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FORMULATION AND QUALITY ASSESSMENT OF INSTANT PADDU MIX WITH MORINGA POWDER AND RED RICE

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ABSTRACT:

This study investigates the development and quality assessment of an instant Paddu mix incorporating Moringa leaf powder and malted red rice flour, prepared using a traditional malting process. The formulation aims to enhance the nutritional profile of Paddu, a popular South Indian snack or breakfast item, leveraging the health benefits of moringa and red rice, both renowned for their rich nutrient content and functional properties. The malting process involves before germinating red rice to improve its nutritional value, flavor, and digestibility. The process includes soaking the grains, allowing them to sprout, drying them to halt germination, and milling them into flour. This malted flour is blended into the Paddu mix to enhance texture, taste, and nutritional quality while reducing anti-nutritional factors and improving nutrient bioavailability. Various formulations were developed by combining malted red rice flour with Moringa leaf powder and other traditional ingredients. The resulting product not only improves the nutritional quality but also preserves the sensory attributes, making it a convenient, healthy, and appealing option for consumers. This study highlights the use of traditional processing techniques in creating nutrient-rich instant food products tailored to modern dietary needs.

Keywords: Instant mix, paddu, ready to cook, south Indian cuisine, red rice, moringa powder, healthy breakfast alternatives.

1. INTRODUCTION

In today's world, where time is precious and life moves quickly, "instant foods" are essential to everyone's daily existence. The word 'instant food' itself refers to simple, quick, and easy cuisine that is not only hygienic, free of microbiological contamination, and convenient to consume, but also easy to make (shanti d. et.al., 2000)[1]. Although the research on the specific health advantages of breakfast is still ambiguous, it has been linked in recent years to weight control, cardio-metabolic risk factors, and cognitive performance. Breakfast is frequently referred to as the most important meal of the day (Gibney et al. 2018)[2]. According to scientific research, preparing a nutritious breakfast is associated with higher daily nutrient consumption, better adherence to dietary guidelines, and higher- quality meals overall (López-Sobaler et al., 2018)[3]. Food fermentation is a well-known method that has been used for many years to preserve food with the aid of bacteria. A wide variety of fermented meals and drinks have a substantial impact on people's diets both in India and around the world by enhancing the food's nutritional value and organoleptic qualities through flavor enhancement. (Chitra U, Reddy CR, et.al.,)[4]. Traditionally, Paniyaram is a fermented dish which upon cooking has a golden brown, traditional fermented acidic (leavened), soft, spongy texture. It is a shallow fat fried cake made out of fermented rice pulse batter with or without fenugreek seeds. Paniyaram is principally prepared from a combination of rice and different types of pulses in 4:1 ratio. Hence, present study was carried out to develop a value added fermented product named Paniyaram by incorporating red rice and moringa powder and replacing the traditional rice component in the batter. Paniyaram is the most traditionally consumed snacks in India. In today's fast-moving world there is an increasing population of working women than non-working women so there is more demand for convenience food. Development of value added product: paniyaram instant mix. Paniyaram is a typical fermented dish with a soft, spongy texture and a golden brown, traditional fermented acidic (leavened) texture when cooked. Fermented rice pulse batter, with or without fenugreek seeds, is used to make this shallow fat fried cake. The main ingredient of paniyaram is rice, which is combined with various pulses in a 4:1 ratio. Therefore, the goal of the current study was to replace the typical rice component in the batter with red rice in order to create Paniyaram, a value-added fermented product, (Deepa M. Madalageri, et.al., (2012)[5].

The rice is semi-milled by producers, leaving some of the red husk on the grain. Another excellent source of selenium, which protects against infections, is red rice. A substance found in red rice known as Monacolin K. aids in reducing LDL, or bad, cholesterol levels. For those who are concerned about their cardiovascular health, this may be a good option. Since the outer layer of the rice, which is where all of the fibre originates, is preserved, it is packed with both soluble and insoluble fibre. These days, doctors also recommend it as a medication substitute to treat mild high cholesterol symptoms (Kaur B et al., (2015)[6].

The powdered leaves of Moringa oleifera (MoLP) have drawn a lot of interest because of its high nutritional content and possible health advantages. According to studies, MoLP has a number of bioactive substances that contribute to its potent antioxidant qualities, including as amino acids, phenols, flavonoids, and saponins (Khalid et al., 2023)[7]. The fresh moringa leaves help boost the milk production of pregnant and lactating moms and are used to treat anemia ("Fuglie, L.J. et al.,)[8]. moringa leaves have several health benefits, such as anti-inflammatory, anti-microbial, anti-cancerous, and antioxidant properties ("Vongsak, B.; et al.,)[9].

MATERIALS AND METHODS:

Raw materials: The materials that are required in the preparation of paddu mix are red rice, moringa powder, urdal flour, rice flakes, baking soda, salt

Traditional Recipe of Paniyaram: (Combination of Rice &Urad dal)

Preparation of moringa powder:

Moringa leaf powder is made using a methodical procedure to guarantee quality and nutrient preservation. After being picked, moringa leaves are first cleaned and washed to get rid of contaminants. Blanching the leaves helps preserve their colour and deactivates enzymes that could break down nutrients. To lower the moisture level without sacrificing too much nutrients, the leaves are either shade-dried or put in a tray dryer after blanching. After being dried, the leaves are first ground coarsely and then crushed into a fine powder. In order to preserve its quality and shelf life, the powder is lastly packed and kept in the proper environment.

Processing of red rice:

The processing of red rice flour begins with the collection of high-quality red rice grains, which are thoroughly washed to remove dirt, impurities, and foreign materials. The cleaned rice is then soaked in water for a specific period to soften the grains, making them easier to process. After soaking, the rice is dried using either a tray dryer or a hot air oven until it reaches the desired moisture level. Once dried, the rice is pulverized into a fine powder using a pulverizer. The resulting flour is then passed through a vibro shifter to separate coarse particles and ensure uniform size and texture. The sifted flour is blended to maintain consistency in quality and composition. Finally, the flour is packed in clean, moisture-proof bags and sealed to preserve freshness and protect it from contamination, ensuring it is ready for storage and use.

Process of Pulverizing

After drying the ingredients, the ingredients are shifted to the pulverizer. The pulverizer is a mechanical device used to crush, grind, or pulverize solid materials into smaller particles or powders.

Process of Vibro Shifter:

After pulverizing the processed material is shifted to vibro shifter. The material is fed onto the center of a vibrating screen. The machine vibrates and vibration causes the material to move across the screen. Fine particles pass through the mesh openings and coarser or oversized particles stay on top and move toward the discharge outlet. Fine powder is collected separately. Oversized material can either be reprocessed or discarded.

Preparation of paddu Mix Powder

To prepare a nutritious and flavourful instant paniyaram mix using red rice and moringa powder, follow these steps: Start by washing and soaking red rice and urad dal separately for about 6 hours. Once soaked, drain the water and dry them in tray/ oven dry then grind them separately to a fine powder using a blender or a grinder. To the red rice and urad dal powders, add moringa powder, rice flakes flour, channa dal powder, baking soda, salt, and a small quantity of fenugreek powder. Blend all these ingredients thoroughly to create a homogeneous mixture. This forms the instant paniyaram mix. To make the batter, measure approximately 150 grams of the prepared instant mix and gradually add water while stirring continuously until it forms a thick, smooth paste. Ensure there are no lumps in the batter. Allow the batter to rest in a warm place for 10-20 50 minutes to enable a mild fermentation process. Once fermented, the batter is ready to use for making paniyarams. Scoop the batter into a heated paniyaram pan and cook until golden and crisp, flipping as needed. The use of red rice and moringa powder not only enhances the nutritional profile of the paniyarams but also imparts a unique flavour and appealing texture.

The product obtained is weighed accurately. The weighed product is added one by one into the blender. Accordingly, all the products are added to the blender. Now the blender is used for mixing all the ingredients into the equal proportions. The blending process will be of 10 -15mins. After that the product obtained is ready for preparation.

Process Of Filling and Sealing

The obtained finished goods is filled in a tetra -pouches or the Low Density Polyethylene pouches. The pouch consists of zip lock at the top of the pouch. The product is filled according to the pouch size. The product filled in the pouch is sealed in a continuous sealer machine. The sealed product is kept for storage stability.

FIG 1: TRAY DRYER

FIG 2: PULVERIZING

FIG 3: VIBRO SHIFTER

FIG 4: SEALING MACHINE

Flow Chart of Instant paddu Mix

Ingredient Selection

↓

Grading and Cleaning

↓

Processing of

Moringa powder | red rice | raw materials

↓

Allow it to cool for 10mins

↓

Drying (50-60◦c)

↓

Milling into fine powder

↓

shifting

↓

Blending (mixing of all ingredients)

↓

Quality control and testing

↓

Final product (Rede rice and moringa powder rice)

↓

The final product is filled, sealed and store

Formulations

The formulation is made in the point of view that main ingredient like red rice should have high percentage than other ingredients because the red rice is rich in nutrient profile and moringa powder is another ingredient where it provides iron to the mix. The red rice which is rich in nutrients are added.

Table:1 formulation

Ingredients	F1	F2	F3	F4
Red rice	105	99.5	95	99
White rice	50.5	60	65	63
Moringa powder	10	15	16.5	18.5
Uradal powder	55.5	50	49	49.5
Rice flakes	20	20	20	20
salt	2	2	2	2
Baking soda	3	3	3	3
Fenugreek powder	0.5	0.5	0.5	0.5

Preparation of paddu

The paddu mix powder is taken in a bowl after unsealing. Properly mix the paddu mix powder in the bowl.
Application 1: Take the paddu mix powder add sufficient water into it as per your consistency. Mix it properly without any lumps or
Application 2: Take the paddu mix powder add curd into it. Mix it properly and leave it for 15 to 30 mins. Pour the batter on the pan, after the paddu turns brown take it in the plate and have it.

Flow chart of preparation paddu

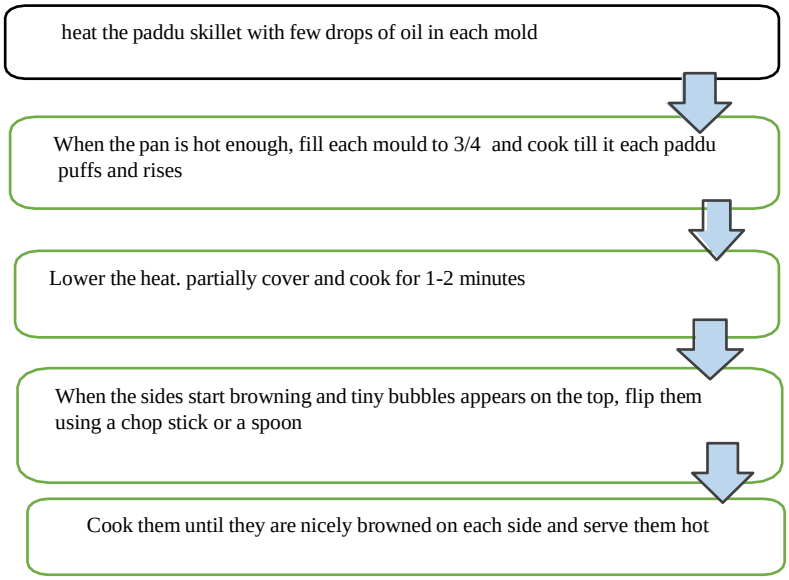

Fig 5: paddu skillet

METHODS

Moisture content: To measure the accurate amount of water present in the sample. Moisture content is analyzed by the oven drying method at 105℃ for 3hrs (AOAC 2000).

Formula: Moisture = W 2 /W 1 ×100%

Ash content: To measure the minerals present in it. Ash content is analyzed by using muffle furnace at 550℃ for 6hrs (AOAC 2000). Formula: Ash = W 2 /W 1 ×100%

pH: It is determined by the digital pH meter.

Titrable acidity: The measure of un -disassociated acids in the sample.

$$\text{Acidity} = \frac{\text{Titrate value} \times \text{equivalent weight of NaOH} \times \text{normality of NaOH}}{\text{weight of the sample}}$$

Acid Insoluble Ash: To measure contaminants like sand in the sample (AOAC 941.12) Formula: Acid insoluble ash = weight of

$$\frac{\text{residue after acid treatment}}{\text{Original weight of the sample}} \times 100\%$$

Carbohydrates: the measure of carbohydrates is by using fehling solution performed according to FSSAI manual method.

Formula: Total Carbohydrates (%) = Volume of sample used (ml)×dilution factor×100

Protein: the protein content is determined by kjeldahl method.

$$\text{Nitrogen\%} = \frac{(\text{Volume of HCl} \times \text{Normality of HCl} \times 1.4007)}{\text{Weight of sample in gm}}$$

Protein (%) = Nitrogen (%) × 6.38

Sensory Analysis: the sensory analysis is done according to hedonic scale rating (table 2). The formulations are exposed to sensory analysis along with control. Different panelist gave the rating for sensory attributes like color, flavor, taste, appearance, taste and overall acceptability. The mean score is the overall acceptability.

Table: 2 Hedonic Scale

OPINION	RATING
Like extremely	9
Like very much	8
Like moderately	7
Like slightly	6
Neither like nor dislike	5

Dislike slightly	4
Dislike moderately	3
Dislike very much	2
Dislike extremely	1

2. RESULTS

Sensory Analysis: According to sensory analysis the formulation 3 that is 95g red rice powder, 65 g white rice flour, 16.5g moringa powder, 49g urad dal powder, 20g rice flakes 2g salt, 3g g baking soda and 2g salt is the best among the 3 as it has highest rating due it is better in taste, appearance and texture. The overall acceptability for the formulation 1 is 7.5, formulation 2 is 8 formulation 3 is 9 and formulation 4 is 8.5.

Table:3 Sensory Analysis

Sensorial Attributes	**F1**	**F2**	**F3**	**F4**
Color	7	7.5	9	8
Consistency	7.5	8	8.5	8
Flavor	7	7	8.5	8.5
Taste	6	8	9	8
Appearance	7.5	8	9	8.5
Overall Acceptability	7.5	8	9	8.5

Physico Chemical Analysis

According to the physico chemical analysis it clearly states that the developed and standardize product is less in the moisture, ash, and acid insoluble ash when compared to control. It was also expressed that the moisture content, ash content acid insoluble content is decreasing where it indicates that the shelf

life stability is increased, retention in mineral is also less and the inorganic matter like sand dust and other foreign particles also less when compared to other formulations.

The formulation 3 has less moisture content 8.5%, ash 1.04%, acid insoluble ash 0.38%, pH 4.3%, acidity 0.7%. The other formulations and control has high in moisture content, ash content.

Table: 4 Physico Chemical Analysis

parameters	**F1**	**F2**	**F3**	**F4**
Moisture	8□	8.04□	8.5□	8.01□
Ash	1.23□	1.06□	1.04□	1.2□
Acid insoluble ash	0.037□	0.43□	0.38□	0.43□
PH	4.6	4.2	4.3	4.03
Acidity	0.02□	0.04□	0.07□	0.06□

Nutritional Analysis

The nutritional analysis of 4 formulations are given in the below table. According to the sensory evaluation the formulation 3 is the best as it has high protein, fiber, iron, and essential minerals when compared to control. The paddu is rich in nutrients which it can be healthy when it is consumed. The formulation 3 has less amount of carbohydrates 65.7g, high amount of protein 13.30g, high amount of fiber 3.99g, high amount of iron 3.65mg, amount of calcium is 18.22mg. The control sample has high amount of carbohydrates, less amount of protein fiber and iron.

Table: 5 Nutritional Analysis

parameters	**control**	**F1**	**F2**	**F3**	**F4**
Energy(kcal)	355.98	347.3	328.9	360.5	367.5
Protein(g)	11.32	12.3	12.5	13.30	13.06

Fat(g)	2.07	2.0	2.06	2.06	2.05
Carbohydrate(g)	71.84	68.9	70.3	65.5	65.5
Fiber (g)	2.6	2.96	2.98	3.99	3.79
Iron(mg)	2	3.06	3.61	3.65	3.58
Calcium(mg)	20.9	18.8	19.18	18.22	19.13

Storage study of the instant paddu mix formulation

Tests were conducted to determine the shelf life of functional foods. The packaging materials—a low density polyethylene pouch (LDPE), zip lock pouches and aluminated pouches used to store the developed instant paddu mix. These pouches are stored and recorded the how much percent of moisture content is absorbed by the packet and also visualized the product whether the sample is affected with rice weevil and any color disappearance. The product is visualized after some days and the product is not affected by any insects. The product's stability and quality are not impacted by the storage temperature. The product is studied at room temperature (28°C) on their stability was investigated.

DISCUSSION

The development of an instant red rice moringa paddu mix addresses the growing demand for convenient, nutritious food options driven by today's fast-paced lifestyles and increased health awareness. By incorporating superfoods like red rice and moringa powder into a traditional South Indian recipe, this product bridges the gap between traditional cuisine and modern nutritional needs. The formulation includes a base of rice, urad dal, rice flakes, and fenugreek seeds, enhanced with red rice—rich in antioxidants, fiber, and minerals—and moringa powder, known for its high iron, calcium, and vitamin content. Nutritional analysis showed improved levels of iron, calcium, protein, and phenolic compounds without compromising on taste or texture. Sensory evaluation was conducted on four formulations (F1–F4). F1 received the lowest scores across all parameters, while F2 showed slight improvement. F3 emerged as the best formulation, with top ratings in taste, texture, and overall acceptability. F4 closely followed, especially excelling in appearance and color. Overall, F3 was identified as the most balanced and preferred formulation, offering a wholesome, convenient meal option with traditional Flavors and added health benefits.

Conclusion

The project successfully achieved its goal of developing and standardizing a nutritionally enriched instant paddu mix by incorporating functional ingredients such as red rice and moringa powder. This innovative product offers a healthier alternative to conventional paddu mixes, aligning with modern consumer demands for convenience, taste, and enhanced nutritional value. Through careful formulation and optimization, the final product demonstrated improved levels of fiber, iron, and antioxidants while maintaining desirable sensory qualities and ease of preparation. The use of natural, nutrient-dense ingredients, along with standardized processing techniques, resulted in a quick-to-cook, health-promoting meal option that caters to both traditional food preferences and contemporary nutritional needs. This instant paddu mix stands as a promising example of how traditional recipes can be effectively upgraded to meet today's lifestyle and wellness expectations.

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