



Flaxcurry Bhakarwadi

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ABSTRACT

FAXCURRY BHAKARWADI is developed as a snack for a diabetic individual. It is based on a traditional spicy Gujarati snack recipe "Bhakarwadi" which can be stored for weeks. The flour based round discs are stuffed with roasted poppy seeds, coconut and deep fried to a crispy finish. The traditional recipe is modified in aspects to lower carbohydrate and GI, and improve its fiber, protein, antioxidant and mineral content with the use of multigrain flours such as ragi, jowar, soya flour, besan etc. Curry Leaves contains good amount of fibre and low calorie having anti-diabetic properties. Functional foods such as flaxseeds, oats, sesame seeds were also used in this recipe. All this beneficial effects make this recipe suitable for diabetic patients. Ranking test using 5point scale was used. It was conducted by 28 naive panel members and 5 expert panel member. The product scored high in this test (4/5, over 75%), hence further modifications were not done. The product was standardized.

KEYWORDS : faxcurry bhakarwadi, diabetes,snack, bhakarwadi, curry leaves

Aim:

To develop a food product suitable for a Diabetic individual.

Objectives:

- To innovate traditional recipe with slight modification
- To design a DIABETIC friendly and nutritive rich product
- To standardize an innovative and healthy snack.
- To understand the product well and to do research based study on the ingredients

Introduction:

Diabetes is a chronic, metabolic disease characterized by elevated levels of blood glucose (or blood sugar), which leads over time to serious damage to the heart, blood vessels, eyes, kidneys, and nerves. According to Diabetes Atlas published by the International Diabetes Federation (IDF), there were an estimated 40 million persons with diabetes in India in 2007 and this number is predicted to rise to almost 70 million people by 2025. In 2014 the global prevalence of diabetes was estimated to be 9% among adults aged 18+ years. (1) In 2012, an estimated 1.5 million deaths were directly caused by diabetes. (2) More than 80% of diabetes deaths occur in low- and middle-income countries. (2) WHO projects that diabetes will be the 7th leading cause of death in 2030. (3) Healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use can prevent or delay the onset of type 2 diabetes. (4)

The product which will be suitable for diabetic was planned under the Applied food science and product modification practical. "FAX-CURRY BHAKARWADI" is developed as a snack for a diabetic individual. It is based on a traditional spicy Gujarati snack recipe "Bhakarwadi" which can be stored for week. The flour based round discs are stuffed with roasted poppy seed, coconut and deep fried to a crispy finish. The traditional recipe is modified in aspects to lower carbohydrate and GI, and improve its fiber, protein, antioxidant and mineral content with the use of multigrain flours such as ragi, jowar, soya flour, besan etc. Curry Leaves contains good amount of fibre and low calorie having anti-diabetic properties. functional foods such as flax-seeds, oats, sesame seeds were also used in this recipe. All this beneficial effects make this recipe suitable for diabetic patients.

Methodology:**Designing a food product.**

following modifications are done to modify traditional recipe.

1. Refined flour is replaced by multigrain flour such as jowar, ragi, oats, wheat flour to improve its fiber content and to lower its GI.

2. Coconut is removed to lower saturated fat content.
3. curry leaves powder is used as it is beneficial for lowering blood sugar level also contain fibre.
4. Sugar is removed as being high in simple carbohydrates which is not advisable for diabetics.
5. Flax-seeds added as functional foods that provide omega-3 and omega-6 Poly unsaturated fatty acids, necessary to prevent cardiovascular diseases.
6. Soybean flour is added as a functional food that not only improves protein quality and quantity but also provides omega-3 polyunsaturated fatty acids, vitamins and minerals and lower GI of whole recipe.
7. Other ingredients are same for both recipes.
8. Bhakarwadi is steaming and then baked in order to reduce its oil content and to make this recipe low calorie.
9. Use of diabetic friendly sweeteners such as dates powder and tamarind to give sweet and tangy taste
10. Use of different in multi grain flour in order to increase its fiber content

Table no: 1 - Recipes of Traditional bhakarwadi and Flax-curry bhakarwadi

Traditional bhakarwadi		Flaxcurry bhakarwadi	
Besan	10g	Besan	10g
Refined flour	25g	Oats+ ragi+ wheat + jowar +soya flour	25g(5g each)
Grated coconut	25g	Curry leaves	15g
Poppy seeds	10g	Poppy seeds	10g
Green chillies	1 pc	Flax seeds	5g
Coriander leaves	5g	Sesame seeds	5g
Oil	15g	Oil	7.5g
Sugar	5g	Aamchur powder	A pinch
Other ingredients: Salt, Cumin seeds powder, coriander seed powder, turmeric, asafoetida, red chillies powder, chat masala etc.			

Evaluation of the product:

Sensory evaluation was done at every step to find whether it is acceptable for consumption considering its taste and overall appearance. Ranking test using 5point scale was used. It was conducted by 28 naive panel members and 5 expert panel member.

Rank	Remark
1	Poor
2	Fair

3	Good
4	Very good
5	Excellent

Table 2 – sensory evaluation report

Characteristics	Naive panel members (average)	Expert panel members (average)	Out of
Appearance	4.5	5	5
Texture	4.5	5	5
Taste	4.5	5	5
Aroma	4.5	5	5
Overall Acceptability	5	5	5
Total	23	25	25
Percentage	92%	100%	100%


The product was ranked “excellent” by both the panel members and no further modification was done. The product was then standardized.

Standardization of The Product:

Table no.3 – Ingredients for standardized product:

Flaxcurry Bhakarwadi			
Besan	10g	Dates powder	1 tsp
Oats+ ragi+ wheat + jowar +soya flour	25g(5g each)	Tamarind pulp	1tsp
Curry leaves	15g	Cumin seeds powder	1tsp
Poppy seeds	10g	coriander seed powder	1tsp
Flax seeds	5g	asafoetida	A pinch
Sesame seeds	5g	red chillies powder	1/2 tsp
Oil	7.5g	chat masala	1/2 tsp
Aamchur powder	A pinch	garam masala	1/2 tsp
Dried mint leaves powder	1/2 tsp	Salt	To taste

METHOD:



Detailed Calculations for both the recipes:

Table No. 4 Detailed Calculations Traditional Bhakarwadi

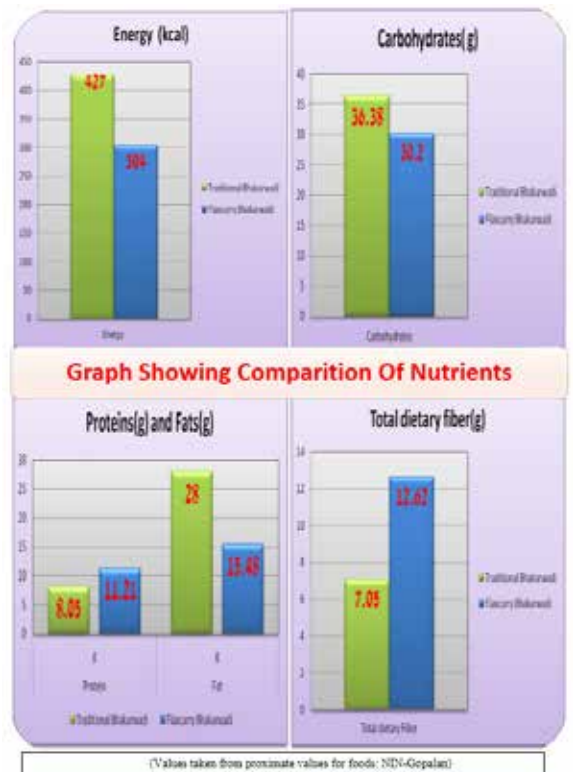
Ingredients	Amount	Energy (kcal)	Carbohydrates (g)	Protein(g)	Fat(g)	TD-F(g)
Besan	10g	36	6	2	0.56	1.5
Refined flour	25g	85	18.4	2.75	0.2	-
Grated coconut	25g	111	3.3	1.13	10.4	2.25
Poppy seeds	10g	40	3.68	2.17	1.9	3.3
Oil	15g	135	-	-	15	-
Sugar	5g	20	5	-	-	-

Table No. 5 Detailed Calculations Flaxcurry Bhakarwadi

Ingredients	Amount	Energy (kcal)	Carbohydrates (g)	Protein(g)	Fat(g)	TDF(g)
Besan	10g	36	6	2	0.56	1.5
Oats powder	5g	18	3.14	0.6	0.38	0.59
Ragi flour	5g	16	3.6	0.36	-	0.57
Soya flour	5g	21	1.04	2.16	0.98	1.15
Jowar flour	5g	17	3.63	0.52	-	0.4
Wheat flour	5g	17	3.56	0.6	-	0.5
Curry leaves	15g	16	2.8	0.9	0.1	2.44
Poppy seeds	10g	40	3.68	2.17	1.9	3.3
Flax seeds	5g	27	1.5	1	1.9	1.37
Sesame seeds	5g	28	1.25	0.9	2.16	0.8
Oil	7.5g	68	-	-	7.5	-

Table No. 6 Comparison Between Traditional Bhakarwadi And Modified Flaxcurry Bhakarwadi :

Sr No.	Nutrients	Units	Traditional Bhakarwadi	Flax-curry Bhakarwadi	RDA for sedentary male	RDA for sedentary female
1	Energy	kcal	427	304	2320	1900
2	Carbohydrates	g	36.38	30.2	-	-
3	Protein	g	8.05	11.21	60	55
4	Fat	g	28	15.48	25	20
5	TDF	g	7.05	12.62	-	-



Results And Discussions

Fiber (50g) is shown to be beneficial for better glycaemic control in Diabetes. (MNT for Diabetes Mellitus and Hypoglycaemia of Non diabetic origin, Krauss and Mahan- 12th edition) the product provides

around 12g of dietary fiber. According to Harvard medical school fiber helps in slow release of blood glucose in the blood. Fiber also lowers blood cholesterol levels and also improves blood glucose control.

Chickpea flour (besan) has a form of complex carbohydrate called starch that the body is able to slowly digest and use for energy over time in a much more beneficial way than consuming refined carbohydrates. Chickpea flour is a slower-burning carbohydrate that doesn't impact glucose levels as substantially, which means it has a lower glycaemic load. Eating more low-glycaemic foods is a way to naturally reverse diabetes, have more energy and prevent sugar cravings. Dietary chickpeas reverse visceral adiposity, dyslipidaemia and insulin resistance in rats induced by a chronic high-fat diet. (Ying Yang et al, 2007)

Flax seeds not only are high in alpha-linolenic acid (omega-3 fatty acid) but also in fiber, lignans and micronutrients. Flaxseeds have shown to improve fasting blood sugars, triglycerides, cholesterol, and haemoglobin A1c levels in diabetics patients. American Diabetic Association recommends intake of moderate amounts of flaxseeds in diet. Flax lignan complex and secoisolariciresinol diglucoside (SDG) have a great potential for reducing the incidence of type 1 diabetes and delaying the development of type 2 diabetes in humans. (Prasad, Kailash et al, January 2016)

Murraya koenigii (Curry leaves) is one such medicinal plant which is being explored for its hypoglycemic property. Curry leaves powder supplementation (12 g providing 2.5 g fibre) was carried out for a period of 1 month in 30 non-insulin dependent diabetes mellitus patients. The results indicated a transient reduction in fasting and post-prandial blood sugar levels at 15-day period with no appreciable changes in serum glycosylated protein levels, glycosylated low density lipoprotein cholesterol fraction, serum lipids, lipoprotein cholesterol levels, uronic acid and total amino acids were observed during the supplementation period, i.e. either at 15 days or 30 days. (U. M. Iyer, U. V. Mani, Plant Foods for Human Nutrition October 1990, Volume 40, Issue 4, pp 275-282) The pilot study was done on 15 subjects categorized into experimental group and were administered 2g of the powdered tulsi leaves/Curry leaves/Tulsi+Curry leaves and another 15 subjects in control group. The main study was conducted on 60 subjects, divided again into control group and experimental groups. The curry leaves had lowered the FBG levels and HbA1c levels significantly, it can be stated that it has hypoglycaemic potential. Thus it may be concluded that the powdered curry leaves may be used in adjunct to the other treatments with proper lifestyle and diet. (Padma Venkatesan Int. J. Pure App. Biosci. 3 (2): 331-337 (2015) Twenty male patients with Type 2 Diabetes in the age group of 51-62 were supplemented with 15 g of curry leaf powder for a period of 30 days. A significant change in the Fasting and Post Prandial glucose levels in seen after the supplementation period. Also a significant decrease in both the pre-lunch and post-lunch glucose levels was noted. In conclusion, it can be said that curry leaf powder had the property to decrease the blood glucose load and is the dietary adjunct in the management of Type 2 Diabetes. (Sucheta Soma Kirupa et al 2013) A study published in the Journal of Plant food for Nutrition [2], found that curry leaves lower your blood sugar levels by affecting the insulin activity. Apart from this, the presence of fiber in the leaves plays a significant role in controlling your blood sugar levels. Additionally, kadi patta is known to improve digestion and alter the way your body absorbs fat, thereby helping you lose weight. This is particularly of significance for people who are obese and suffer from diabetes.

To make this products instead of using refined flour combinations of flour are used such as soya flour ,ragi flour, oats ,jowar flour and wheat flour. Diets with a high glycemic load and a low cereal fiber content increase risk of NIDDM in men. Soybean is added to improve the protein quality of the product as well as lower the GI. Phytic acid present in soybean confers beneficial effects in reducing cancer, diabetes and inflammation due to its antioxidant property. An inverse association was found between legume intake especially soybean intake and risk of type 2 Diabetes (Villegas et al, 2008). Finger millet (ragi) is rich in calcium, iron and functional fiber. There is some evidence that foods from finger millet have a low glycaemic index and are good for diabetic patients. Oats is well known since years for its cholesterol lowering properties. The soluble fiber s beta-glucan increases transit time and thus lowers rate of digestion, thus oats have

lower Glycaemic index. This is beneficial in Diabetes. 3g of beta-glucan/day from high molecular weight oats given to hypercholesteraemic individuals lowered their LDL cholesterol significantly. (Wolever et al, 2010). Jowar contains a much higher concentration of fiber. According to a 2009 study published in "Nutrition Reviews" a diet rich in fiber foods may lower the risk of obesity, stroke, high blood pressure, heart disease, diabetes, elevated blood cholesterol and digestive problems.

Sesame contain high levels of natural antioxidants like sesamin, sesamol and sesamol which prevent it from oxidative free radical damage to a great extent. Sesame is rich in omega-6 polyunsaturated fatty acids. Sesame seed contain almost 25% of its weight as protein and is also rich in calcium. Patients with prediabetes and mild to moderate hyperlipidemia treated with sesame extract for 6 weeks are likely to realize positive changes in their lipid profiles and blood glucose levels. It may be beneficial for maintaining healthy lipid and glucose levels in patients with prediabetes and mild to moderate hyperlipidaemia. Journal of Food Research (2013) shiv prasad)

The high amount of dietary fiber found in poppy seeds is useful for lowering cholesterol levels, regulating insulin and blood glucose concentrations, and promoting gastrointestinal health. The trace mineral manganese present in poppy seeds is beneficial for fighting against osteoporosis, arthritis and diabetes, amongst several other medical conditions.

CONCLUSION

Flaxcurry bhakarwadi contains curryleaves and mutigrain flour (oats-, jowar,soya, ragi,wheat) which being high in fiber is beneficial in and Diabetes. It is enriched with functional foods such as soybean, and sesame seeds, flaxseeds, oats which has additional health benefits . Flaxcurry bhakarwadi is baked and not deep fried which reduce the oil content of recipe and make it low fat snack. Use of all these ingredients in recipe made this product not only beneficial in diabetes and CVD but rich in protein, fiber, essential fatty acids.

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