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Studies on The Preparation Ofrts Beverage From Soy Whey Blended with Kiwi Fruit Pulp

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ABSTRACT: *A RTS beverage prepared from Soy whey blended with Kiwi fruit pulp is a good option over syntheticCarbonated drink as it is not only fresh, energetic, good appearance, taste and rich nutritional value but herbal and medicinal substances with anti-aging, energy supplying, relaxing, or beauty enhancing effects also. This value added product is rich in protein,Carbohydrate, minerals,vitamins, phyto-chemicals and dietary fibres. Raw materials of RTS beverage prepared from soy wheyare Soy whey and Kiwi fruit. It is prepared by mixing Soymilk whey and Kiwi fruit pulp, in different formulations (v/v), sugar and preservatives (Sodium benzoate and Potassium sorbate). Optimization of the raw materials was done by sensory analysis of the product. Sensory analysis was performed on 9 point hedonic scale by a panel of 10 semi trained members.The beverage samples were evaluated forColor, appearance, flavor, taste and overall acceptability. RTS beverage was stored at room temperature (25-30°C) and refrigeration temperature (4-6°C) for 60 days to evaluateChanges in physico-chemical, microbiological, sensory and beverage making quality parameters at an interval of every 15 days. Effect of storageCondition (temperature) Changed the physico-chemical parameters of RTS beverage. During storage Physico-chemical properties of beverage such as total sugars, pH, acidity, ascorbic acid, and overall acceptability were affected significantly, whereas TSS was not affected. Acidity, reducing sugars, SPC, yeast and moldCount were increased, whereas pH decreased butChanges were insignificant at refrigeration temperature (4-6°C) asComparison to at room temperature (25-30°C). It may be Concluded that RTSbeverage prepared by Soy whey blended with Kiwi fruit pulp Can be prepared successfully with the incorporation of the 70% soya whey, 30 % kiwi fruit pulp and 220 gm sugar.*

Keywords: *Kiwi fruit, Soy whey, RTS Beverage.*

INTRODUCTION

Background

A variety of soft drinks are presently available in the market but majority of them are synthetic Carbonated drinks. So gradually there is a distinct shift towards fruit juice based beverages and many brands like Frooty, Maaza, Treetop, Volfruit, etc., are available in the market. Beverages are very popular across the Country and people from all age groups drink either hot or Cold beverages regularly. Fruit based beverage is a functional beverage which includes vitamins, minerals, amino acids or additional raw fruit or vegetable ingredients, so as to provide specific health benefits that go beyond general nutrition. Functional beverages have become popular due to its appeal to Consumers who are seeking specific health benefits in their foods and beverages. Functional drinks are promoted with benefits such as heart health, improved immunity and digestion, joint health, satiety, and energy-boosting. Whey based beverages are available in the market with incorporated mango, banana, papaya, water melon etc.

Soya based beverages are available in the market such as soymilk and flavored soymilk. Besides the soymilk its whey is also a good source of nutrition by being rich in protein, minerals, Carbohydrate and less fat Content.

Black soybean (*Glycine max(L) merr*) is the world's foremost provider of protein and oil. Soybean is a species of legume that has been found to be native to East Asia. It is available in a wide variety of sizes as well as seed Coat Colors (black, brown, blue, yellow or mottled). The mature bean isCovered with a hull that is hard and water resistant.

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Soybeans have a very high nutritional value, especially large amounts of protein. This makes them the perfect replacement of meat, which is rich inCalories, fats and Carbohydrates. The increasing popularity of soya foods is mainly attributed to the large amount of health benefits which are associated with the use of soya beans. The easiest way to Consume soya is by drinking soya milk. Soy milk is a high protein, iron-rich milky liquid produced by pressing to ground and Cooked soybeans.

FDA has Confirmed that foods Containing soy protein may reduce the risk of Coronary heart disease. Only people with soy allergy (about 0.5 percent of the population) should avoid eating foodContaining soy protein. It has many health benefits, which are Coming from the quality of the soy proteins, dietary fiber, Omega-3 fatty acids, biopeptides, tocopherols, lecithin and from health promoting phytochemicals such as isoflavones, anthocyanin, phytates, saponins and polyphenols. Soya intake reduces osteoporosis, heart disease by reducing total Cholesterol, low density lipoprotein Cholesterol and preventing plaque buildup in the arteries. Skin of black soybean, which Contains anthocyanin, is able to prevent premature oxidation process whichCauses a degenerative disease. In reality, anthocyanin Content in black soybean bigger than blueberries. Black soybean also reduces the risk of diabetes.

Kiwi fruit is from the family ofClimbing shrubs known as Actinidia. It requires a warm and gentle Climate to grow and this's why kiwi fruit is produced in only a few geographic locations including California, New Zealand, Chile, Italy and France. The proper botanical name for the variety of kiwi fruit Consumed today is Actinidia deliciosa, its Common name, "Kiwi fruit," refers to the Kiwi bird, the national symbol of New Zealand, which was one of the primary producing nations of the fruit. In India Kashmir, Manipur and Himachal Pradesh are the largest producers of this fruit. Kiwi fruit provides such nutrients, too, but also offers many extraordinary benefits above and beyond what is normally found in most fruits. In India kiwi in not much more popular like other fruit and peoples are also not aware its nutritional value. It has green Creamy flesh and tiny black seeds in the center. It usually has intense flavour and sweetness. Berries tend to have special Characteristics which give them extra nutrients. The kiwi seeds contain all the nutrients-protein, vitamins, minerals and energy-needed to begin new life. Vitamin E in kiwi fruit does not Causes spoilage even during long storage. They are full of antioxidants and packed with more vitamin C than an equivalent amount of orange.

Kiwi fruit is one of the few fruits that are green at maturity, and chlorophyll is responsible for that colour. Kiwi has much more health benefits, as it reduces Depression, Diabetes, Hypertension, oxidative stress, stress reduction, manage blood pressure, weight Control, good for skin, protects our eyes, prevents asthma and other respiratory diseases, fights Cardiovascular diseases and increases digestive health. Kiwi fruit has been shown to Contain an antimutagenic component, helping to prevent the mutations of genes that may initiate the Cancer process. Kiwi fruit is ranked as having the fourth highest natural antioxidant potential next to the red fruits containing high levels of beta Carotene.

Problem Statement

The study was Conducted on the preparation of RTS beverage prepared from soy whey blended with kiwi fruit pulp. Soy whey is a by-product of soymilk during tofu formation. This whey is rich in protein,Carbohydrate, minerals, vitamins phyto-chemicals and many health promoting substances but there is no any study on the development of beverage by the use of soy whey. Nutritional as well as medicinal value (Antioxidant) of the kiwi is very rich but in India it is not more popular like other fruit.

Objectives of the Study

The objectives of the study are as follows :

(i) Formation of Ready to Serve Beverage from soy whey and kiwi fruit pulp.

(ii) Physico-chemical, Microbiological and Sensory analysis of Ready to Serve Beverage.

(iii) Antioxidant analysis of the Ready to Serve Beverage.

(iv) Storage analysis of the Ready to Serve Beverage.

MATERIALS AND METHODS

Materials

Black soybean wasCarried from Uttarakhand (India) and fresh kiwi fruit and sugar wereCarried from local market.

Chemicals

NaOH, Dragendorff's Reagent (CDH), Molishch reagent (CDH), Methanol (Fisher Scientific), H_2SO_4

(Fisher Scientific), Ninhydrin reagent(CDH), Folin-Ciocalteau reagent (HPLC), Sodium Carbonate (HIMEDIA), DPPH (HIMEDIA), Ethanol (Chanshu Yangyuan), Ascorbic Acid Sodium Carbonate (HIMEDIA), PDA, LB Media, Sodium benzoate, Sodium alginate, Sudan IV (CDH), Iodine resublimed (MERCK).

Instruments

Erma hand refractometer, Perkin Elmer UV/Vis Spectrophotometer lambda 35, Eppendorf ultra Centrifuge 5804 R, Synergy H1 Hybrid Reader (Biotek), Muffle furnace, Oven, Microwave.

Extraction of Whey From Black Soybean (Glycine Max(L) Merr)

The process of extraction of whey from black soya bean had three steps

(a) Preparation of soymilk

(b) Coagulation of soymilk byCitric acid

(c) Filtration of milk by using muslinCloth

Preparation of Kiwi Pulp

Dust and dirt of fresh kiwi fruits were removed by washing with fresh running water. The skin of the kiwi fruit was gently removed with the help of knife. Chopping of kiwi fruit was done in small pieces. These pieces were grinded in Chroma grinder to get pulp. This pulp was taken in sterilized bottle and heated for 2 min at 80°C and Cooled in Cold water.

Processing of RTS

RTS was formed by mixing soymilk whey, kiwi fruit pulp, sugar and preservative in different formulation (v/v), given in table 2.1. Selection of the sample was done by sensory analysis of the product on 9 point hedonic scale by a panel of 10 semi trained members. The beverage samples were evaluated for Color, appearance, flavor, taste and overall acceptability. The best one was Chosen from the entire product for the further analysis. The sugar and sodium benzoate were dissolved in whey by heating at 70°C

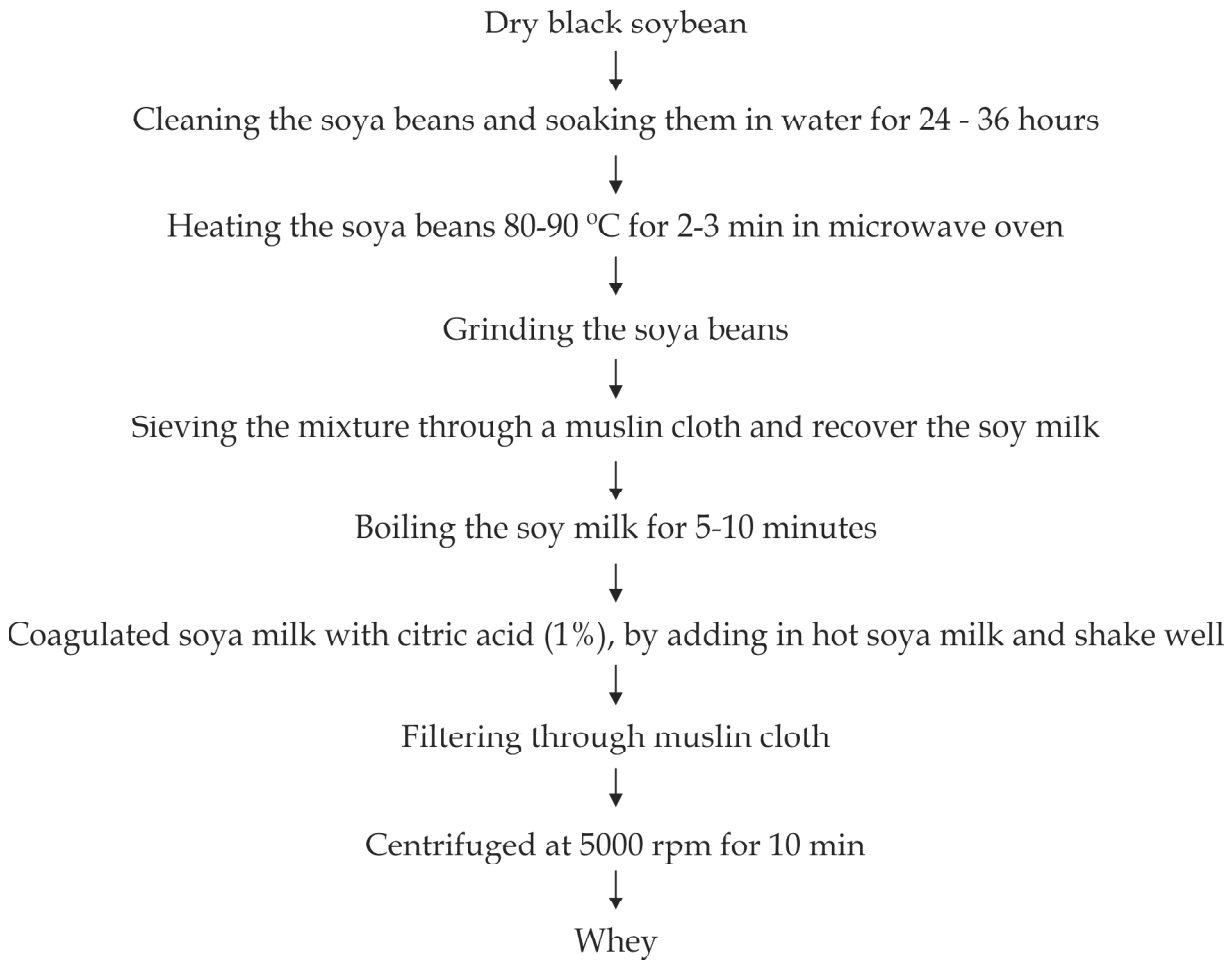

Figure 1: Process flowChart for the preparation of soymilk whey

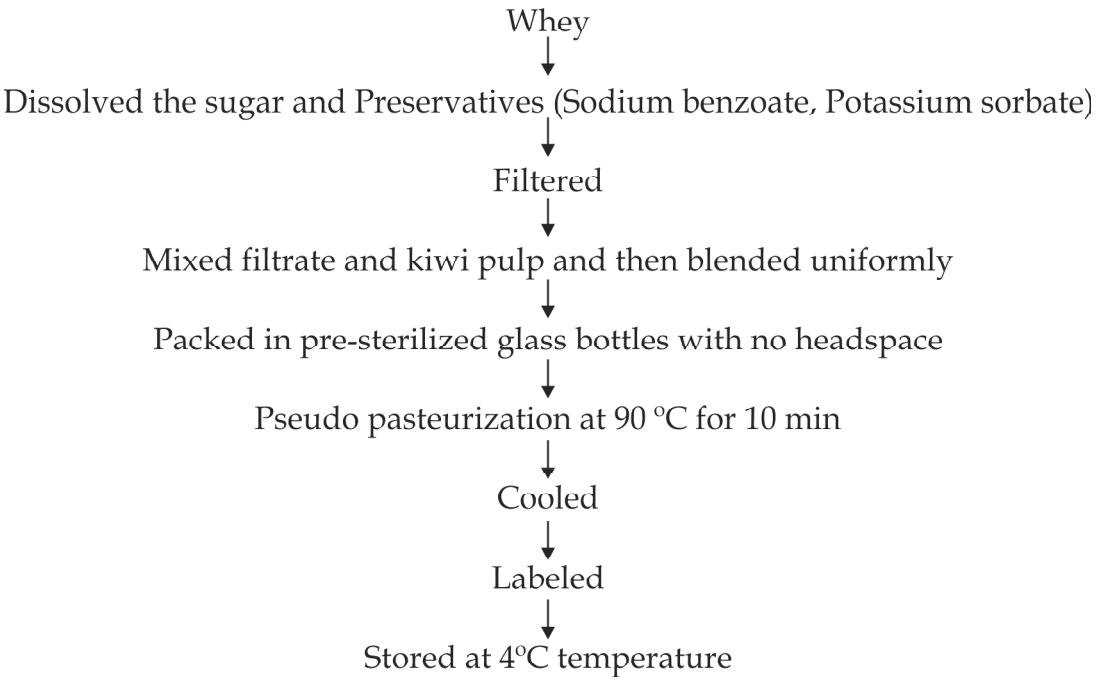

Figure 2: Flow diagram of RTS processing

and then filtered through muslin Cloth. The fruit's pulp was added to whey and homogenized. Thus prepared beverage was filtered and filled in previously sterilized glass bottles (50 ml) with no head space in the bottle. Filled bottles were heated at 90°C for 10 min and Cooled in Cold water.

Table 1
% Materials used to prepare RTS

	Whey %	*Kiwi pulp%*	*Sugar (gm)*	*Preservative*	*Overall Acceptance*
T1	50	50	250	0.3%	5
T2	55	45	245	0.3%	6
T3	60	40	240	0.3%	7
T4	65	35	235	0.3%	8
T5	70	30	220	0.3%	9
T6	75	25	210	0.3%	8
T7	80	20	200	0.3%	8

Storage of RTS

RTS bottles were stored at room temperature (25-30°C) and refrigeration temperature (4-6°C) for 2 months by drawing samples at every 15 days interval to evaluate Changes in physic-chemical, microbiological, sensory and beverage making quality parameters.

Physico-Chemical, Microbial and Sensory Analysis of RTS

Moisture, Protein, Fat and AshContent were determined as described by AOAC (1984). The method given by Hedge and Hofreiter (1962) was used for the analysis of total carbohydrate.

Reducing sugar was determined by using the method of Miller (1972). Estimation of pH, Ascorbic acid, Percent Titrable Acidity and Total soluble solids were done by the methods given by Ranganna (1986).

Total Phenolic content of the extracts was determined using folin-ciocalteu reagent (Taga *et al.*, 1984).

Microbial Aanlysis

TotalCount wasCarried out using plate spreading method where yeast and mold were enumerated by surface plating on PDA agar plate.

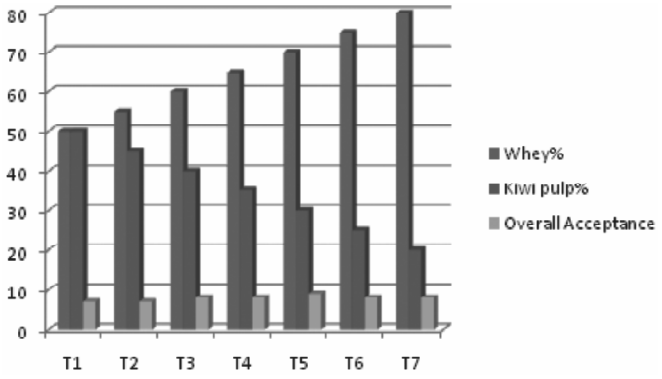

Figure 1 Formulation of the sample T1, T2, T3, T4, T5, T6, T7 and its acceptance.

Sensory Analysis

Sensory analysis was performed on 9 point hedonic scale by a panel of 10 semi trained members on hedonic scale where score 1 was for dislike extremely and 9 for like extremely (Larmond, 1977). The beverage samples were evaluated for Color, appearance, flavor, taste, and over all acceptability.

Phyto-chemical Test

The preliminary phyto-chemical test wasCarried for detection of various activeCompounds in RTS. These tests were only qualitative test.

For the detection ofCoumarins the method of Geisman (1962) was used.Detection of saponins was done by the method of Shihata(1951). For the detection of alkaloids the test was done according to Aiyegoro and Okoh, (2010). Glycosides and Total antioxidant status were also determined.

RESULTS AND DISCUSSION

Selection of the Product from Different Formulation (V/V) Sample on the Basis of the Sensory Analysis

Formulation (v/v) of whey: kiwi pulp::70:30 was highest value of overall acceptance, so sample T5 was final product for the further analysis.

Proximate Analysis of the Product and Raw Material

The RTS was rich in protein. Its pH was acidic due to the high acidity of the kiwi fruit incorporated in it which is aCitrus fruit having high amount ofCitric acid.

Table 2
Proximate analysis of RTS and Raw Material (soy whey and kiwi pulp)

Serial no	*Nutrient 100gm*	*Soy whey*	*Kiwi pulp*	*RTS*
1	Moisture	96.0	83	92.30
2	Total solid	4.0	17	7.70
3	Fat	0.02	6.0	1.81
4	Protein	0.90	1.0	0.94
5	Carbohydrate	2.60	9.4	4.45
6	Ash	0.48	0.6	0.50
7	TSS	1.5	–	19.50
8	pH	6.4	4.2	4.72

Analysis of Total Antioxidants of the Product

Antioxidant status of the product was 0.225m mol/ litre, equivalent to standard.

Analysis of Total Phenolics of the Product

Standard

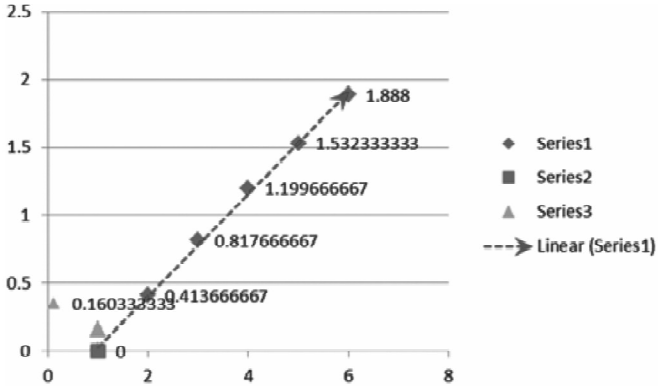

Figure 2: TPC graph

Table 3
Total Phenolics : Shows the total phenolics of standard

0ul	*0*	*Beverage*
100ul	0.413667	0.160333
200ul	0.817667	
300ul	1.199667	
400ul	1.532333	
500ul	1.888	

From the graph (figure 2) it can be concluded that amount of total phenolic content in the RTS was 0.160ug, equivalent to GAE.

Qualitative Analysis of Phytochemical of the Product

Detection of Coumarins

The presence ofCoumarin was indicated by a green bright yellow in the presence of UV light.

Detection of Alkaloids

The presence of alkaloids was indicated by the appearance of an orange reddish precipitation in beverage.

Glycoside

A brick red precipitate confirmed the presence of Glycosides in the beverage.

STORAGE ANALYSIS OF THE PRODUCT

Ascorbic Acid

Ascorbic acid or vitamin C content of RTS was reduced during the storage period of 60 days. But the analysis revealed that the loss of vitamin C content was more in case of the sample stored at room temperature as compared to that stored at refrigeration temperature. This was because oxidation of vitamin C was faster at room temperature in Comparison to refrigeration condition. So temperature had significant effect on the rate of loss of ascorbic acid.

Table 4
Changes in Ascorbic acidConcentration of RTS at Refrigeration temperature and Room Temperature

Sample Storage	*Day 0*	*Day 15*	*Day 30*	*Day 45*	*Day 60*	*F value*
Refrigeration temperature	40.2	39	35	30	24	NS
Room temp	40.2	33	27	20	15	NS

Total soluble solids (TSS)

TSS of the sample had negligible changes during 60 days of storage at room temperature and refrigerated temperature. Initial TSS range was 19.5* brick which remained unchanged during the entire storage period in refrigerated condition. In room temperature storage, it got reduced to 19.2* brick after 60 days which did not shown any significant difference, similar results were reported by Vidhya and Narain (2011) during storage of wood apple bar.

Table 4
Changes in total soluble solids of RTS during storage at room and refrigeration temperature

Sample Storage	*Day 0*	*Day 15*	*Day 30*	*Day 45*	*Day 60*	*F value*
Refrigeration temperature	19.5	19.5	19.5	19.5	19.5	NS
Room temp	19.5	19.5	19.5	19.3	19.2	NS

Acidity

Acidity was Calculated on the basis of percent titrable acidity. Acidity was increased during the storage of the RTS in both Conditions. Vitamin C is soluble in the water and oxidative sensitive, which gradually decreases. This is the main reason to increase the acidity.

Table 5
Change in Ascorbic acid Concentration of RTS at Refrigeration temperature and Room Temperature

Sample Storage	*Day 0*	*Day 15*	*Day 30*	*Day 45*	*Day 60*	*F value*
Refrigeration temperature	1.90	2.	2.3	2.50	2.75	NS
Room temp	1.90	2.10	2.50	2.80	3.00	NS

pH

During the storage of RTS at room and refrigeration temperature, pH value wasChanged. Initial pH of sample was 4.72. After 60 days of storage at refrigeration temperature, it decreased up to 4.20, and at room temperature, it reduced to 4.18.

Table 6
Change in pH of product at Refrigeration and Room Temperature

Storage condition	*Day 0*	*Day 15*	*Day 30*	*Day 45*	*Day 60*	*F value*
Refrigeration temperature	4.72	4.60	4.40	4.30	4.20	NS
Room temperature	4.72	4.58	4.45	4.32	4.18	NS

Colour

Optical density at 440 nm as an index of color intensity of beverage, revealed no change in the color of RTS stored at refrigerating temperature. Slight Change in color in RTS stored at room temperature was observed but this value was non-significant. Slight change in color was due to the degradation of the pigment present in the RTS.

Table 7
Changes in colour of the product at Refrigeration and Room Temperature

Sample Storage	*Day 0*	*Day 15*	*Day 30*	*Day 45*	*Day 60*	*F value*
Refrigeration temperature	0.270	0.270	0.270	0.270	0.270	NS
Room temperature	0.270	0.270	0.300	0.320	0.340	NS

MICROBIAL ANALYSIS

The beverage samples were analysed periodically for total plate count and yeast and mold count. The data obtained with respect to microbial load were summarized in Table 8. The data present in Table 8 indicate that the RTS stored at room temperature had higher count than the sample stored at refrigeration temperature. During storage total plate count increased significantly.

Yeast and Mould Count

Yeast and mold count of the beverage are presented in the Table 3.9. The data show that all the samples were devoid of any yeast and mold count during zero day of storage. The yeast and mold count appeared after 45 days and increased after that. The samples stored at room temperature had significantly higher counts as compared to the sample stored at refrigeration temperature.

SENSORY ANALYSIS

RTS stored at room and refrigeration temperature were evaluated at 9 point hedonic scale for their sensory quality. The sensory score for overall acceptability are given in Table 10.

Table 8
Change in microbial count of product at refrigeration and room temperature

Product	*Day 0*	*Day 15*	*Day 30*	*Day 45*	*Day 60*	*F value*
Refrigeration temperature	6 × 10^3 CFU/mL	11.7 × 10^3 CFU/mL	19.4 × 10^3 CFU/mL	24 × 10^3 CFU/mL	36.4 × 10^3 CFU/mL	*
Room temperature	7.2 × 10^3 CFU/mL	14 × 10^3 CFU/mL	23.2 × 10^3 CFU/mL	35 × 10^3 CFU/mL	49 × 10^3 CFU/mL	*

Table 9
Change in yeast and mold count of product at Refrigeration and Room Temperature

Product	*Day 0*	*Day 15*	*Day 30*	*Day 45*	*Day 60*	*F value*
Refrigeration temperature	0	0	2.31 × 10^3CFU/mL	4.1 × 10^3CFU/mL	6.4 × 10^3CFU/mL	*
Room temperature	0	0	3.7 × 10^3CFU/mL	6.3 × 10^3CFU/mL	8.7 × 10^3CFU/mL	*

The sensory score of RTS reduced non-significantly during storage. The reduction in sensory score was higher at room temperature as compared to that stored at refrigeration temperature.

Table 10
Changes in overall acceptance of beverage at Refrigeration and Room Temperature

Product Storage	*Day 0*	*Day 15*	*Day 30*	*Day 45*	*Day 60*	*F value*
Refrigeration temperature	9	9	9	8	8	NS
Room temperature	9	9	9	8	7	NS

CONCLUSION

From the results it can be concluded that the RTS beverage can be prepared successfully with the incorporation of the 70% soya whey, 30% kiwi fruit pulp and 220 gm sugar, with optimum sensory characteristics. Color, flavor and stability of soy whey beverage blended with kiwi fruit pulp were estimated to be high. The product is nutritionally, medicinally as well as organoleptically herbal beverage with aggregate taste and energy due to soy whey and kiwifruit. Bioactive ingredients may balance nutritional deficits and support physical and mental health. Costomers tend to favor a healthy lifestyle and the nutritional choices that go with it. This RTS beverage is rich in antioxidant and phytochemical substances and dietary fibers also. So it may reduce the risk of cancer, diabetes and heart disease. Product developer seeking out fuctional and nutritional attributes to tap the tremendous growth opportunity in the beverage industry can move forward for a development of such herbal and functional beverage.

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