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‘Six-Mix’ Multi-Millet Dosa Mix and Its shelf life

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Abstract:

A study was undertaken to standardize an innovative nutritious food product and see the consumer acceptability. The product designed was made keeping in mind diabetic patients and people of all age groups, gluten sensitive patients, pregnant and lactating mothers, under weight or malnourished children etc. The nutritionally rich common delicacy enjoyed by Indians “Dosa” was improvised with addition of various millets such as (ragi, jowar, bajra, foxtail millet, little millet, barnyard millet, urad dal) fenugreek seeds and “moringa powder” [a functional food]. This paper highlights the health benefits of this healthy dosa mix with Moringa powder and 6 different millets. This product can be beneficial for diabetic and heart patients. A shelf life study was done using 5 point hedonic scoring test on characteristics such as, taste, colour/texture, aroma, appearance and mouth feel.

The other aspects studied were packaging, designing a nutritional label, budgeting and marketing. The product was marketed through social media platforms. As per the conducted sensory evaluation for one month, the product lasted for 4 weeks if stored in a cool and dry place.

Key words: Moringa, Millets, Dosa Mix, Food Product Development, Gluten Sensitivity, Sensory Evaluation.

INTRODUCTION:

Diabetes is a chronic disease that is characterized by high levels of blood glucose also known as hyperglycaemia. An unhealthy diet and lack of exercise are generally associated with significantly increased risk of diabetes^[4]. On the other hand majority of cases of T2DM could be altered or prevented by adopting a healthy lifestyle, such as sufficient consumption of whole grains, controlled total energy intake, and increased physical activity^[2]. Management techniques for prevention of diabetes in high-risk as well as in affected individuals, other than medication, is mainly through changes in lifestyle and dietary modifications^[1]. The modified product “SIX MIX” multi millet dosa mix was especially developed for diabetic patients and others who are looking for healthy options.

Dosa is a south Indian recipe made from a fermented batter consisting of lentils and rice. The modified recipe is made with replacing the lentils and rice with 6 different millets (i.e. Sorghum, finger millet, pearl millet, barnyard millet, foxtail millet and little millet) black gram dal and drumstick powder (moringa). Many researchers have shown that millets may make a good substitute for rice for some diabetics; Millet's have high fibre content and slows digestion and releases sugar into the bloodstream at a more even pace. This helps diabetics avoid dangerous spikes in blood sugar which leads to glucose spilling over into the urine, known as glucosuria. Millets also contain high quantities of methionine, an amino acid that is deficient in most grains. Soaked fenugreek seeds have anti diabetic properties, by increasing insulin sensitivity in hyperglycemic states, and helps in weight loss with good fiber content. (www.icrisat.org/millet-diabetes/)

So the present study was under taken to formulate a dosa mix with following objectives

1. To standardize an innovative, healthy and nutritious product.
2. To select a cost effective packaging material.
3. To design a nutritional label.
4. To study the shelf life of the product using a sensory evaluation.

5. To learn entrepreneurship skills.
6. To make a cost effective product by learning the budgeting aspects.
7. To market the product in an effective way.

DESCRIPTION OF INGREDIENTS:

Foxtail millet is a general source of vital nutrients for the strengthening of muscles and bones. Foxtail millet is rich in vitamin B12 which is essential for maintaining a healthy heart, smooth functioning of the nervous system, and in general good for skin and hair growth. ^[11] A diet including Foxtail Millet may improve glycemic control and reduce insulin, cholesterol and fasting glucose in Type-2 diabetes patients. Foxtail Millet is rich in natural iron which helps reduce muscular spasms and eases out restless syndrome. (<https://slurpfarm.com/pages/foxtail>)

Barnyard millet grain is a good source of protein, carbohydrate, fibre, and, most notably, contains more micronutrients (iron and zinc) than other major cereals. ^[9] The high ratio of carbohydrate to crude fibre ensures the slower release of sugars in the blood, and so thus aids in maintaining blood sugar levels. This makes barnyard millet an ideal food not only for people with lifestyle diseases, but also for anaemic patients and especially women in developing countries. ^[10]

Sorghum, like other cereals, is an excellent source of starch and protein. This gluten-free cereal bears significance in the present day scenario where the occurrence of Celiac Disease (CD), an immunological response to gluten intolerance, is on the rise. The starches and sugars in sorghum are released more slowly than in other cereals and hence it could be beneficial to diabetics. ^[5] Sorghum has a higher crude fat content than wheat or rice. It is a rich source of B-complex vitamins.

Pearl Millet contains high amounts of Iron and Zinc which may help to increase the haemoglobin levels. The high fibre content of pearl millet can be extensively used to prepare healthy foods for people who need a high diet, especially as it is helpful in obesity and dealing with the problem of constipation. The presence of omega-3 fatty acids in pearl millet as compared to any other cereal grain highlights its potential in prevention and treatment of cardiovascular diseases, diabetes, arthritis and certain types of cancer. ^[8] Pearl millet grains are all very high in calories, precisely the reason they do wonders for growing children and pregnant women (www.icrisat.org).

Little millet is rich in crude fibre, iron and phosphorus which are comparable to cereals and other millets ^[6]. Regular consumption of little millet is very beneficial for postmenopausal women suffering from signs of cardiovascular disease, like high blood pressure and high cholesterol levels. Additionally, it can blend with most traditional and novel foods without imparting any flavours of its own. ^[7] Hence, little millet was chosen to enhance the nutrient composition of the dosa mix in terms of dietary fibre and other nutrients.

Finger millet is well recognised because of its high content of calcium, dietary fibre and phenolic compounds. The non starchy polysaccharides of the millet form bulk of its dietary fiber constituents and offer several health benefits including delayed nutrient absorption, increased faecal bulk and lowering of blood lipids. Regular consumption of finger millet as a food or even as snacks helps in managing diabetes and its complications by regulation of glucose homeostasis and prevention of dyslipidemia. ^[3]

Urad dal is a rich source of nutrition and helps boost energy. Urad dal is rich in fibres which help improves digestion. It may also help manage constipation by promoting bowel movements due to its laxative property. Regular consumption of urad dal improves sexual desire in men which in turn helps manage sexual dysfunction due to its aphrodisiac property. Urad dal is also considered to be good for diabetes as it improves insulin secretion and sensitivity (<https://nutraorifice.com/urad-dal/>)

Fenugreek seeds have medicinal properties such as hypocholesterolemic, lactation aid, antibacterial, gastric stimulant, for anorexia, anti diabetic agent, galactagogue, hepatoprotective effect and anticancer. It is well known for its fibre which is about 25% which changes the texture of food. These days it is used as food stabilizer, adhesive and emulsifying agent due to its high fibre, protein and gum content. Fenugreek is having beneficial influence on digestion and also has the ability to modify the food. ^[14]

Moringa powder has pharmacological properties, including anti-diabetic, anti-inflammatory, cardio protective anti carcinogenic, antioxidant, and antimicrobial. According to ayurvedic medicine, it is attributed for the treatment of some diseases, such as asthma, epilepsy, eye and skin diseases, fever and haemorrhoids ^[12, 13]. Moringa supplementation has a nutritional purpose, although it can provide other benefits to the product, such as improved digestibility, dough stability, antioxidant capacity, preservation, etc

MATERIALS AND METHOD:

A food product was to be designed under a course of Food Science and Nutrition as part of food product development. A lot of brain storming was done to innovate a new nutritious healthy recipe which was also cost effective. Highly acceptable products such as Frozen Soy Cutlet, multigrain laddoo, diabetic khakhra, Multigrain Pizza Base and multi-millet dosa mix were thought off. Multi-millet dosa mix was finalized as the final product due to availability of ingredients. The idea of food product was mainly based on consumer acceptance, palatability, cost-effectiveness, and nutrients provided by each product.

Raw materials used to make this product were Jowar, Bajra, Ragi, foxtail millet, little pearl millet, barnyard millet, black gram dal, fenugreek seeds and moringa powder.

PREPARATION OF 'SIX-MIX': MULTMILLET DOSA MIX:**Table 1: Product before Standardization**

INGREDIENTS	AMOUNT
Fox Tail Millet	30gm
Little Millet	30gm
Barnyard Millet	30gm
Pearl Millet(Bajra)	30gm
Sorghum (Jowar)	30gm
Finger Millet (Ragi)	30gm
Black Gram Dal	60gm
Moringa powder	30gm
Fenugreek seeds	5gm

It was observed that there was a typical bitter after taste to the dosa's prepared using these proportions. Therefore it was changed again by decreasing the amounts of certain ingredients which were causing the bitterness. As can be observed in Fig 1

Table 2: Product after Standardization

INGREDIENTS	AMOUNT
Fox Tail Millet	30gm
Little Millet	30gm
Barnyard Millet	30gm
Pearl Millet(Bajra)	30gm
Sorghum (Jowar)	30gm
Finger Millet (Ragi)	30gm
Black Gram Dal	60gm
Moringa powder	10gm
Fenugreek seeds	2gm

METHOD OF PREPARATION:

1. Mix all the millet flours together according to the standardized value.
2. Grind black gram dal along with fenugreek seeds and add it to the millet mix.
3. Add Moringa powder.

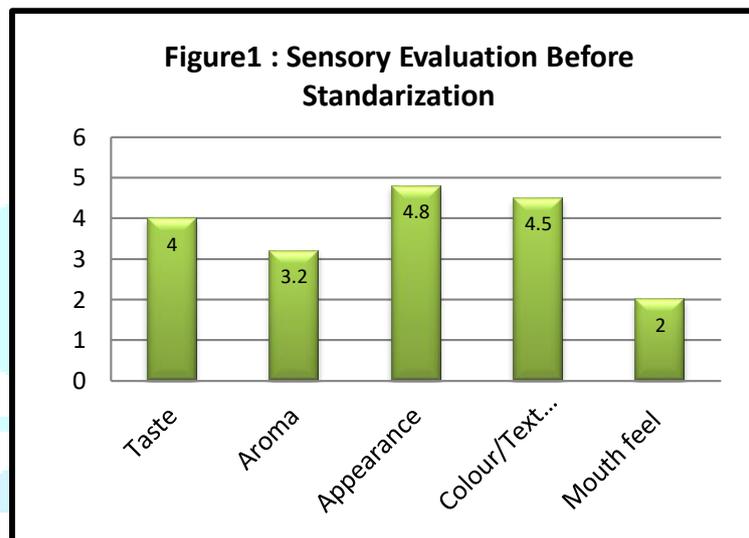
PREPARATION OF DOSA:

Take some millet mix in a bowl and add salt as per taste and water to make dosa batter. Let the batter ferment for around 6-8 hours. After 6-8 hours spread some batter on a pan and roast it with ghee or oil on both the sides. Crispy delicious multi-millet dosa is ready.

SENSORY EVALUATION FOR STANDARISED RECIPE:

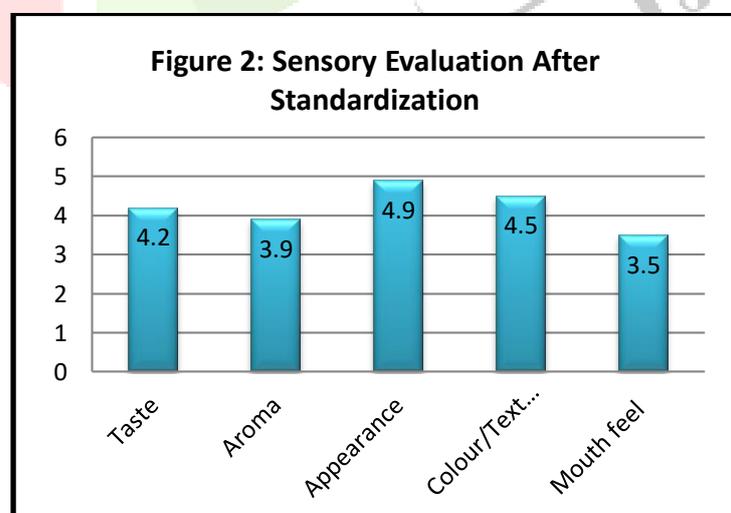
For sensory evaluation hedonic scale was used, and evaluation was done with the help of 10 naive panel members. It included colour/ texture, aroma, appearance, taste and mouth feel. Which was scored on a 5 point scale where 5 =like a lot, 4 =like a little, 3 = neither like nor dislike, 2 = dislike a little and 1= dislike a lot. Results were thus noted down.

Fig 1: SENSORY EVALUATION FOR STANDARISED RECIPE (Before Standardization)



As seen in figure 1 the aroma and mouth feel of the product were not liked by the panel members, the after taste of the product was bitter and therefore, another sensory evaluation was done by reducing the proportions of certain ingredients.

Fig 2: SENSORY EVALUATION FOR STANDARISED RECIPE (After Standardization)



As seen in fig 2 after reducing the proportions of moringa powder and fenugreek seeds, the characteristics such as aroma and mouth feel, which were rated very less (fig 1) were now liked by the panel members. Other characteristics such as taste, appearance, and colour were also very well appreciated after standardizing the product.

PACKAGING MATERIAL:

Food packaging helps protect foods against physical, chemical and environmental factors that could possibly contaminate all of the food. The principal roles of food packaging are to protect food products from outside influences and damage, to contain the food, and to provide consumers with ingredient and nutritional information. The goal of food packaging is to contain food in a cost-effective way that satisfies industry requirements and consumer desires, maintains food safety, and minimizes environmental impact. [15]



Figure 3 Packaging Material

Kraft paper bags are produced by a sulphate treatment process. The natural Kraft is the strongest of all paper and is commonly used for bags and wrapping. It is mainly used to package flour, sugar, and dried fruits and vegetables. It will prevent contaminants such as moisture, dust, and dirt and it can be sealed by heat healing machine, it is convenient to use and provide dual seal zipper protection to keep food fresh. The PE inner membrane makes it waterproof and moisture proof. This food storage pouch has a matte window; one can see the contents and do not need to open it. The material and structure are also not easy to break. (www.tedpc.com/ziplock-pouch)

This bag was selected to pack the product as it is one of the most reliable types of bag to pack flours. Having over secure locking that can provide a good way to ensure that the product inside is clean and free from damage. The product was kept in this bag for 4 weeks during the sensory evaluation and it was observed that the product inside was completely free from insects and damage. Each packet of six mix weighed approximately 500gms as seen in (Table 4)

NUTRITIONAL LABEL:

Nutritional labels provide information on the food we choose to eat and feed to others. It is an important process in food processing. Label gives an identity to the product, the quantity of contents, and the ingredients to ensure that the consumers are not being misled or cheated. For the manufacture, the label is a major vehicle for promoting products and product lines. It is used to identify one product from another and to decide which product to purchase. [16]

A nutritional label was designed for 'six mix' that consists of ingredients, nutritive value table, net weight, packaging date, best before, vegetarian mark, benefits or special recommendations and cooking steps, as shown in figure 4 and 5. The front label in fig 5 was designed with the help of 'Canva.com' and the nutritional label on the back was designed on Microsoft power point slides (fig 4).

Health Benefits Of Millet

- ✓Treats coronary disorders
- ✓Reduces risk of colon cancer
- ✓Helps in preventing celiac disease
- ✓Good source of antioxidants
- ✓Aids in sleep
- ✓Helps with weight loss
- ✓Helps in decreasing BP
- ✓Controls diabetes
- ✓Helps reliving menstrual cramps

COOKING STEPS:

Take the mix in a bowl and add water to make the batter.

→

Allow the Dosa batter to ferment for around 6-8 hours.

→

Spread the batter on a hot pan, apply ghee and roast it.

INGREDIENTS: Black Gram Dal, Pearl Millet, Foxtail Millet, Barnyard Millet, Sorghum(Jowar), Finger Millet (Ragi), Little Millet, Fenugreek Seeds, Drumstick Powder, Salt.

Net weight: Approx. 500gms
Packed on:
Best before 4 weeks from packaging date.
MRP: 150/-

NUTRITIONAL INFORMATION
(Per 100gm approx)

Sr. No.	Parameters	Results of Analysis
1	Energy	627.65
2	Carbohydrate	161.63
3	Protein	33.74
4	Fat	7.16
5	Dietary fibre	10.65

Store in a cool and dry place and store in a air tight container once opened.

- ✓100% organic
- ✓No preservatives
- ✓No added colours
- ✓Highest nutritional value flour
- ✓Low fat
- ✓Pest free



WITH ADDED MORINGA POWDER

SIX MIX

Six Millet Dosa Mix

Figure 4: Nutrition Label (back)

Figure 5: Nutrition Label (Front)

SENSORY EVALUATION FOR SHELF LIFE STUDY:

To study the shelf life of 'six-mix', sensory evaluation of the product was conducted every week for 1 month periodically with 10 naive panel members. Scoring test was done which included colour, texture, aroma, appearance, taste and mouth feel.

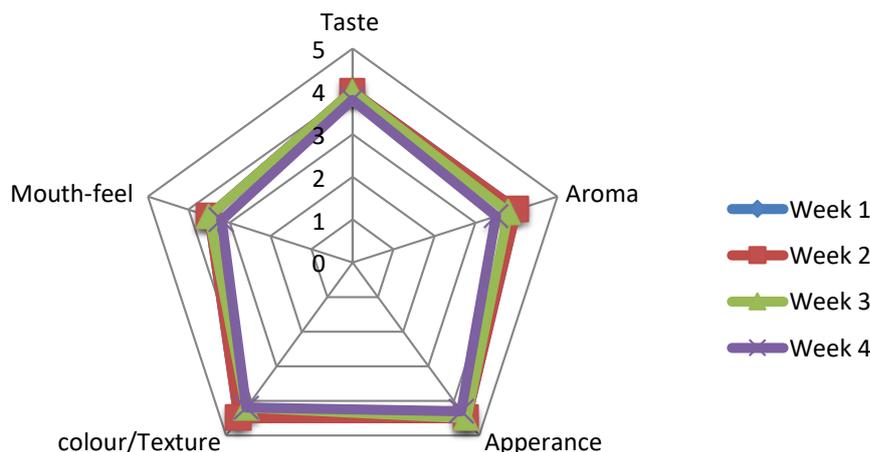


Figure 6: Sensory Evaluation after 4 Weeks

There were changes observed in the characteristics of the product after sensory evaluation for 4 weeks. As observed in fig 5 the product had good taste, aroma, colour, mouth feel and appearance during the 1st and 2nd week. The characteristics such as aroma and mouth feel started declining a little by week 4. No major changes were noted and no changes in appearance or taste were noted. Therefore, the product was finally labelled as best before 4 weeks from packaging.



Figure 7: Final Product

Table 3: Total Expenditure on the ingredients used in the making 'SIX-MIX'

INGREDIENTS	AMOUNT
Fox Tail Millet (500gms)	100/-
Little Millet (500gms)	100/-
Barnyard Millet (500gms)	100/-
Pearl Millet(Bajra) (500gms)	80/-
Sorghum (Jowar) (500gms)	80/-
Finger Millet (Ragi) (500gms)	80/-
Black Gram Dal 1kg	200/-
Moringa powder (400gms)	100/-
Fenugreek seeds (100gms)	40/-
Total	880/-

BUDGETING

Budgeting is very important aspect while developing a food product because it helps to achieve financial success and decides the pricing of the product. The products budget must be cost effective so that all income groups can afford it. Budgeting is important because it helps you control your spending, track your expenses, and save more money. Budgeting includes cost of raw ingredients, packaging materials and miscellaneous expenditure which includes electricity, travelling expenses, rent, maintenance etc (www.investopedia.com) For the bulk production, food ingredients were brought from the wholesale marketing to reduce the expense and increase the profit.

Table 4: Cost of 1 packet of SIX MIX

INGREDIENTS	AMOUNT	PRICE
Fox Tail Millet	60gms	12
Little Millet	60gms	12
Barnyard Millet	60gms	12
Pearl Millet(Bajra)	60gms	10
Sorghum (Jowar)	60gms	10
Finger Millet (Ragi)	60gms	10
Black Gram Dal	120gms	24
Moringa powder	20gms	5
Fenugreek seeds	5gms	2
Miscellaneous	-	25
Packaging Material	-	28
Total	500gms	150/-

Total cost of one packet of Six Mix was Rs 150/- If 100 packets were to be sold then the total profit made would be 15,000, the total profit for 50 packets would be Rs 7,500. The raw materials were bought from wholesale market and therefore profit was more.

CONCLUSION: Multi-millet dosa mix is a product providing variety of nutrients and can be recommended for all age groups as it has good amount of Proteins, vitamins, Calcium and adequate fibre. It can be specially recommended for diabetic, hypertensive, gluten sensitive people, lactating women, malnourish individuals.

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