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Promoting Sustainable Global Wellness by Millet Incorporation of Traditional Recipes

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Abstract

Millets, a group of grains with small seeds, have been cultivated for thousands of years and are widely consumed in many countries. These grains are known for their nutritional value, as they are abundant in fiber, essential vitamins, minerals and antioxidants. Millet *uttapam* is a nutritious and delicious innovation to the popular south Indian breakfast dish *uttapam*. This dish needs to become increasingly popular in India and across the globe for *attaining* sustainable global wellness. The main objectives of the study were to promote sustainable development through the incorporation of novel approaches to traditional recipes, to develop and commoditize novel, cost-effective products rich in macronutrients as well as micronutrients as well as to promote sustainable global wellness of the community by incorporation of millets in commonly consumed recipe i.e. *uttapam*.

The traditional fermented rice *uttapam* recipe served as a control recipe and two experimental versions were prepared in which rice flour replaced by incorporating *ragi* and *bajra* flour along with addition of curd and spinach. All recipes were standardized and the samples were prepared in controlled laboratory settings. Organoleptic assessment was carried out by the panelists in addition to nutritional value analysis conducted in the laboratory. The nutritive value results demonstrate that the *bajra* spinach *uttapam* has 13.54g of protein and 7.33 mg of iron per serving as compared to 7.26 g and 1.33 mg respectively in the control recipe. However, *ragi* spinach *uttapam* has a higher calcium and iron content with a calculated value of 459.14 mg and 4.05 mg respectively per serving. The organoleptic evaluation also confirmed great overall acceptability of both the innovations.

For individuals seeking to make eco-friendly food choices as well as those who are health-conscious, this is a win-win scenario. As long as we continue to place a high value on sustainable global wellness, millets are likely to play a significant role in our diets.

Keywords: millets, *uttapam*, sustainable, global, wellness

Introduction

Uttapam is a popular South Indian breakfast food that is made from fermented rice and is eaten all over India. Millet *uttapam* is a tasty and healthful twist on this traditional cuisine. Conversely, millet *uttapam* incorporates millet grains in place of part or all of the rice in the conventional *uttapam* batter, giving this well-liked dish a nutritious and wholesome twist. With the popularity of processed foods and fast food in today's world, it is critical that we return to our ancestral ways and adopt traditional, healthful eating practices. There has been a surge in interest in reviving old recipes as concerns about sustainability and global wellbeing grow. Millet is one such

agriculture that has grown in favor due to its sustainability and health advantages. By adding millets to customary dishes, we may encourage sustainability and world health.

For generations, people have been passing down traditional recipes from one generation to the next and they are frequently based on using products that may be found nearby. Not only are these recipes tasty, but they are also nutritious and healthy. We can improve these traditional meals' nutritional content and increase their sustainability by adding millets to them. Bread, porridge, pilafs and salads can all benefit from the nutty flavor and delightful crunchiness that millets add to food. Due to their adaptability, they are an ideal component to include in traditional dishes from various cultures across the globe.

Millet is a family of small-seeded grains that are consumed widely around the world and have been grown for thousands of years. They are highly valued for their nutritional content and a great source of antioxidants, fiber, vitamins and minerals. Millets are a great option for people who are looking for healthier alternatives to refined grains because they are free of gluten and have a low glycemic index.

The millet flour is soaked, crushed and fermented with other lentils or curd to make millet *uttapam*. The batter was prepared on a non-stick *tawa* to provide a light, fluffy and delectable texture. The millet *uttapam* keeps its traditional flavor while enhancing its nutritious value. There are various health advantages to millet *uttapam*. Their high fiber content facilitates good blood sugar regulation, aids in digestion and increases satiety, which makes them an excellent option for weight control. Strong bones are a result of the availability of vital minerals like iron, calcium and magnesium; and overall wellbeing is supported by antioxidants present in millets.

These *uttapams* are adaptable in addition to being nutrient-dense. They go well with a wide range of side dishes, including tomato chutney, coconut chutney and *sambhar*, a vegetable stew made with lentils. You can have the millet *uttapam* for breakfast, as a light snack or even as a component of a well-balanced dinner. A delicious and nutritious substitute for conventional *uttapam*, millet *uttapam* blends the health benefits of millet grains into a popular Indian meal. Flavored, nutritious and adaptable, millet *uttapams* are a delicious option for anybody wishing to expand their culinary palette, satisfy a health concern or avoid gluten.

Objectives

1. To promote sustainable development through the incorporation of novel approaches to traditional recipes.
2. To develop and commoditize novel, cost-effective products rich in macronutrients as well as micronutrients.
3. To promote sustainable global wellness of the community by incorporation of millets in commonly consumed recipe i.e. *uttapam*.

Review of Literature

The word millet also known as food for poor, are small seeded grasses that belonging to the botanical family *Poaceae*. According to Bazile et al. (2015), they are renowned for their flexibility and tolerance to a variety of climatic situations. Millets are categorized as coarse grains. According to Kothari et al. (2016), they comprise a number of species, including foxtail millet (***Setaria italica***), finger millet (*Eleusine coracana*), pearl millet (*Pennisetum glaucum*), and sorghum (***Sorghum bicolor***).

A class of grasses with tiny seeds called millets is grown as staple crops all over the world. In comparison with main cereal crops like rice, wheat and maize, they require less water and fertilizer inputs. Millets are suited for small holder farmers and encourage agro-biodiversity because of their short growth cycle and ability to be grown in a variety of agro-ecological zones. Due to their decreased resource requirements, they also have a comparatively small carbon footprint (Kumar et al., 2018).

Millets are rich in essential nutrients, dietary fiber and phytochemicals. They are a good source of carbohydrates, proteins, dietary fiber, vitamins (especially niacin, thiamine, and riboflavin), and minerals (such as iron, calcium, and zinc) (Saleh, 2018; Hlaváčková et al., 2019). Millets are also gluten-free, making them suitable for individuals with celiac disease or gluten sensitivity. In recent years, millets have gained significant attention due to their numerous health benefits, resilience to harsh environmental conditions and potential to address global food security challenges, cardiovascular health and the prevention of chronic diseases (Chandra-Hioe et al., 2019 and Abhishek Mishra et. al. 2022)

Growing and eating millets can make a substantial difference in food security, especially in areas where hunger and food insecurity are common. Small-scale farmers can rely on millets as a dependable source of revenue and nourishment as they are well-suited for subsistence cultivation. They may be stored for long periods of time without experiencing a major loss of nutrients and they yield well even in challenging circumstances. Governments and organizations can improve rural livelihoods, lower poverty rates and increase vulnerable populations' access to food by supporting millet planting and value addition (Ravi et al., 2020 and D. Patni et al., 2017).

Millets are suited for industrial applications because of a few distinctive qualities. For instance, finger millet straw is used to make fiberboards and paper while foxtail millet (Setaria italica) starch is being investigated as a biodegradable packaging material (Pande, S. et al. 2019 and Eragoda, D. B. et al. 2021). Studies are being carried out to investigate the possibilities for using finger and pearl millets, especially those belonging to the genus Eleusine, in the brewing industry. Craft brews and malted drinks, among other unusual alcoholic beverages, can be made with these millets. Although finger millet has a higher nutritional value than pearl millet, the latter has a distinct flavor. In addition, millets can be processed into a range of snack foods, such as roasted millet and granola and puff-based millets. According to (Fapetu S.E., 2020) and (Tharakan A., 2019), these snacks have a low glycemic index and a high nutrient content, making them healthier than conventional processed snacks.

Methodology

Millets have garnered attention again in recent times because of its many health advantages and ability to help with problems including food security, malnourishment and sustainable agriculture. As a result, there has been a notable increase in the creativity of new millets dishes that are more enticing and adaptable for contemporary diets. Traditionally, *uttapam* are usually made from fermented rice batter. But for the enhancement of the nutritional value of traditional *uttapam*, millets, curd and vegetables were used. The traditional *uttapam* served as control recipe (C) while two experimental versions comprised of incorporation of *ragi* (T1) and *bajra* (T2) flour in place of rice flour. The recipes were standardized and prepared under hygienic settings. Proximate analysis was carried out in laboratory settings in addition to organoleptic evaluation conducted by the panelists.

Fig. 1 Preparation of *Uttapams* in Laboratory

Rice Spinach *Uttapam* (C)

Ragi Spinach *Uttapam* (T1)

Bajra Spinach *Uttapam* (T2)

Rice Spinach *Uttapam*

A nourishing and delicious spin on the traditional *uttapam* recipe, rice spinach *uttapam* combines spinach and rice to provide a filling and healthy breakfast or snack option (Fig. 2). Rice is a great source of protein and carbohydrates. With a higher dietary fiber content, spinach promotes digestive health, helps with satiety and aids in digestion. Apart from being abundant in vitamins, minerals and antioxidants, spinach is also high in iron, calcium and magnesium, as well as beta-carotene and potassium.

Table 1: Ingredients for Rice Spinach *Uttapam*

Sr. No.	Ingredient	Quantity (g/ml)
1.	Rice	80
2.	Spinach	50
3.	Curry Leaves	5
4.	Coriander Leaves	5
5.	Green Chilly	2.5
6.	Eno Fruit Salt	1.25
7.	Salt	3
8.	Oil	2

Method for preparation of Rice Spinach *Uttapam*

1. Soaked rice in a dish of water for two to three hours. Ground it into a fine paste and let it ferment for a night.
2. After cleaning, blanching and grinding, the spinach was made into a fine paste.
3. Chopped the coriander, green chili and curry leaves finely.
4. Added curry and coriander leaves, spinach paste and salt.
5. Stirred and added water as necessary to achieve batter consistency.
6. Mixed eno fruit salt thoroughly.
7. Greased the *tawa* with a few drops of oil. Poured a laddle of batter in the center of *tawa*, covered and cooked it for two to three minutes.
8. When the batter on top appeared a touch dry or overdone and the edges begin to become golden brown. Then, carefully lifted the *uttapam*, turned it over and allowed it to sit for two minutes by sliding a thin silicone spatula from the sides into the center.
9. The *uttapam* were ready to be served.

Fig. 2 Rice Spinach *Uttapam*

II. *Ragi* Spinach *Uttapam*

Ragi spinach *uttapam* is a wholesome and delectable take on the classic *uttapam* recipe, made with spinach and *ragi* (finger millet) flour for a nutritious and satisfying breakfast or snack alternative (Fig. 3). High dietary fiber content, such as that found in *ragi* flour, facilitates satiety, aids in digestion and supports digestive health. Additionally rich in iron, calcium and magnesium are other important nutrients found in *ragi*. *Ragi* is a great option for anyone with celiac disease or gluten sensitivity since it is naturally gluten-free. Vitamins A, C, beta-carotene, potassium and other minerals are among the many vitamins, minerals and antioxidants found in this *uttapam*. The components used to make *ragi* spinach *uttapam* are listed in Table 2.

Fig. 3 *Ragi* Spinach *Uttapam*

Table 2: Ingredients for *Ragi* Spinach *Uttapam*

Sr. No.	Ingredients	Quantity (g/ml)
1.	***Ragi* Flour**	80
2.	**Curd**	80
3.	**Spinach**	50
4.	**Coriander Leaves**	5
5.	**Curry Leaves**	5
6.	**Green Chilly**	2.5
7.	**Oil**	2.5
8.	**Eno fruit Salt**	1.25
9.	**Salt**	2

Method for Preparation of *Ragi* Spinach *Uttapam*

1. Soaked *ragi* flour in a basin with water and curd, adding more as needed; let the mixture ferment for a night.
2. Made a spinach puree and finely chopped the curry leaves, green chili and coriander leaves.
3. Then added to the batter and mixed well.
4. Next added the curry leaves, coriander leaves, spinach puree and salt. Stirred it thoroughly and added water as needed to get the batter consistency.
5. Mixed eno fruit salt well.

6. Applied a few drops of oil to grease the *tawa*. Poured a laddle of batter in the center of *tawa*, covered and cooked it for two to three minutes.

7. When the batter on top appeared a touch dry or overdone and the edges begin to become golden brown. Then, carefully lifted the *uttapam*, turned it over and allowed it to sit for two minutes by sliding a thin silicone spatula from the sides into the center.

8. The *uttapam* were ready to be served.

III. *Bajra* Spinach *Uttapam*

Bajra spinach *uttapam* are a terrific way to add vegetables and millets to your diet, and they are also a healthier alternative to traditional *uttapam* (Fig. 4). They are nutrient-dense, devoid of gluten and suitable for vegan diets. Savor them as a healthy breakfast or as a low-fat dinner choice. The classic *uttapam*, a popular morning dish in South India, may be made even more tasty and healthful with addition of *bajra* and spinach. Pearl millet or *bajra* has a high protein, fiber and nutritional content. The addition of spinach to *uttapam* gives it a slight sweetness and moisture, making it a tastier and healthier option. The ingredients used to make *bajra* spinach *uttapam* are listed in Table 3.

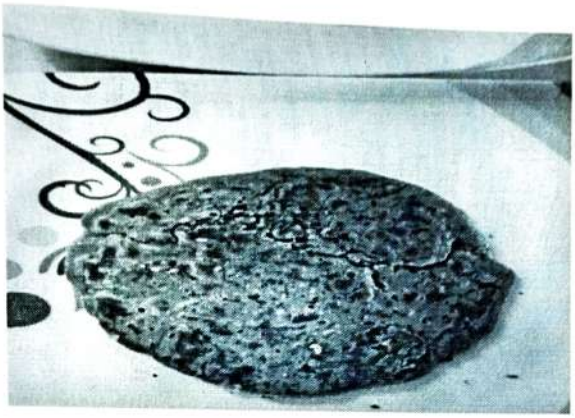


Fig. 4 *Bajra* Spinach *Uttapam*

Table 3: Ingredients for *Bajra* Spinach *Uttapam*

Sr. No.	Ingredient	Quantity (g/ml)
1.	*Bajra* Flour	80
2.	Curd	80
3.	Spinach	50
4.	Curry Leaves	5
5.	Coriander Leaves	5

6.	Green Chilly	2.5
7.	Eno fruit Salt	1.25
8.	Salt	3
9.	Oil	2

Method for Preparation of *Bajra* Spinach *Uttapam*

1. Soaked *bajra* flour with curd and water in a bowl and left the mixture for fermentation for a night.
2. Made a puree of spinach and finely chopped the coriander, curry and green chili leaves.
3. Added the spinach paste, coriander leaves, curry leaves, green chili and salt. Added water as necessary to acquire the batter consistency.
4. Added eno fruit salt and gently mixed it.
5. Preheated the *tawa* and added a few drops of oil to grease. Poured a laddle of batter in the center of *tawa*, covered and cooked it for two to three minutes.
6. When the batter on top appeared a touch dry or overdone and the edges begin to become golden brown. Then, carefully lifted the *uttapam*, turned it over and allowed it to sit for two minutes by sliding a thin silicone spatula from the sides into the center.
7. The *uttapam* were ready to be served.

Results

A tabular presentation of the results of nutritional value of traditional *uttapam* (C) and innovative versions (T1 and T2) using millet has been made, along with a graphical representation of the comparative analysis of millet recipes. The nutritive value tables have been made with reference to C. Gopalan's 1990 book Nutritive Value of Indian Foods. The suggested millet *uttapam's* cost comparison analysis has also been covered below in the form of tables and figures.

A. Nutritional Value Calculation of Control and Experimental *Uttapams*

The two distinctive millet *uttapams*' nutritional values were calculated. Different green veggies were added to these two *uttapam* to enhance its nutritional content. Protein, fibre, iron, calcium and β-carotene levels were shown to be higher in these millet recipes.

The macronutrients and micronutrients found in rice spinach *uttapam* are displayed in Table 4. The results revealed that each serving of rice spinach *uttapam* furnished 320 Kcal of energy with 66.32 grams of carbohydrates, 7.26 grams of protein and 3.02 grams of fat. The micronutrient contribution of this control *uttapam* recipe consists of

1.3 mg of iron, 95.94 mg of calcium, 23.4 mg of vitamin C and 3896 µg of beta-carotene present per serving. Each 80 g of this control *uttapam* has shown 1.01 g of fibre per serving.

Table 4: Nutritional Value Calculation of Rice Spinach *Uttapam* (C)

Sr. No.	Ingredient	Quantity (g/ml)	Energy (Kcal)	Carbohydrate (g)	Protein (g)	Fat (g)	Fibre (g)	β Carotene (µg)	Vit. C (mg)	Calcium (mg)	Iron (mg)
1.	Rice	80	276	62.56	5.44	0.64	0.16	0	0	8	0.56
2.	Spinach	50	13	1.45	1.0	0.35	0.3	2790	14	36.5	0.57
3.	Coriander leaves	5	2.2	0.3	0.16	0.02	0.06	345.8	6.6	9.2	0.06
4.	Curry Leaves	5	10.8	1.83	0.6	0.01	0.32	756	0.2	41.5	0.04
5.	Green Chilly	2.5	0.72	0.06	0.06	0.01	0.17	4.2	2.6	0.74	0.1
6.	Oil	2	18	0	0	2	0	0	0	0	0
	Total		320	66.32	7.26	3.02	1.01	3896	23.4	95.94	1.33

Table 5: Nutritive Value Calculation of *Ragi* Spinach *Uttapam* (T1)

Sr. No.	Ingredient	Quantity (g/ml)	Energy (Kcal)	Carbohydrate (g)	Protein (g)	Fat (g)	Fibre (g)	β Carotene (µg)	Vit. C (mg)	Calcium (mg)	Iron (mg)
1.	*Ragi* Flour	80	264.2	57	5.84	1.04	2.88	33.6	0	275.2	3.12
2.	Curd	80	23.2	3.68	2	0.08	0	0.48	0.8	96	0.16
3.	Spinach	50	13	1.45	1.0	0.35	0.3	2790	14	36.5	0.57
4.	Coriander Leaves	5	2.2	0.3	0.16	0.02	0.06	345.8	6.6	9.2	0.06
5.	Curry Leaves	5	10.8	1.83	0.6	0.01	0.32	756	0.2	41.5	0.04
6.	Green Chilly	2.5	0.72	0.06	0.06	0.01	0.17	4.2	2.6	0.74	0.1
7.	Oil	2	18	0	0	2	0	0	0	0	0
	Total		332	64.32	9.66	3.51	3.73	3930	24.2	459.14	4.05

The macronutrients and micronutrients of *ragi* spinach *uttapam* are shown in Table 5. The findings showed that adding millets to *uttapam* has increased protein, calcium and iron content. According to the nutritive value

calculations, each serving of *ragi* spinach *uttapam* (T1) has 332 kcal of energy with 64.32 g of carbohydrates, 9.66 g of protein and 3.51 g of fat. The nutritive value analysis displays that each serving of *ragi* spinach *uttapam* furnishes micronutrients viz. β - carotene 3930 µg, vitamin C 24.2 mg, calcium 459.14 mg and iron 4.05 mg. The fibre content of this experimental recipe was found out to be 3.73g per serving.

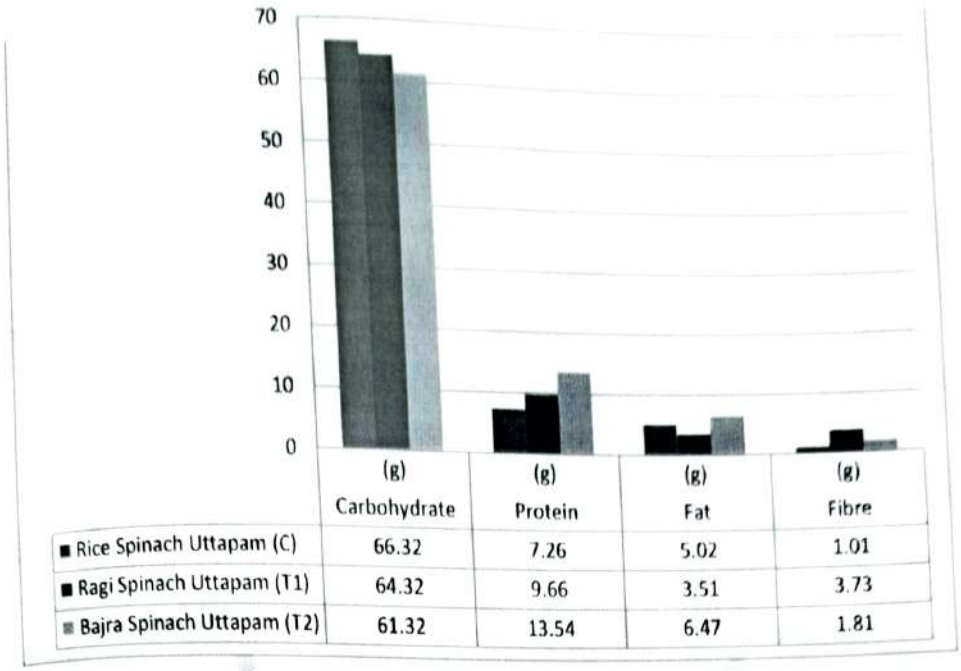
Table 6 displays the macronutrient and micronutrient profile of *bajra* spinach *uttapam*. Each serving of the *bajra* spinach *uttapam* furnishes 356 kcal of energy with 61.32 grams of carbohydrates, 13.54 grams of protein and 6.74 grams of fat. The mireonutrients' calculation reflects content of iron 7.33 mg, calcium is 217.54 mg, vitamin C is 24.2 mg and β-carotene as 4002 µg. The fibre present per serving of *bajra* spinach *uttapam* is 1.81grams.

Table 6: Nutritive Value Calculation of *Bajra* Spinach *Uttapam* (T2)

Sr. No.	Ingredient	Quantity (g/ml)	Energy (Kcal)	Carbohydrate (g)	Protein (g)	Fat (g)	Fibre (g)	β Carotene (µg)	Vit. C (mg)	Calcium (mg)	Iron (mg)
1.	*Bajra* Flour	80	288	54	9.28	4	0.96	105.6	0	33.6	6.4
2.	Curd	80	23.2	3.68	2	0.08	0	0.48	0.8	96	0.16
3.	Spinach	50	13	1.45	1.0	0.35	0.3	2790	14	36.5	0.57
4.	Coriander Leaves	5	2.2	0.3	0.16	0.02	0.06	345.8	6.6	9.2	0.06
5.	Curry Leaves	5	10.8	1.83	0.6	0.01	0.32	756	0.2	41.5	0.04
6.	Green Chilly	2.5	0.72	0.06	0.06	0.014	0.17	4.2	2.6	0.74	0.1
7.	Oil	2	18	0	0	2	0	0	0	0	0
	Total		356	61.32	13.54	6.47	1.81	4002	24.2	217.54	7.33

Table 7: Macronutrients' Comparison of Control and Experimental *Uttapam* Recipes

Recipe	Carbohydrate (g)	Protein (g)	Fat (g)	Fibre (g)
Rice Spinach *Uttapam* (C)	66.32	7.26	5.02	1.01
Ragi Spinach *Uttapam* (T1)	64.32	9.66	3.51	3.73
Bajra Spinach *Uttapam* (T2)	61.32	13.54	6.47	1.81



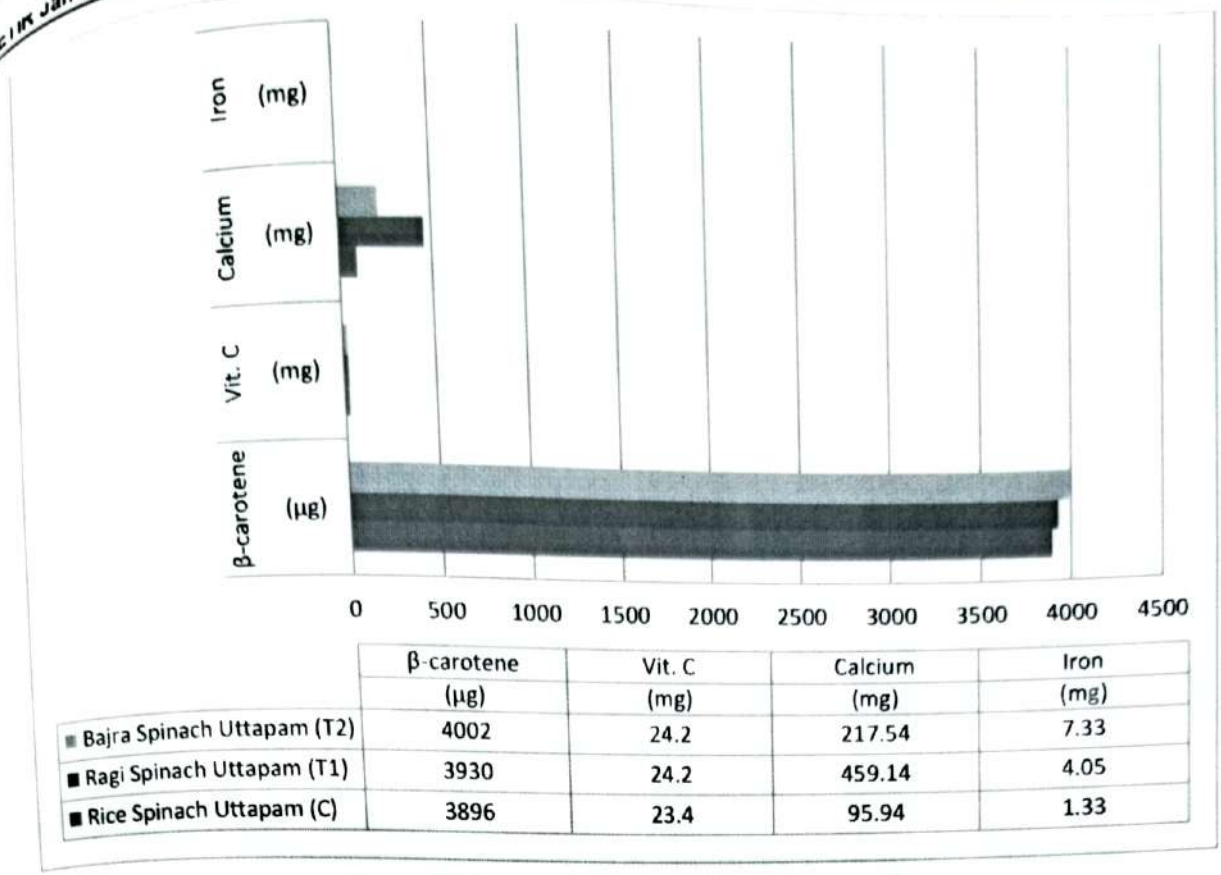
	(g) Carbohydrate	(g) Protein	(g) Fat	(g) Fibre
Rice Spinach Uttapam (C)	66.32	7.26	5.02	1.01
Ragi Spinach Uttapam (T1)	64.32	9.66	3.51	3.73
Bajra Spinach Uttapam (T2)	61.32	13.54	6.47	1.81

Fig. 5 Macronutrients' Comparison of Control and Experimental *Uttapam* Recipes

Table 7 and Figure 5 present an analysis of the macronutrient comparison and nutritional value assessment of all three *uttapam* recipes. This comparison infers that carbohydrate content is almost similar in control as well as experimental *uttapam* recipes. The nutritive value results clearly demonstrate that *bajra* spinach *uttapam* has 13.54 g of protein as compared to 7.26 g in the control recipe. However, *ragi* spinach *uttapam* has protein content with a calculated value of 9.66 g per serving as compared to the control recipe value of 7.26 g. *Ragi* spinach *uttapam* has shown a reduction in fat content too with a calculated value of 3.51 g as compared to 5.02 g of the control recipe. The depiction of increased fibre content of the experimental *uttapams* makes them an excellent choice for people of all ages.

Table 8: Micronutrients' Comparison of Control and Experimental *Uttapam* Recipes

Recipe	β-carotene (µg)	Vit. C (mg)	Calcium (mg)	Iron (mg)
Rice Spinach *Uttapam* (C)	3896	23.4	95.94	1.33
Ragi Spinach *Uttapam* (T1)	3930	24.2	459.14	4.05
Bajra Spinach *Uttapam* (T2)	4002	24.2	217.54	7.33



	β-carotene (µg)	Vit. C (mg)	Calcium (mg)	Iron (mg)
Bajra Spinach Uttapam (T2)	4002	24.2	217.54	7.33
Ragi Spinach Uttapam (T1)	3930	24.2	459.14	4.05
Rice Spinach Uttapam (C)	3896	23.4	95.94	1.33

Fig. 6 Micronutrients' Comparison of Control and Experimental *Uttapam* Recipes

Table 8 and Fig. 6 display the comparison of micronutrients appraisal in the nutritional value of experimental *uttapams* as compared to the control *uttapam* recipe. The graphical representation clearly states that both the experimental versions of *uttapams* have shown an increment in β-carotene content with 3896 µg in control *uttapam*, 3930 µg in *ragi* spinach *uttapam* and 4002 µg in *bajra* spinach *uttapam*. There has been a great appraisal of calcium content per serving of *ragi* spinach *uttapam* with 459.14 mg as compared to 95.94 mg in the control recipe. It is also evident that there has been a considerable increment in the amount of iron present in both the innovations with 1.33 mg, 4.05 mg and 7.33 mg per serving respectively in rice, *ragi* and *bajra uttapams*. However, vitamin C present in all three *uttapam* recipes in almost same.

B. Cost Calculation of Control and Experimental *Uttapams*

The cost value calculations for the two innovative experimental versions of millet *uttapams* and control rice recipe are shown in Tables 9, 10 and 11.

Table 9: Cost Analysis of Rice Spinach *Uttapam*

Sr. No.	Name of the Ingredient	Quantity (g/ml)	Price per kg/unit	Cost (Rs.)
1.	Rice	80	80.00	6.4
2.	Spinach	50	50.00	2.5
3.	Coriander Leaves	2.5	---	---
4.	Curry Leaves	5	---	---
5.	Green Chilly	1.25	---	---
6.	Oil	3	110.00	0.33
7.	Eno Fruit Salt	1.25	1.80	2.25
8.	Salt	2	40.00	0.08
			Total	**11.55**

Table 10: Cost Analysis of *Ragi* Spinach *Uttapam*

Sr. No.	Name of the Ingredient	Quantity (g/ml)	Price per kg/unit	Cost (Rs.)
1.	***Ragi* Flour**	80	80.00	6.40
2.	**Spinach**	50	50.00	2.5
3.	**Curd**	80	100.00	8.00
4.	**Coriander Leaves**	2.5	---	---
5.	**Curry Leaves**	5	---	---
6.	**Green Chilly**	1.25	---	---
7.	**Oil**	3	110.00	0.33
8.	**Eno Fruit Salt**	1.25	1.80	2.25
9.	**Salt**	2	40.00	0.08
			Total	**18.15**

Table 11: Cost Analysis of *Bajra* Spinach *Uttapam*

Sr. No.	Name of the Ingredient	Quantity (g/ml)	Price per kg/unit	Cost (Rs.)
1.	*Bajra* Flour	80	70.00	5.76
2.	Spinach	50	50.00	2.5
3.	Curd	80	100.00	8.00
4.	Coriander Leaves	2.5	---	---
5.	Curry Leaves	5	---	---
6.	Green Chilly	1.25	---	---
7.	Oil	3	110.00	0.33
8.	Eno Fruit Salt	1.25	1.80	2.25
9.	Salt	2	40.00	0.08
			Total	**18.90**

It was discovered that the values of the three types of spinach *uttapam* i.e. rice, *ragi*, and *bajra* were calculated to be Rs. 11.55, Rs. 18.15 and Rs. 18.90 per serving respectively. These values are reasonably priced for all. However, the inclusion of veggies and the use of millets haven't driven up the price unnecessarily. Instead, these innovations are value additions which greatly improve the taste, diversity and nutritional content of this widely consumed traditional dish, creating new business prospects for vendors. Additionally, these additions will improve community health thereby reaching our goal of global wellness.

Table 12: Cost Comparison of Control and Experimental *Uttapams*

Recipe	Cost (Rs.)
Rice Spinach *Uttapam* (C)	**11.55**
***Ragi* Spinach *Uttapam* (T1)**	**18.15**
***Bajra* Spinach *Uttapam* (T2)**	**18.90**

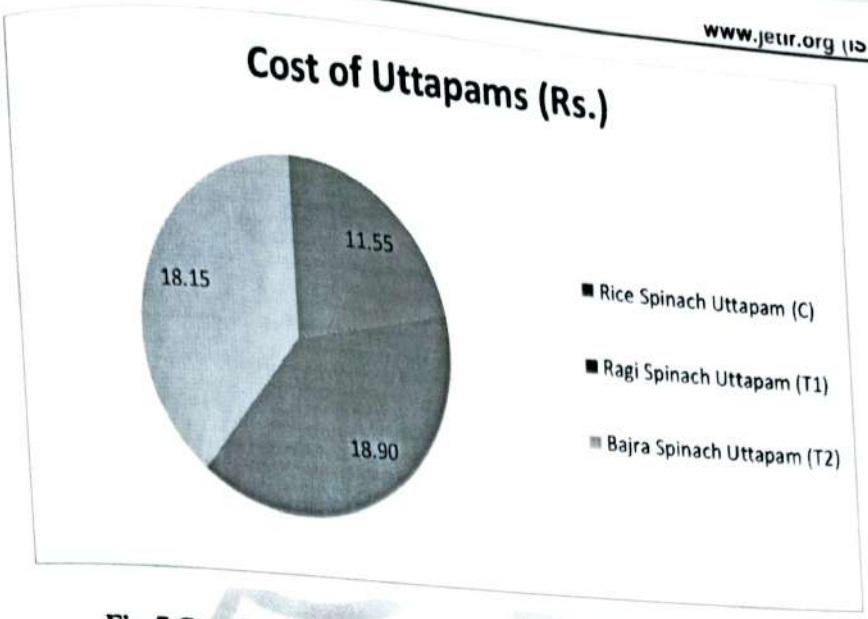


Fig. 7 Cost Comparison of Control and Experimental *Uttapams*

Comparative cost analysis of the three *uttapam* recipes is shown in Table 12 and Fig. 7 and confirm that the slight upraise in cost of *uttapam* on addition of millets in place of control rice flour is worth the addition of macronutrients as well as micronutrients appraised in these experimental versions of *uttapams*. Secondly, the cost of these innovative suggestions is not more than Rs. 20 per serving which makes them an affordable nutritive menu listing for achieving the ultimate goal of global wellness. We can enjoy a tasty and nutritious supper while promoting both the environment and our general well-being by including millets into our diet through recipes like *uttapam*. They make pleasant, healthful snacks that everyone may try for a change.

C. Sensory Evaluation of Control and Experimental *Uttapams*

A 9-point hedonic scale was used by seven semi-trained panelists of different ages to do sensory evaluation and determine whether or not the millet *uttapams* were deemed satisfactory. Hedonic rating scale from 1 to 9 was used to score the sensory attributes like texture, aroma, color, appearance, taste and overall acceptability of all the three *uttapam* recipes. Score cards were filled by the panelists and mean values for all attributes were calculated and are presented in Table 13 and graphically depicted in Figure 8.

Table 13: Comparison of Organoleptic Evaluation of Control and Experimental *Uttapams*

S. No.	Sensory Attributes / Recipe	Texture and Aroma	Colour and Appearance	Taste	Overall Acceptability
1.	Rice Spinach *Uttapam* (C)	7.6	7.7	7.8	7.9
2.	*Ragi* Spinach *Uttapam* (T1)	7.9	7.9	8.2	8.3
3.	*Bajra* Spinach *Uttapam* (T2)	8.1	8.0	8.4	8.4

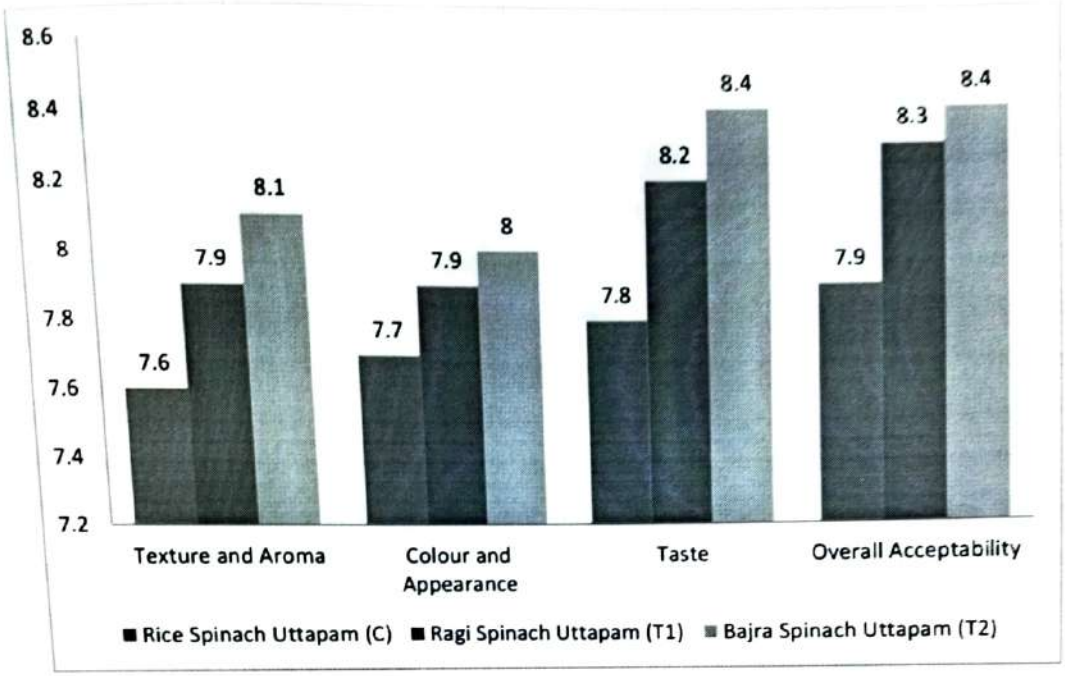


Fig. 8: Comparison of Organoleptic Evaluation of Control and Experimental *Uttapams*

The panelists' average evaluations for the texture and aroma of different *uttapam* are shown in the graph above. It is clearly indicated that the control *uttapam* (C) has the lowest rating, with an average score of 7.6 while T1 (*ragi uttapam*) and T2 (*bajra uttapam*) have comparatively higher average scores i.e. 7.9 and 8.1 respectively. The graph above also shows that *bajra* spinach *uttapam's* average score for color and appearance is 8.0 which is the maximum while the rice spinach *uttapam's* score is the lowest (7.7). The findings also show that *ragi* millet replacement has a significant impact on appearance and color.

The panelists' replies were graphed and it was evident from graph that T1 had the highest taste score too (8.4), whereas the control *uttapam* scored (7.8). This is yet another unequivocal sign that *ragi* millet addition has improved the *uttapam's* taste with a score mean value of 8.2.

acceptance based on all the characteristics is represented by the overall acceptability graph; the product T2 has highest average score of 8.4 followed by T1 (8.3) as opposed to *uttapam* C (7.9). According to statistical analysis, there was a substantial correlation between the characteristics; as a result, there is a significant relationship between flavor, taste, color, appearance and overall acceptability.

Conclusion

The increasing need for better food options in the modern day is demonstrated by the popularity of millet-based recipes in response to the rise in diet-related disorders. Due to their high nutritional content and ability to fight disease, millets have become a popular ingredient among those looking to enhance their overall health and well-being. Promoting sustainable global wellness by incorporating millet into traditional recipes is an important step towards a healthier and more sustainable future. By embracing traditional cooking methods and ingredients, we can reconnect with our cultural heritage and support sustainable agriculture. Millet is a nutritious, gluten-free and sustainable grain that can enhance the nutritional value of traditional recipes and promote global wellness. By incorporating millet into traditional recipes, we can support small-scale farmers, reduce the environmental impact of agriculture and provide access to nutritious and sustainable ingredients for people around the world. It is time to celebrate the diversity of traditional recipes and embrace the power of millet for a healthier and more sustainable world. By adding millet to a variety of recipes, including time-honored favorites, people can make healthy dietary choices while still enjoying their favorite flavors. With diet-related disorders on the rise, there is a growing need for healthier food options; which is reflected in the growing popularity of millet-based recipes. Millets are a healthy substitute that can be incorporated into well-liked traditional recipes, making them a win-win for people looking to eat less and for those who want to be ecologically conscientious. Millets will certainly remain a staple of our meals as long as we keep the sustainability of our world and our own well-being as our top priorities. These are healthy, nutrient-dense and perhaps healthier food options, according to the study's findings on the nutritional content of millets *uttapams*.

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