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EVALUATION OF PHYSIOCHEMICAL, PROXIMATE, MICROBIAL, AND SENSORY CHARACTERISTICS OF AMARANTH GRAIN – SOYBEAN BASED NON DAIRY BEVERAGE BLENDS

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ABSTRACT

Pseudocereals are the most underrated, drought resistant, gluten free, and low maintenance grains with wide range of health and functional benefits. When compared to true cereals, amaranth grain is a highly nutritious pseudo cereal with higher protein content. The present investigations were carried out to formulate Amaranth grain and Soybean based Ready to Serve non-dairy beverages. The Amaranth Grain and Soybean based ready to serve (RTS) non-dairy beverage was prepared with ingredients such as Amaranth Grain, Soybean, brown sugar (Sweetening agent), and Cardamom (Flavoring agent). The beverage was prepared in five varying ratios of Amaranth grain and Soya bean and coded as T_1 (75:25), T_2 (65:35), T_3 (55:45), T_4 (45:55), T_5 (35:65). The control sample was prepared without the addition of Amaranth Grain extract. The other ingredients incorporated in the beverage were 4.5 grams of brown sugar and 0.5 grams of elaichi powder. The formulated RTS beverage was subjected to sensory evaluation employing nine point hedonic scale. The treatment T_1 prepared from blending Amaranth Grain Extract and Soybean Extract in 75:25 ratio was rated as best with better sensory scores.

KEYWORDS: *Amaranth Grain, Soybean, RTS non-dairy beverage, Nine point hedonic scale*

INTRODUCTION

Non- dairy milk alternative is defined as dissolved and disintegrated plant extracts of cereals, millets, pseudocereals, legumes, nuts, and oilseeds that resemble bovines' milk in appearance and consistency. In ongoing years, consumers choosing non-dairy milk choices are progressively increasing because of medical and moral reasons. Pseudocereals are the most underutilized, drought-resistant, gluten-free, and low maintenance grains with abundant health benefits and functional properties(Kundu, Dhankhar, & Sharma, 2018).

Most of the world's population receives their nutrition from three cereal species like wheat, rice, and maize (Berghofer&Schoenlechner, 2010). Amaranth was used as a staple food throughout

history in Inca, Maya, and Aztec civilizations. At present Amaranth is grown for commercial purposes in Mexico, South America, the United States, China, Poland, and Austria (Milan-Carrillo et al., 2012).

Amaranth grain has been found to provide alternative food ingredients in the development of food products other than wheat and other cereals for celiac patients. A gluten-free diet is the simplest healing remedy presently to be had for sufferers with celiac disease; an autoimmune disorder of the small gut related to an everlasting intolerance to gluten proteins (Martinez-Villaluenga, Penas, & Hernandez-Ledesma, 2020).

Soybean consumption has been linked to a number of potential health benefits, including reduction of chronic diseases like cardiovascular disease, obesity, insulin resistance/type II diabetes, immune disorders, and certain type of cancers. Soybeans are normally composed of ~35–40% protein, ~20% lipids, ~9% dietary fiber, and ~8.5% moisture primarily based totally on the dry weight of mature uncooked seeds. Soybean may be a promising source of peptides that have a good vary of biological activities such as anti-diabetic, hypolipidemic, anti-cancer, anti-hypertensive, antioxidant, immunostimulatory, anti-inflammatory, and neuromodulatory properties (Dixit, Antony, Sharma, &Tiwari, 2016a).

Beverages are an optimum vehicle to move nutrients and bioactive compounds into the body moreover to facilitate their bioavailability. Bioactive compounds, like phytochemicals (e.g., phytoestrogens, phenolic compounds, flavonoids, carotenoids, etc.), dietary fibre, vitamins, fatty acids, probiotics, and minerals, are often incorporated into beverages(Ignat *et al.*, 2020). Thus, by considering the benefits of the beverage the product was developed using Amaranth Grain as a major ingredient, and an attempt was made by the researcher to formulate Amaranth Grain and Soybean based RTS non-dairy beverage which was rich in protein and other vital nutrients. The blending of Amaranth Grain Extract along with Soybean Extract not only enriches quality and nutrition but also offers to develop a better food product. All ingredients used like Amaranth Grain, Soybean, brown sugar, and elaichi have many health benefits such as fighting diseases, boosting immunity, maintaining skin health, improving digestion, and promoting longevity. As it is a non-dairy beverage it provides nourishment especially for people suffering from Lactose Intolerance, following a vegan lifestyle, and has Cow's Milk Allergy.

In latest years, the desire for non-dairy functional drinks among fitness-aware clients is growing hastily because of the excessive occurrence of lactose intolerance, Cow's Milk Protein Allergy, hypercholesterolemia, and vegan lifestyle. The scarcity and non-affordability of cow's milk also raised the need for low cost dairy alternatives. India has one quarter of undernourished people in the world. A few factors that directly cause malnutrition are poverty or lack of access to nutritious food. To combat these shortcomings, low cost and locally available plant based ingredients can be used to formulate protein rich food products. Any food product development must be innovative and

unique which fills the need and requirements of consumers will certainly succeed in the current market. Therefore, the primary goal of this study was to optimize non-dairy alternatives based on Amaranth Grain and Soybean, as well as to develop a non-dairy product such as ready to serve beverage using simple domestic processing procedures.

OBJECTIVES

- To formulate Amaranth Grain and Soybean based ready to serve non-dairy beverage in five varying ratios and to evaluate its acceptability using nine point hedonic scale.
- To assess the physiochemical, proximate, and microbial analysis of a non-dairy beverage made from Amaranth grain and Soybean.
- To calculate the cost of the Amaranth grain and Soybean based ready to serve non-dairy beverage.

MATERIALS AND METHODS

ETHICAL CLEARANCE

The research study was reviewed and approved by the Independent Human Ethics Committee (IHEC)– the protocol no - SDNBVC/HSC/IHEC/2020/13.

The current study was an experimental research study. The materials detail, procedure, experiments, and techniques followed during the present study have been described under the following heads:

PROCUREMENT OF RAW MATERIAL

The raw materials used in the preparation of Amaranth Grain and Soybean based non-dairy beverage such as Amaranth Grain was procured from supermarket, Chennai, and other ingredients such as soybean, brown sugar, and elaichi were procured from the local market.

EXTRACTION OF AMARANTH GRAIN EXTRACT

The first step in extraction is soaking. The extraction of Amaranth Grain extract was carried out as per the procedure suggested by (Manassero, Anon, &Speroni, 2020) with mild modification. The Amaranth Grain was soaked in water for about 12 hours. The soaked Amaranth Grain was pressure cooked for 10 minutes until the Grain is soft. The cooked Amaranth Grain was transferred into the blender and mixed thoroughly at high speed for 3 – 5 minutes with the addition of water. The obtained slurry was filtered through double layered muslin cloth to obtain Amaranth Grain extract which was pasteurized and filled in a pre-sterilized glass bottle and stored in a refrigerator at 4°C. The extraction of Amaranth Grain extract can be seen in fig- 1.

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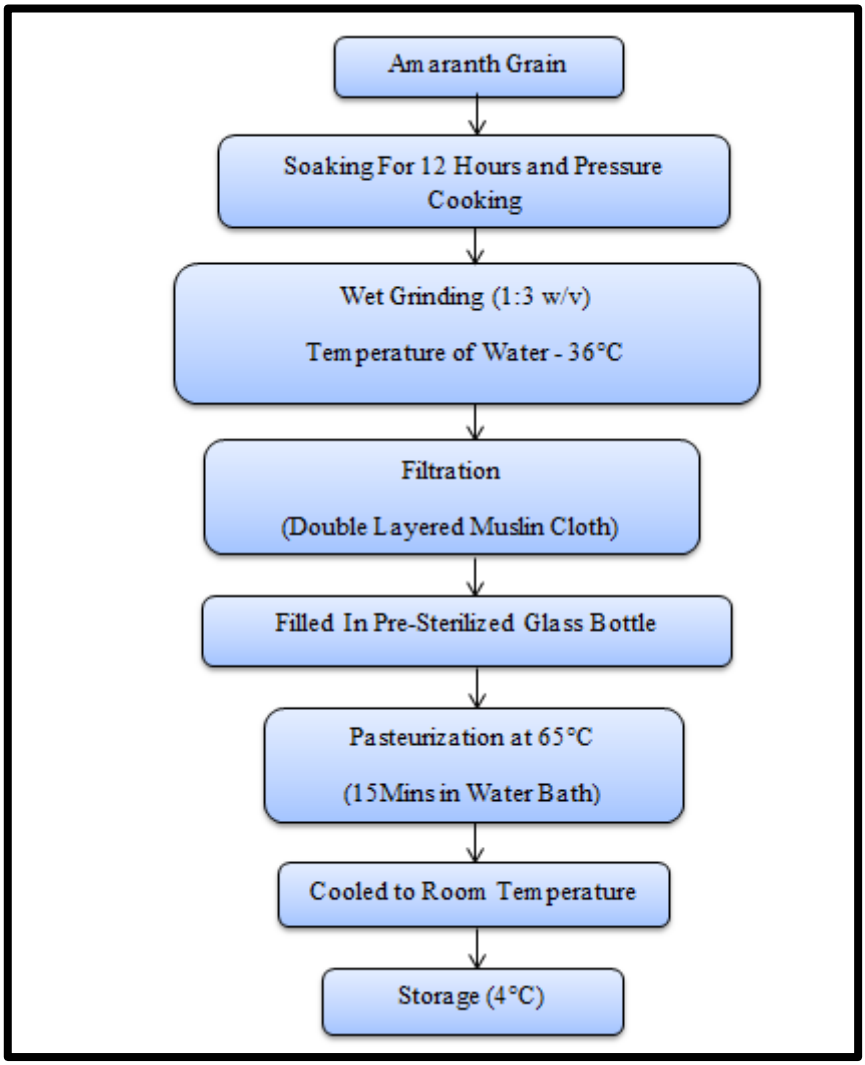

Fig 1- Extraction of Amaranth Grain Extract

EXTRACTION OF SOYBEAN EXTRACT

Initially, the Soybean was soaked in water for 12 hours. The soaked Soybean was then transferred into the blender and grounded thoroughly with the addition of water. The obtained slurry was filtered through double layered muslin cloth to obtain Soybean extract. Further, the Soybean extract was pasteurized. The pasteurization temperature and time used were 84°C and 30 seconds and then the extract was filled in a pre-sterilized glass bottle and stored at 4°C. The extraction process is displayed in fig- 2. The extraction of soybean extract was carried out as per the procedure suggested by Gana&Gbabo (2017).

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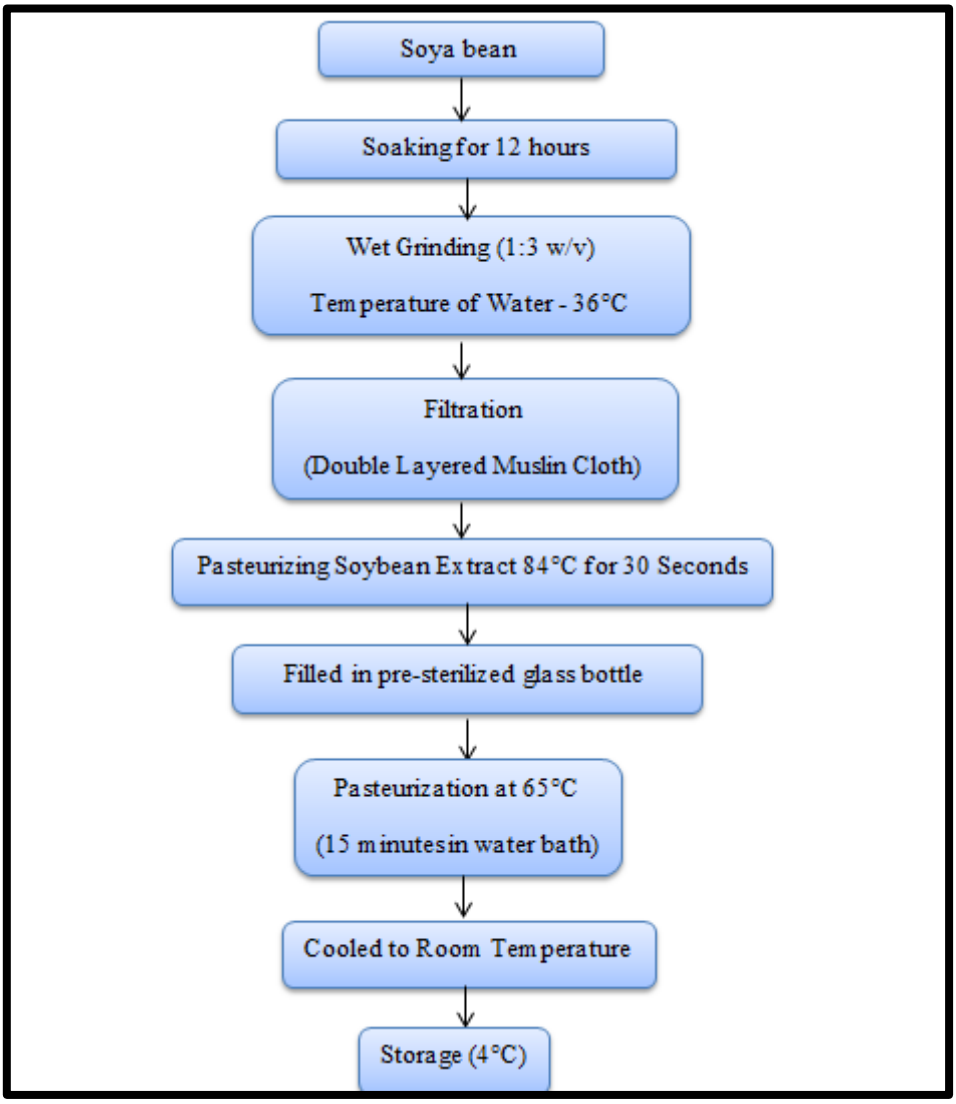

Fig 2- Extraction of Soybean Extract

METHOD OF PREPARATION OF AMARANTH GRAIN AND SOYBEAN BASED RTS NON-DAIRY BEVERAGE

The RTS non-dairy beverage was prepared by using the method suggested by TejaswiBoyapati, (2019) with slight modifications. The Amaranth Grain and Soybean based ready to serve non-dairy beverage blends were prepared with ingredients such as Amaranth Grain, Soybean, brown sugar, and elaichi. The beverage was prepared in five varying ratios and coded as T_1 (75:25), T_2 (65:35), T_3 (55:45), T_4 (45:55), T_5 (35:65). 4.5 grams of brown sugar and 0.5 grams of elaichi powder were the general concoctions added to each beverage samples and control sample.

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TABLE 1 – DETAILS OF TREATMENTS FOR RTS NON-DAIRY BEVERAGE BLENDS

S.NO	INGREDIENTS	CONTROL (5)	T_1 (%)	T_2 (%)	T_3 (%)	T_4 (%)	T_5 (%)
1	Soybean Extract	95	25	35	45	55	65
2	Amaranth Grain Extract	-	70	60	50	40	30
3	Elaichi powder	0.5	0.5	0.5	0.5	0.5	0.5
4	Brown sugar	4.5	4.5	4.5	4.5	4.5	4.5

The extracts of soybean and Amaranth Grain were filled in different ratios (as mentioned in table 1) in separate containers for the preparation of Amaranth Grain and Soybean based ready to serve non-dairy beverages. To the extracts fixed amounts of brown sugar and elaichi powder were added and stirred well using stainless steel spoon. The Amaranth Grain and Soybean based ready to serve non-dairy beverage preparation can be seen in fig- 3.

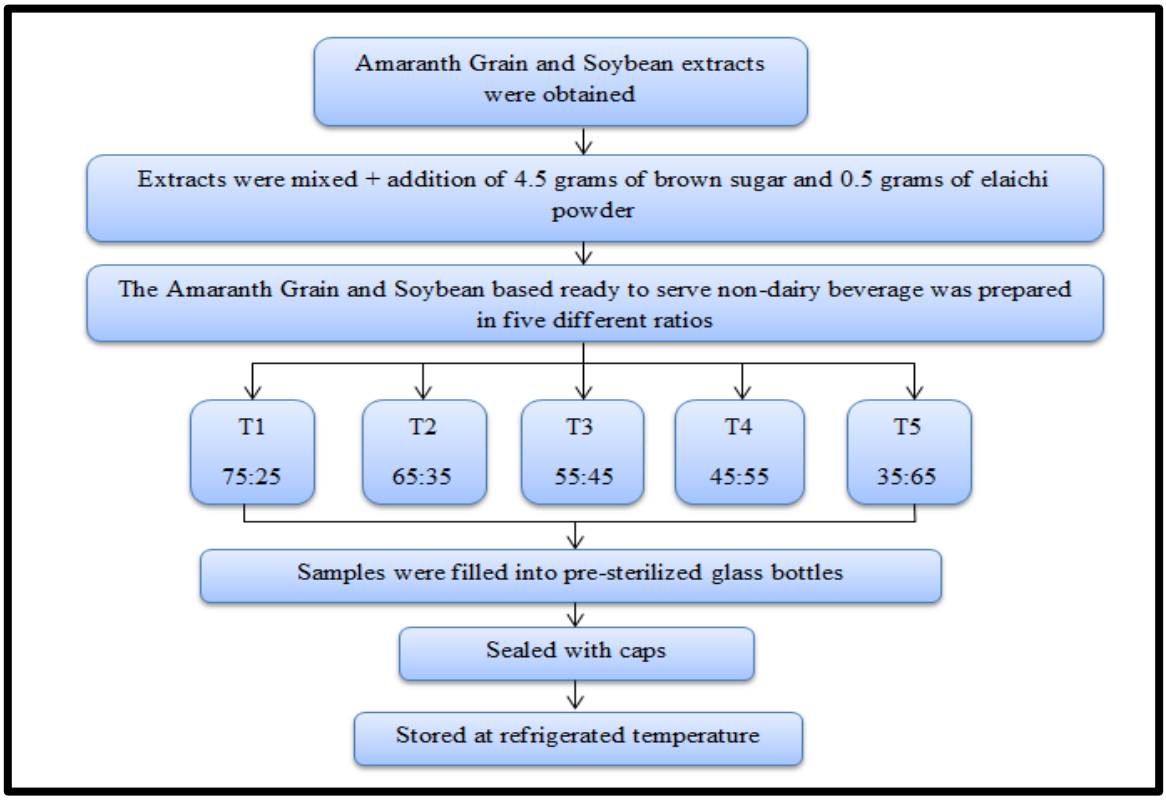

FIG 3- PREPARATION OF AMARANTH GRAIN AND SOYBEAN BASED RTS NON-DAIRY BEVERAGE BLENDS

PREPARATION OF CONTROL SAMPLE

The Control sample T_0 was formulated by following the same procedure as that used to prepare RTS non-dairy beverages. Except Amaranth Grain Extract, all other ingredients are used in

the control sample preparation. The proportions of ingredients added in the Control sample were mentioned above in table- 1.

EVALUATION OF PHYSICAL PROPERTIES OF THE FORMULATED RTS NON-DAIRY BEVERAGES

The methods used for analyzing the physical properties of the formulated Amaranth Grain and Soybean based ready to serve non-dairy beverage blend sample and Control sample were listed in table 2 with references.

TABLE 2 – METHODS USED FOR ANALYZING THE PHYSICAL PROPERTIES OF RTS NON-DAIRY BEVERAGES WITH REFERENCES

S.NO	PARAMETERS	METHODS AND REFERENCES
1	Total Titratable Acidity (%)	FSSAI Manual 2016 – Fruits and Vegetable Products
2	Total Soluble Solids (%)	
3	pH	Digital pH meter
4	Viscosity (cP)	Atago Viscometer

NUTRIENT ANALYSIS OF RTS NON-DAIRY BEVERAGE

The Amaranth Grain and Soybean based ready to serve non-dairy beverage sample T_1 was highly acceptable by sensory evaluation and hence it was taken for nutrient analysis along with the control sample. The nutrient analysis was done by using standard AOAC methods, 2016.

MICROBIAL ANALYSIS OF RTS NON-DAIRY BEVERAGE

The growth of microbes, storage stability, and shelf life were analyzed during the 0th day, 3rd day, and 5th day of the beverage, using the standard total plate count method. The growth of microbes, in general, is undesirable as it causes spoilage of food. It also results in the production of toxic substances in the food (Shakuntala et al., 2017).

SENSORY EVALUATION OF RTS NON-DAIRY BEVERAGES

A scorecard with the nine point hedonic scale was used for assessing the sensory characteristics of the formulated Amaranth Grain and Soybean based ready to serve non-dairy beverage. The formulated Amaranth Grain and Soybean based ready to serve non-dairy beverage were evaluated for sensory attributes like appearance, color, taste, texture, flavour, and overall acceptability. Due to the COVID pandemic, the sensory evaluation was carried out among family members.

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COST CALCULATION

The production cost of the control and optimized Amaranth Grain and Soybean based ready to serve non-dairy beverage was calculated based on raw material cost and processing cost suggested by Kuchekar, Narwade&Galikwad, (2019) with mild modifications.

STATISTICAL ANALYSIS

The collected data were statistically analyzed and tabulated with the help of approved statistical techniques. The data obtained from the acceptability scores of the sensory parameters like appearance, taste, texture, color, and overall acceptability of Amaranth Grain and Soybean based ready to serve non-dairy beverage in five varying ratios were subjected to statistical analysis Mean and standard deviation.

RESULTS AND DISCUSSION

EVALUATION OF PHYSIOCHEMICAL PROPERTIES OF THE FORMULATED RTS NON-DAIRY BEVERAGES

The results obtained for physiochemical properties evaluation of the Amaranth Grain and Soybean based RTS non-dairy beverage has been mentioned in Table 3 which was also compared with the control sample.

TABLE 3- EVALUATION OF PHYSIOCHEMICAL PROPERTIES OF THE FORMULATED RTS NON-DAIRY BEVERAGE

S.NO	ANALYSIS	CONTROL	SAMPLE T_1
1	Total Titratable Acidity (%)	0.16±0.00	0.3±0.02
2	Total Soluble Solids (%)	9.40±0.27	8.21±0.03
3	pH	6.53 ±0.01	6.11±0.03
4	Viscosity (cP)	22.14±0.91	36.2±2.64

Each value is mean observation in triplicate ± Standard Deviation.

The Total Titratable Acidity of Amaranth Grain and Soybean based RTS non-dairy beverage blend sample T_1 and control sample was found to be 0.3% / 100ml and 0.16%/100ml respectively. The Total Titratable Acidity of the control sample was higher when compared with sample T_1. The Total Titratable Acidity of Amaranth Grain and Soybean based RTS non-dairy beverage sample T_1 value was found to be higher than the value reported by Terhaag, Almeida, &Benassi, (2013).

The Total Soluble Solids of the control sample and sample T_1 obtained the value of 9.40±0.27% and 8.21±0.03% respectively. The control sample value was found to be higher than the

sample T_1 value. The Total Soluble Solids of sample T_1 was slightly lower when compared with the range of values (9.08 to 9.69%) reported by Kaur&Tanwar, (2016).

The pH of the formulated sample beverage T_1 and control sample was determined using a digital pH meter. The pH of the sample T_1 and the control sample was found to be 6.11±0.03 and 6.53 ±0.01 respectively. Both control and sample T_1 showed a similar pH value. Similar pH value was obtained in the study made by Rincon, BrazAssunçãoBotelho, & de Alencar, (2020).

The viscosity of the control sample and sample T_1 was observed to be 22.14±0.91cP and 36.2±2.64cP respectively. The viscosity of the sample beverage T_1 was found to be higher than the control sample. The viscosity of the control sample and beverage sample T_1 was higher than the value (13.4 cP) obtained for viscosity in the previous study by Terhaag, Almeida, &Benassi, (2013).

NUTRITIVE VALUE OFRTS NON-DAIRY BEVERAGE

The result reveals the amount of nutrient content present in the Amaranth Grain and Soybean based RTS non-dairy beverage sample T_1 and Control sample which is represented in table 4.

TABLE 4 – NUTRITIONAL COMPOSITION IN THE CONTROL SAMPLE AND SAMPLE T_1

S.NO	NUTRIENTS	CONTROL	SAMPLE T_1
1	Energy (kcal)	52.83± 0.88	65.74 ±0.05
2	Protein (g)	4.57±0.20	2.0 ±0.3
3	Fat (g)	2.29±0.30	2.7 ±0.1
4	Carbohydrates (g)	3.21±0.17	7.90±0.1
5	Ash (% w/w)	0.59±0.04	0.20±0.1
6	Moisture (% w/w)	91.45±0.45	87.2±0.3
7	Calcium (mg)	9.77± 0.50	15.9±0.1

The values obtained are triplicate mean± SD.

The ash content of the Amaranth Grain and Soybean based RTS non-dairy beverage sample T_1 is found to be 0.20±0.1% and the ash content of the control sample obtained was 0.59±0.04% which is higher than the sample beverage. A study states that accession from the warm wet mid-altitude areas have a higher content of ash while those of high altitude areas had low ash and other

mineral content of Amaranth Grain (Kachiguma, Mwase, Maliro, &Damaliphetsa, 2015). The results are in line with the findings of Hassan, Aly, & El-Hadidie, (2012) which ranges from 0.31 to 0.38%.

The moisture content of food is defined as the amount of water present in the food product. It affects the appearance, taste, texture, weight, and shelf life of food products. Even the slight changes in the moisture content can deteriorate the physical and chemical aspects of the product. The moisture content of Amaranth Grain and Soybean based RTS non-dairy beverage sample T_1 is found to be higher when compared with control. The moisture content of the sample T_1 and control sample were 87.2±0.3% and 91.45±0.45% respectively. Hence the moisture content of the sample T_1 is found to be more or less equal to that of the control sample. The moisture content of the sample T_1 is almost nearby the value found in the rice extract beverage as reported by Hassan, Aly, & El-Hadidie, (2012).

The energy of about 52.83± 0.88 kcal for the control sample and 65.74 ±0.05 kcal for sample T_1 were obtained. The energy present in the control sample is found to be low than that of sample beverage T_1. The energy values of beverages were 32.0 mg/L in the study Hassan, Aly, & El-Hadidie, (2012) was found between 36.49 and 72.81 kcal/100ml which is similar when compared to the Amaranth Grain and Soybean based RTS non-dairy beverage sample T_1. The calorific value suggests that Amaranth Grain Extract blended with Soybean Extract can also be utilized for preparing energy drinks.

The Amaranth Grain consists of all essential amino acids and it's a complete protein that is easily digested. Thereby, the control sample made with Soybean extract also contains all the essential amino acids. Compared to animal proteins, plant proteins have a lower nutritional quality due to the limiting amino acids. However, Amaranth Grain proteins present a high nutritional value since the proportion of their essential amino acids is similar to that recommended by the World Health Organization (Manassero, Anon, &Speroni, 2020). The protein content of the beverage sample T_1 and control sample obtained was 2.0 ±0.3g and 4.57±0.20g respectively. By comparing the sample T_1 with the control sample, the amount of protein present in the sample T_1 is lower than the control sample. This is because the protein was higher in soybean than in Amaranth Grain (Gorinstein et al., 2001). When compared to other cereals, Amaranth Grain is an extremely nutritional pseudo-cereal with a higher amount of proteins. The protein values ranged from 2.1 to 1.04 g/100g from the study Rincon, BrazAssuncaoBotelho, & de Alencar (2020) was found to be in line with the protein content of the Amaranth Grain and Soybean based RTS non-dairy beverage sample T_1.

The amount of fat present in the control sample and Amaranth Grain and Soybean based ready to serve beverage sample T_1 was found to be 2.29±0.30g and 2.7±0.1g respectively. In this, a slight increase in the fat content in the sample T_1 than the control sample was observed. Amaranth seed contains 0.27- 0.32 mg/g of sterols (Grobelnik et al., 2010). The fat content of the sesame seed extract based non-dairy milk alternative was found to be 5.04±0.12g in the previous study (Vahini&

Many, 2021) which was higher when compared to the fat content of Amaranth Grain and Soybean based RTS non-dairy beverage sample T_1. The fat content of the Amaranth Grain beverage is considered to be low due to the moderate lipid content of the Grains (Manassero et al., 2020).

The carbohydrate content of the beverage sample T_1 was found to be 7.90±0.1g and the carbohydrate content of the control beverage observed was 3.21±0.17g respectively. The increase in the carbohydrate content of the sample T_1 was seen when compared with the control beverage. In Amaranth, starch comprises the main component of carbohydrates but is found usually in lower amounts than in cereals (Chauhan, 2017). Increasing seed weights went along with rising contents of carbohydrates and decreasing contents of crude protein (Gimplinger, Dobos, Schonlechner, &Kaul, 2007). Hence there is an increase of carbohydrates in the sample T_1 was observed. An increased amount of carbohydrates contained in the sample T_1 was seen when comparing the sample with the study Hassan, Aly, & El-Hadidie, (2012).

The calcium amount present in the beverage sample T_1 and control beverage obtained was 15.9±0.1mg and 9.77±0.50 mg respectively. The sample T_1 represents a higher amount of calcium when compared with the control sample. The calcium content of sample beverage T_1 was higher than that found in other non-calcium-added plant-based extracts. The calcium content of the beverage sample T_1 was found to be similar when compared to the beverage formulated by Terhaag, Almeida, &Benassi, (2013). The calcium content in soymilk reported in the study wasKundu, Dhankhar, & Sharma, (2018) was 5.970 ± 0.010^{a} which was found to be lesser when compared to the newly formulated beverage sample T_1. Blending of Amaranth Grain Extract to the Soybean Extract might be the reason for an increased amount of calcium present in the RTS non-dairy beverage.

MICROBIAL ANALYSIS OF THE RTS NON-DAIRY BEVERAGE

The total microbial count of beverage sample T1 and control beverage is presented in Table 5. The microbial analysis showed that the total bacterial count of control gained 0.51×10^{2}cfu/ml on zero days, 1.70×10^{2}cfu/ml on the third day and 3.38×10^{2}cfu/ml on the fifth day, and the sample beverage received 0.65×10^{1}cfu/ml on zero days, 0.85×10^{2}cfu/ml on third day and0.96×103 cfu/ml on the fifth day. The yeast and mould count of the control sample gained 0.31×10^{2}cfu/ml on zero days, 0.72×10^{2}cfu/ml on the third day, and 2.14×10^{2}cfu/ml on the fifth day. However sample beverage received nil growth on zero days, 0.38×10^{2}cfu/ml on the third day and 0.98×10^{2}cfu/ml on the fifth day. This indicates that the RTS non-dairy beverage is microbiologically safe than the control sample.

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TABLE 5- TOTAL MICROBIAL COUNT OF BEVERAGE SAMPLE T_1 AND CONTROL BEVERAGE

S.NO	SAMPLES	TOTAL BACTERIAL COUNT			YEAST AND MOULD COUNT		
		0^{th} day (cfu/ml)	3^{nd} day (cfu/ml)	5^{th} day (cfu/ml)	0^{th} day (cfu/ml)	3^{nd} day (cfu/ml)	5^{th} day (cfu/ml)
1	Control	0.51×10^2	1.70×10^2	3.38×10^2	0.31×10^2	0.72×10^2	2.14×10^2
2	Sample T_1	0.65×10^1	0.85×10^2	0.96×10^3	0.00	0.38×10^2	0.98×10^2

SENSORY EVALUATION OF THE RTS NON-DAIRY BEVERAGE

The subjects were given a scorecard with 9 point hedonic scale with a minimum score of 1 for poor and a maximum score of 9 for excellence. The mean scores allotted by the panel judges for each sensory attribute of various treatments are presented in table 6.

TABLE 6 - SENSORY EVALUATION OF AMARANTH GRAIN AND SOYBEAN BASED RTS NON-DAIRY BEVERAGE

S.NO	TEST SAMPLES	APPEARANCE	COLOUR	TASTE	TEXTURE	FLAVOUR	OVERALL ACCEPTABILITY
1	Control	8.61±0.37	8.2±0.44	8.15±0.70	8.3±0.71	8.25±0.50	8.22±0.47
2	T_1	8.65±0.36	8.2±0.44	8.2±0.71	8.5±0.37	8.05±0.75	8.35±0.60
3	T_2	8.53±0.71	8.1±0.36	7.8±0.68	8.41±0.50	8.03±0.64	8.30±0.60
4	T_3	8.35±0.75	8.1±0.54	7.8±0.69	7.9±0.75	8.01±0.44	8.1±0.54
5	T_4	8.24±0.68	7.9±0.91	7.7±0.68	7.4±0.72	8.01±0.36	7.9±0.91
6	T_5	8.10±0.72	7.75±0.82	7.55±0.51	7.15±0.63	8.0±0.70	7.85±0.82

The results of the sensory evaluation revealed that the formulation of the RTS non-dairy beverage blend in the ratio T_1 (75:25) had a maximum overall acceptability score.

COST OF RTS NON-DAIRY BEVERAGE

The total cost of the Amaranth Grain and Soybean based ready to serve beverage was made upon the basis of the cost of raw material and labour cost. The raw material cost includes Amaranth Grain, Soybean, brown sugar, elaichi. Processing cost includes electricity, labour charges, and miscellaneous cost. The nutritious Amaranth Grain and Soybean based ready to serve beverage cost a minimal charge of Rs. 19.

CONCLUSION

The present investigation on the formulation of Amaranth Grain and Soybean based ready to serve beverage blend was found to be acceptable, highly nutritious, and also microbially safe for consumption. The developed RTS non-dairy beverage blend prepared was found to be a non-allergic, gluten-free, protein and calcium rich product. The RTS non-dairy beverage blend was naturally prepared without the addition of artificial ingredients such as preservatives, sweeteners, flavoring agents, and coloring agents. The developed beverage will not only improve the nutritional status but also solve several nutritional problems prevailing in the community. The beverage made out of plant based extracts has a high amount of antioxidant and physiochemical properties which improves the health of the society. In terms of nutritional quality protein and calcium content of the beverage were found to be significantly higher than the similar product available in the market. It can be concluded that the Amaranth Grain and Soybean based ready to serve non-dairy beverage blends are stuffed with nutritional and other functional properties and hence they can be used to combat malnutrition and hidden hunger among people in the region where cow's milk is scarce. This product is catered not only to the people who are lactose intolerant or suffering from gluten sensitivity, cow's milk allergy, and malnourishment but also for the people who are following a healthy lifestyle and a balanced diet can also be benefited by consuming the Amaranth Grain and Soybean based non-dairy beverage. The results also infer that Plant Based Extract is an affordable protein source that can alleviate malnutrition and micronutrient deficiency in developing countries where cow's milk supply is insufficient.

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