syrup was diluted (in the ratio of 20:80, i.e., 20% syrup and 80% water) further followed by carbonation with the rate of 6.2 g of CO_2 per liter of the diluted drink and bottled. Three samples were prepared namely, Control samples T_0(Control sample, without essence), T_1(Kewada essence) and T_2 (Rose essence). In the next part, prepared samples were subjected to sensory evaluation and chemical analysis when fresh and after regular intervals at room temperature (27±1 °C) and refrigerated temperature (below 7^0C). Microbial analysis of the product was done to check the quality of the herbal drink and self-life of the product. The control sample T_0 was the most acceptable due to its unique taste and flavor, followed by samples T_1 and T_2. The present study entailed to conclude that preparation of a drink with hemidesmus indicus roots extracts gives a new taste and flavor with high nutritional values. This drink can be stored safe for nearly a month if carbonated and storage at refrigerated temperature (below 5^0C).

Keywords: *Hemidesmus indicus*

1. Introduction

Artificial carbonated beverages or soft drink consumption has become a highly visible and controversial public health and public policy issue. Soft drinks are viewed by many as a major contributor to obesity and related health problems and have consequently been targeted to help curtail the rising prevalence of obesity, particularly among children. Soft drinks have been banned from schools in Britain and France, and in the United States. Hence fruit and herbal beverages on a commercial scale has gradually become an important industry. In tropical countries like India, natural beverages provide delicious cold drinks during the hot summer. Due to their nutritive value, they are becoming more popular than synthetic drinks, which at present have large market in many countries.

The present study has been contemplated to formulate a drink from an old medicinal herb (*Hemidesmus indicus*), specifically its roots extract to retain all the potential benefits with a new taste and flavor.

Hemidesmus indicus plant is a slender, twining or prostrate perennial shrub with cylindrical stems. These plants are thickened at the nodes and bear aromatic roots. (Globalherbal, 2005).

These plants are important for its medicinal values. The root and root bark of this plant are considered as tonic, alterative, demulcent, diaphoretic, diuretic and blood-purifying. They are used for the preparation of several well-known Ayurvedic medicines for the treatment of bowel complaints, elephantiasis, fever, nausea, syphilis and vomiting. The medicines prepared from these plants are also prescribed for anorexia, dyspepsia, fever, leucorrhoea, chronic rheumatism, skin diseases, gravel and several other urinary diseases. (Pioneerherbs, 2005).

According to Ayurveda, root is cooling, aphrodisiac, antipyretic, alexiteric, antidiarrheal, astringent to bowels and useful in treatment of fevers, foul body odor, asthma, bronchitis, blood disorders, leucorrhoea, dysentery, diarrhea, thirst, burning sensation, piles, eye troubles, epileptic fits, poisoning, rat bites etc. As per Unani system of medicine, root and stem are laxative, diaphoretic, diuretic and useful in treatment of syphilis and leucoderma. Roots are useful in hemicrania, joint pains and syphilis whereas stem is good in treatment of brain, lever and kidney related diseases. It is also useful in treatment of urinary discharges, uterine complaints, paralysis, cough, asthma etc. (Pioneerherbs, 2005).

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Many researches were conducted to identify the Medicinal properties, Larvicidal effect Protective effect, antioxidant properties and Biochemical chemical properties but no work has been reported about the formulation of new beverage using this herb was reported so far. Therefore, the present study has been contemplated to study the formulation, safety and quality of the herbal beverage prepared from *Hemidesmus indicus root extract*.

2. Materials and methods

The study was conducted per the below experimental plan listed in the table 1.

Table 1: Experimental Plan

Variable/Parameters	Levels	Description
Product	1	Beverage
Samples	3	Control Sample(T_0), Sample with Kewda essence (T_1) and Sample with Rose essence(T_2)
Ingredients	6	Herb root,Water,Sugar,Ascorbic acid Citric acid and Essence.
Storage Condition	2	Ambient and Refrigerated Temperature.
Packaging Material	1	Glass Bottles(Colored Black)
Sample Size	1	100ml

Recording parameters

All the recording parameters are broadly categorized into three sections:

1) *Sensory Parameters* with five levels including Color, Aroma, Flavor, Taste and Overall Acceptability
2) *Physico-Chemical* parameters with three levels including pH, TSS and Vitamin C
3) *Microbiological* aspect is analyzed by Standard Plate Count (SPC) to determine the self-life of the product.

All the ingredients required were gathered from the local market including the root of the herb and three samples were prepared to get a comparative study and different combinations of taste and flavor change. Descriptions of different samples of herbal drink are listed in the below:

- *T_0 CONTROL SAMPLE* (Without Essence) 20% of syrup and water of 80%
- *T_1 KEWDA* (0.5ml/100ml of essence) 20% of syrup and water of 80%
- *T_2 ROSE* (0.5ml/100ml of essence) 20% of syrup and water of 80%

2.1 Formulation of Concentrate

Firstly, the root of the herb is powdered and then mixed with water, thrice the amount of the powder, boiled and left over night.

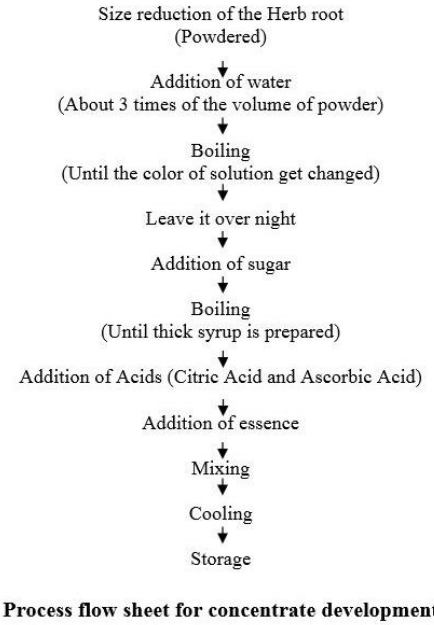

Figure 1 Formulation of Concentrate

Addition of sugar is done on the next day followed by the boiling. The boiling should be continued until desired thickness is achieved. Addition of acids and essences should be done while cooling with proper agitation. At last cooled and stored. This process was repeated thrice to prepare three samples.

2.2 Formulation of Product

After the preparation of the syrup/concentrate it was diluted further to formulate the actual product. Dilution was done at the ratio of 20% syrup and 80% of water. Carbonation is done at rate of 6.2g (CO2) per liter. Then the carbonated drink is filled, sealed and stored.

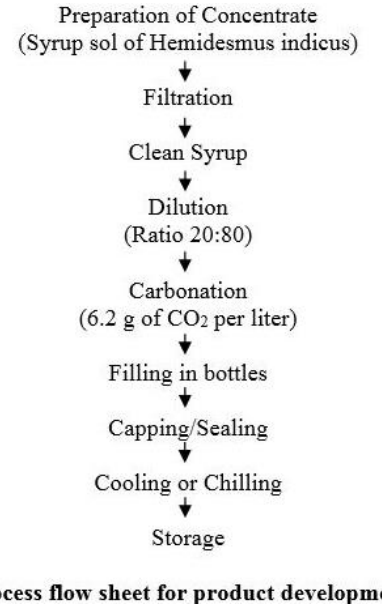

Figure 2 Formulation of Product

2.3 Physico-chemical analysis

The sample with highest acceptability was used for chemical analysis to determine the pH, TSS, Vitamin-C content.

2.3.1 Estimation of pH

pH was determined by the standard method i.e. Ranganna(1986). pH is defined as the logarithm of the reciprocal of the hydrogen ion concentration in gm/ l, it is of importance as a measure of the active acidity which influences the flavor or palatability of a product and effects the processing requirements. The glass electrode pH meter has largely replaced older methods for measuring pH, and is the most quicker and reliable method available. The overall range of pH for common fruits is 2 to 5 and the most common range is between 3 and 4.

2.3.2 Estimation of Total Soluble Solids (TSS)

TSS determination was done as recommended by R. P. Srivastava (2002). Soluble solid may be determined by means of a Hand Refractometer which measures refractive index. Brix is a measure of soluble solids only in case of pure sucrose solution. Generally, fruit juice contains more sugar than any other soluble constituents, and hence brix provides a useful guide of soluble solid or sugar content. Soluble solid other than sucrose does not affect the specific gravity and the refractive index to the same extent as sucrose and the effect on refractive index is not the same as the effect on specific gravity.

2.3.3 Estimation of Ascorbic acid (Vitamin-C)

Vitamin C determination has been done as recommended by R.P.Srivastava(2002).This method is based upon reduction of the dye 2, 6, dichlorophenol - indiphenol by an acid solution of an ascorbic acid. In the absence of interfering substances (Cu, Fe, Sn, etc.) the reduction capacity of the extract of the sample is directly proportional to the ascorbic acid content. The dye solution needs to be standardized every time it is used 5ml of the ascorbic acid standard solution in a small clean conical flask, and 5ml of the 1% oxalic acid solution and titrate with the dye indicator rapidly to faint pink end point that persists for 15sec from the column of the used in the titration. Calculation the ascorbic acid equivalent of the dye in mg/ml.

$$Ascorbic\ acid\ (mg/100g) = EV \times V_1 \times 100/V_2 \times W$$

2.3.4 Sensory analysis of finished Products

Sensory attributes including color, aroma, taste and overall acceptability is determined by hedonic rating tastes as recommended by Ranganna (2007). Hedonic rating taste is used for evaluation of sensory characteristics. This test is used for acceptability by consumer for the product. The detail methodology is presented below. The organoleptic quality of the product will be determined with the help of consumer panel using 9-point hedonic scale (Larmond, 1977) following standard procedure is given by Bureau of Indian standards (BIS, 1971). Sensory attributes include color, odor, flavor, taste and overall acceptability.

2.4 Shelf life study

2.4.1 Standard Plate Count

Standard plate Count (SPC) procedure was used to determine the number of microorganisms in the herbal juice. It is an agar plate method for estimating population of bacteria. The serial dilution (10^{-3}) of the fresh herbal juice was prepared. 1ml of each dilution was transferred so sterilized Petri plate, 10ml of the sterilized melted cooled agar medium was added to each plate and each plate was rotated gently, immediately after addition of the medium for uniform distribution of the organisms and the agar could solidify.

2.5 Statistical analysis

The experiments were conducted by adopting completely randomized design. The data recorded during the course of investigation were statistically analyzed by the 'analysis of Variance' suggested by Gupta (1999). The significant effect of treatment was judged with the help of 'F' (variance ratio). Calculated F value was compared with the table value at 5% level of significance. If calculated value exceeded the table value, the effect was significant. The significance of the study was tested at 5% level.

3. Results and discussion

The studies were conducted 3 phases in a systematic approach to understand the characterization of formulated drink in every aspect. In the first phase, sensory analysis was done by preparing 3 samples ($T_0T_1T_2$) whereas for chemical analysis and microbial analysis only two samples were considered, one sample was kept in ambient temperature (27±1 °C) and the second was kept under refrigerated temperature (below 7^0C).

3.1 Sensory analysis

Sensory or organoleptic evaluation was done to determine the highest consumer acceptability with sensory characteristics like taste, flavor, color and overall acceptability.

3.1.1 Color

Score for Color of the product is listed in the table 3 and same is shown in the graphical figure 3 ANOVA (two-way classification) was carried out at 5% level of

significant for the days. The table indicates that F for the days was 0.099859 which indicates that days play a significant role to influence the color of the product.

3.1.2 Aroma

Aroma of the product varied 0.8 to 1.6 in the scale showing there was some loss of aroma of the product during storage. ANOVA (two-way classification) was carried out at 5% level of significant for the days. The table indicates that F for the days was 0.095645 which shows that day's plays significant role to influence the aroma of the product.

3.1.2 Taste

Taste score of the product sample T_0 was throughout higher than the rest. Secondly there was no significant difference in the scores showing taste of the samples varies very slowly during the storage. ANOVA (two-way classification) was carried out at 5% level of significant for the days. The table indicates that F for the days was 0.095645 which shows that day's plays significant role to influence the taste of the product.

3.1.3 Overall acceptability

Samples of herbal drink were evaluated by panel of judges. Therefore, based on sensory evaluation it was found that the sample T_0, T_1 andT_2 were 8.2 ,7 and 7.3 respectively as given. this depicts that the control sample T_0 without essence stored under Refrigerated temperature was the highest acceptable with mean score varies from 9 to 8.2 whereas sample T_1 i.e. the sample was the least accepted with mean score varies from 8 to 7 among the panel of judges. ANOVA (two-way classification) was carried out at 5% level of significant for the days. The table indicates that F for the days was 0.934426 which shows that days plays significant role to influence the overall acceptability of the product.

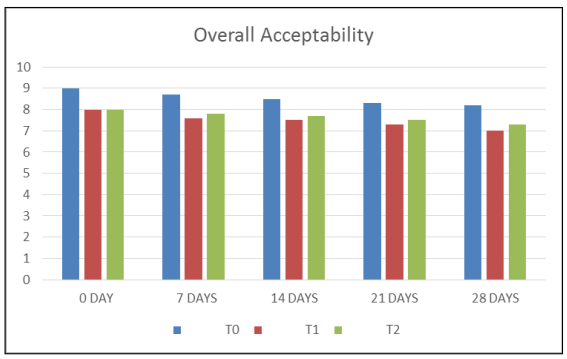

Figure 3 Overall Acceptability of the product

3.2 Chemical analysis

3.2.1 pH level

The effect of storage period and different temperature on pH of the prepared Herbal drink is presented in table. Change in pH level of the sample was observed for 28 days. The prepared Herbal beverage was stored in two different temperature condition (Normal room temperature 25°C±5°C and Refrigeration temperature 4°C to 8°C. ANOVA (two-way classification) was carried out at 5% level of significant for the days. The table indicates that F for the days was 5.60714 which shows that days plays significant role to influence the pH level of the product.

3.2.2 Total Soluble Solids (TSS)

Change in TSS of the sample was observed for 28 days. The prepared Herbal beverage was stored in two different temperature condition (Normal room temperature 25°C±5°C and Refrigeration temperature 4°C to 8°C). TSS of the sample was noted down on interval at every 7th days. ANOVA (two-way classification) was carried out at 5% level of significant for the days. The table indicates that F for the days was 4.642857 which show that day's plays significant role to influence the total soluble solid of the product.

3.2.3 ASCORBIC ACID

Change in Ascorbic acid of the sample was observed for 28 days. The prepared Herbal beverage was stored in two different temperature condition (Normal room temperature 25°C±5°C and Refrigeration temperature 4°C to 8°C). ANOVA (two-way classification) was carried out at 5% level of significant for the days. The table indicates that F for the days was 12.01354 which shows that days plays significant role to influence the Vitamin C level of the product.

The standard deviation of the mean values of Chemical analysis and its parameter is shown in below figure.

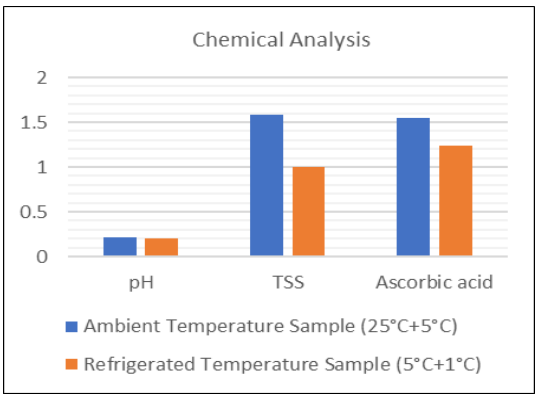

Figure 4 Deviations of pH, TSS and Ascorbic acid content in samples (ambient and refrigerated)

3.3 Microbiological analysis results

The sample was studied for microbiological growth which helped in determination of shelf life of the product. Samples from both the storage conditions (Normal room temperature 25°C±5°C and

Refrigeration temperature (5°C ±1°C) were taken and analyzed at an interval of every 7 days. It was found that the herbal beverage is stabled for one month under Refrigerated condition.

3.3.1 Microbiological analysis of sample under Ambient Temperature (25°C±5°C)

The results of microbiological tests showed that the shelf life of the processed juice under ambient temperature condition (25°C±5°C) was about 15 - 20days. After 20 days, the sample started to deteriorate and microbial count increased dramatically, which showed that the drink was not fit for consumption after 20 days.

3.3.2 Microbiological analysis of sample under Refrigerated temperature (5°C ±1°C)

The results of microbiological tests showed that the shelf life of the processed drink under Refrigerated condition (5°C ±1°C) was about 28 -30days. After 30 days, the sample started to deteriorate and microbial count increased dramatically, which showed that the drink was not fit for consumption after 30 days.

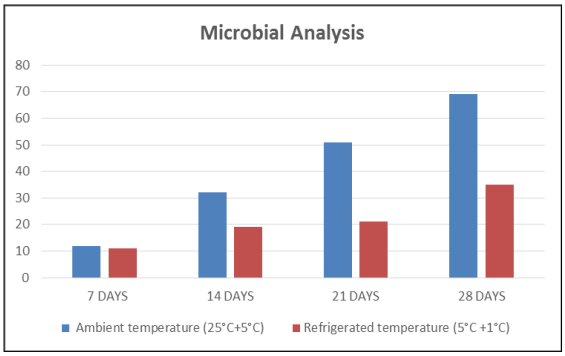

Figure 5 The statistical view of microbial analysis with unit cfu/ml and dilution factor 10^{-3}

Conclusion

The formulation of herbal beverage is possible to satisfy consumer taste and preferences. The herbal drink sample formed without any essence with *Hemidesmus indicus* root extract in drink shows better chemical properties as pH, TSS content and vitamin C content. The herbal drink formed had a high Vitamin-C which showed that the product formed was nutritionally rich.

The herbal drink can be stored effectively and be kept for period of 28-30 days if stored at temperature of (5°C ±1°C). The formed drink is helpful as it fulfills the basic need of vitamin C of our body and it has completely new flavor.

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