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Research Article

Development and quality evaluation of Ready to Eat value added products (Cake and Wafer) from composite flour (Moringa leaves powder and Great millet & Finger millet flour)

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Abstract:

The current study was conducted for the development and evaluation of millet-based food products from finger millet and great millet incorporated with moringa leaves powder. Various millet products like Cakes and Wafers were developed using finger millet and little millet along with varying combinations of other flours and raw materials. Various formulations were developed, sensory studies were conducted to the superior product based on overall acceptance using 9-point hedonic scale by the semi-trained panel members. The formulation which was rated superior was further analyzed for physico-chemical parameters like proximate analysis, microbial analysis, statistical analysis, and shelf-life studies. The proximate composition of Cakes & Wafers showed moisture (22.81, 18.32%), ash (2.80, 2.80%), fat (3.85, 1.72gm), protein (10.26,4.87gm), carbohydrate (69.53, 34.66gm) fiber (10.92, 5.88%) Thiamine (B1) (0.53,5.88mg) Riboflavin(B2) (0.15, 0.05mg) Niacin(B3) (1.16,0.84mg) Calcium (167.60, 87.28mg) Iron (3.98, 2.09mg) respectively.

Key words: finger millet; great millet; moringa leaves powder; macro; and micronutrients

Introduction

Millets are group of small grained cereal food crops which are highly tolerant to drought and other extreme weather conditions and are grown with low chemical inputs such as fertilizers and pesticides. Finger millet (Eleusine coracana L.) is a prevalent grain crop in the dry parts of Asia and Africa. It prolongs to be a staple food and is known locally as “Ragi” in southern states like Karnataka, Andhra Pradesh, and Telangana, especially in Karnataka. It serves as fodder as well as grain. Its grain is the richest source of calcium and it is utilized in a wide range of food products, including cakes, puddings, sweets, and other baked products. Little Millet (Panicum Sumatrense) is a quick growing, short duration cereal which can withstand both drought and water logging. Little millet is a nutrient-dense grain that includes minerals like magnesium, phosphorus, and iron, as well as dietary fiber, protein, and B vitamins (particularly niacin and thiamine). *Moringa oleifera* is a kind of perennial tropical deciduous arbor belonging to the family Moringaceae, which originated in India and has been widely planted in Asia, Africa, and tropical and subtropical regions of Central America. At least 110 different compounds have been isolated from *Moringa oleifera*. These include vitamins A, B1, B2, B3, C and vitamin E, minerals like calcium and iron, and many flavonoids, glucosinolates, terpenes, alkaloids, saponins, sterols, fatty acids, and phenolic compounds (Abd Rani et al., 2018).

Nutritional importance of millets

Millets are high in nutrition and dietary fibre. They serve as good source of protein, micronutrients and phytochemicals. The millets contain 7-12% protein, 2-5% fat, 65-75% carbohydrates and 15-20% dietary fibre. Because of the high amount of dietary fiber, iron, zinc, calcium, phosphorus, potassium, vitamin B, and essential amino acids, it is nutritionally superior to wheat and rice [11, 12].

Value added products:

Cakes: Cakes are all time favourites to the people irrespective of the age. Preparation of cake with the combination of breadfruit flour and millets

flour are great in taste and with the nutrients in it. cakes are consumed either as breakfast in the mornings in western side or as great evening snack in the evenings. Raw materials used are rich in their own bioactive components and can be served without any losses.

Wafer: Combination of moringa leaves powder and with millets flour greatly results in varieties of the wafer which goes in good combination with different ice cream flavours or can be consumed alone as snack in the teatime or as the garnishing material when crushed and sprinkled on the top of different deserts.

Nutritional Information of Finger millet, little millet and moringa leaf powder per 100 gm

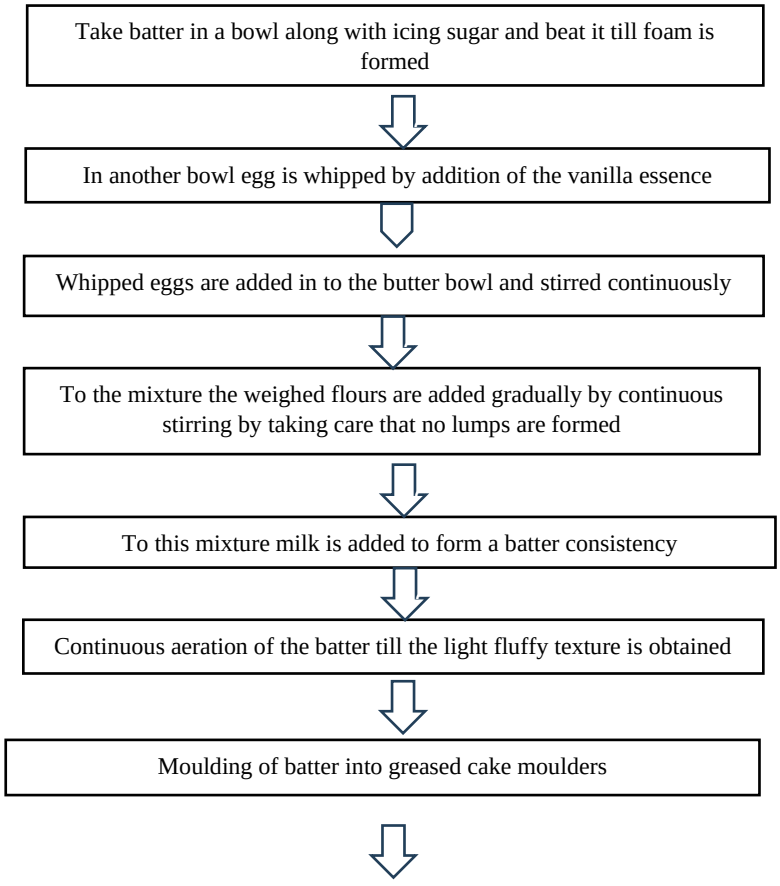
Parameters	Finger millet	Little millet	Moringa leaf powder
Moisture (%)	11%	10.92	8.04
Protein (g)	7.3	10.4	23.73
Fat (g)	72	3.1	8.98
Carbohydrate (g)	1.3	70.7	44.54
Fiber (g)	3.6	2	4.65
Calcium (mg)	344	25	8616.14
Iron (mg)	3.9	5.4	659.23
Thiamine (mg)	0.42	0.38	20.5
Niacin (mg)	1.1	4.3	2.22

Materials and methods:

Raw materials were procured from local market for the preparation of cake and wafer. Refined Wheat Flour (Maida), refined sugar, edible common salt, skim milk powder, margarine, artificial flavouring agents. As per the following formulation prepare cake and wafer.

Product formulation of cake

Ingredients (gm)	Control	C1	C2	C3	C4
Maida	97	77	57	37	17
Millet flour (Ragi +Jowar)	0	20 (10+10)	40(20+20)	60(30+30)	80(40+40)
Moringa leave powder	3	3	3	3	3
butter	25	25	25	25	25
sugar	90	90	90	90	90



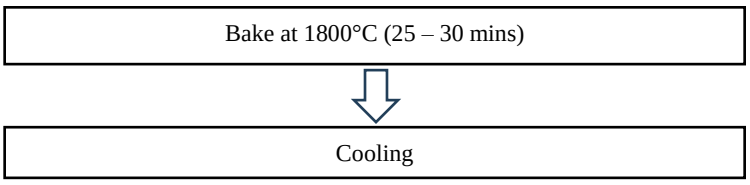


Figure: process flow diagram of preparation of cake

Product formulation of wafer

Ingredients(gm)	Control	W1	W2	W3	W4
Maida	100	80	60	40	20
Millet flour (Ragi + Jowar)	00	20 (10+10)	40(20+20)	60(30+30)	80(40+40)
Moringa leaves powder	1.5	1.5	1.5	1.5	1.5
Butter	12.5	12.5	12.5	12.5	12.5
Sugar	45	45	45	45	45

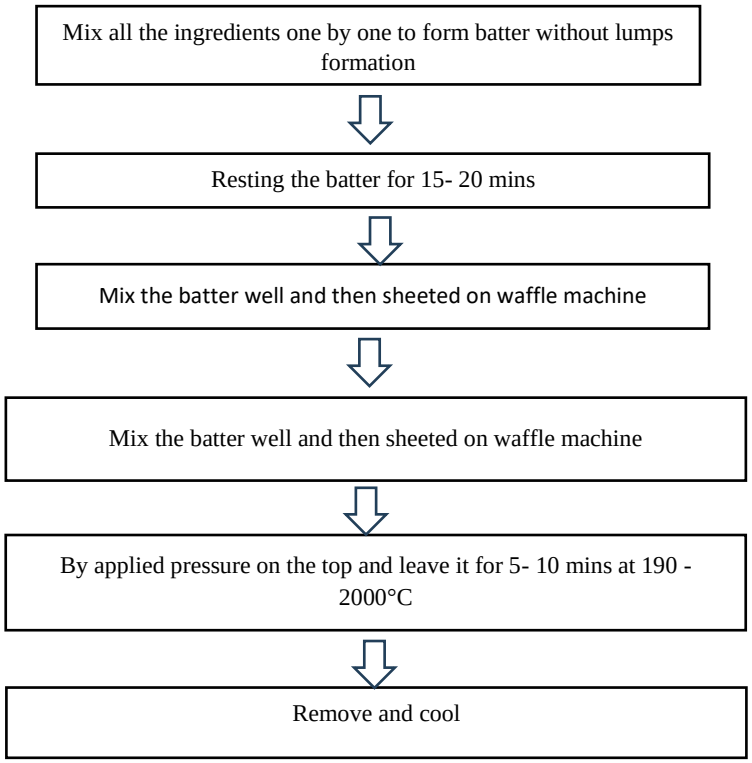


Figure: process flow diagram of preparation of wafer

Results and discussions

The value-added products were prepared from moringa leave powder incorporated with millets. Those products were subjected to proximate analysis, vitamin and mineral were estimated. The quality evaluation of value-added products was done. It includes Proximate analysis, Microbial analysis, Shelf life studies, and statical analysis.

Parameters	Cake		Wafers	
	control	sample	control	sample
Moisture content (%)	23.99	22.81	18.32	17.76
Protein (g)	11.67	10.26	6.49	4.87
Carbohydrate (g)	75.10	69.53	37.97	34.66
Fat (g)	2.99	3.85	1.30	1.72
Crude fiber (g)	4.34	10.92	2.96	5.88
Ash (g)	1.84	2.80	1.58	2.80

Table: Proximate analysis of cake and wafer

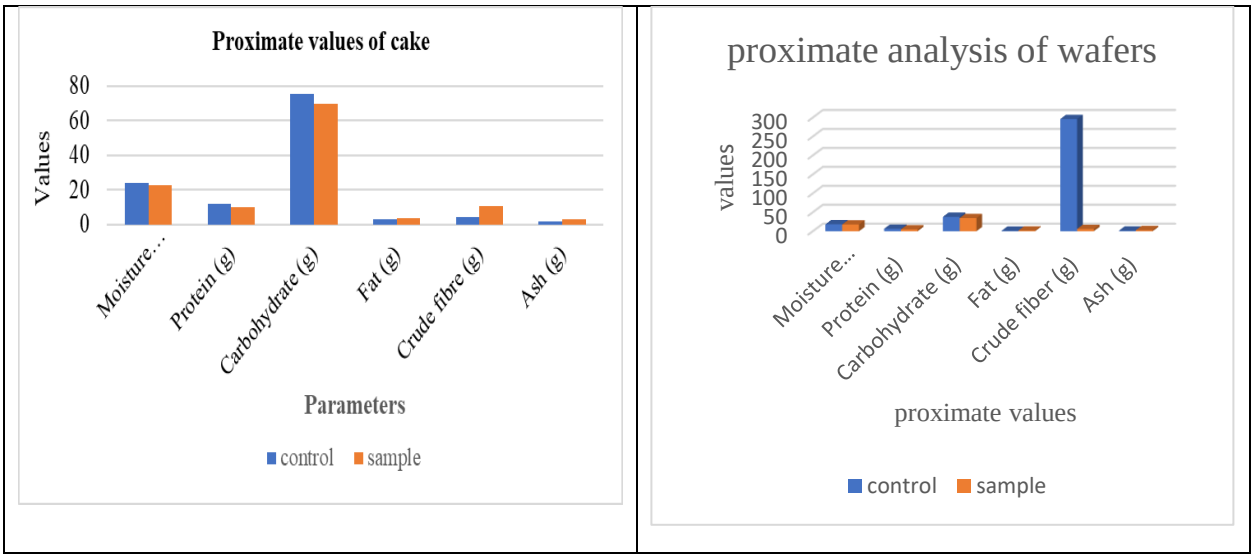


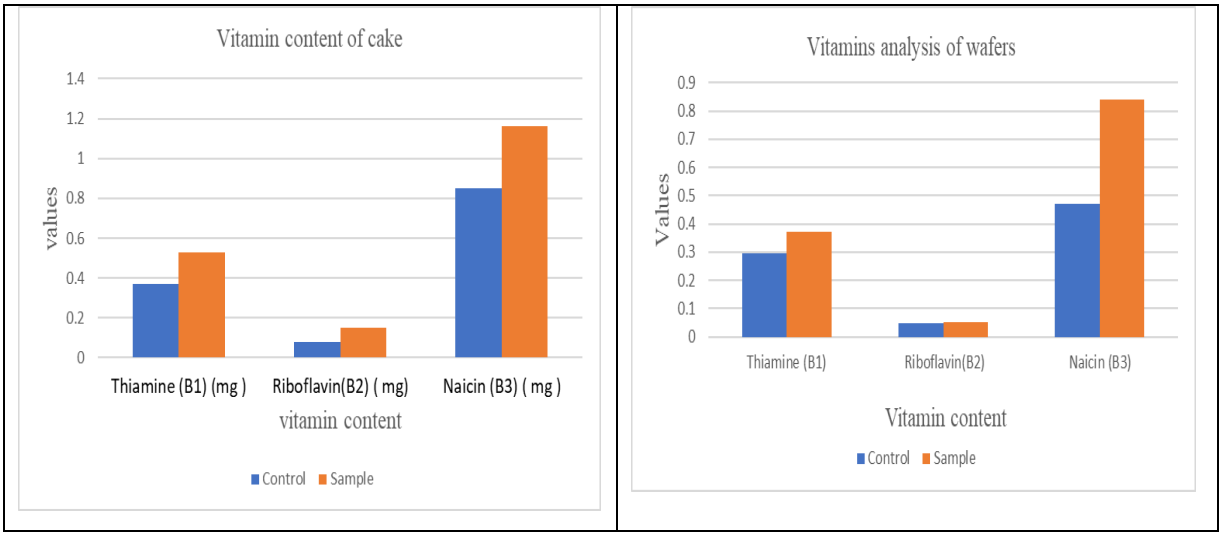
Figure: Graph of proximate analysis of cake and wafer

The Moisture and Crude fiber contents of control and sample were observed 23.99%,4.34,22.81% and 10.92gm/100gm respectively. The Moisture and Crude fiber contents of control and sample were observed 18.32%,2.96,17.76% and 5.88gm/100gm respectively.

Vitamin content of cake and wafer

Vitamins(mg)	**Cake**		**Wafers**	
	control	**sample**	**control**	**sample**
Thiamine (B1)	0.37	0.53	0.294	0.37
Riboflavin(B2)	0.079	0.15	0.049	0.05
Niacin (B3)	0.85	1.16	0.469	0.84

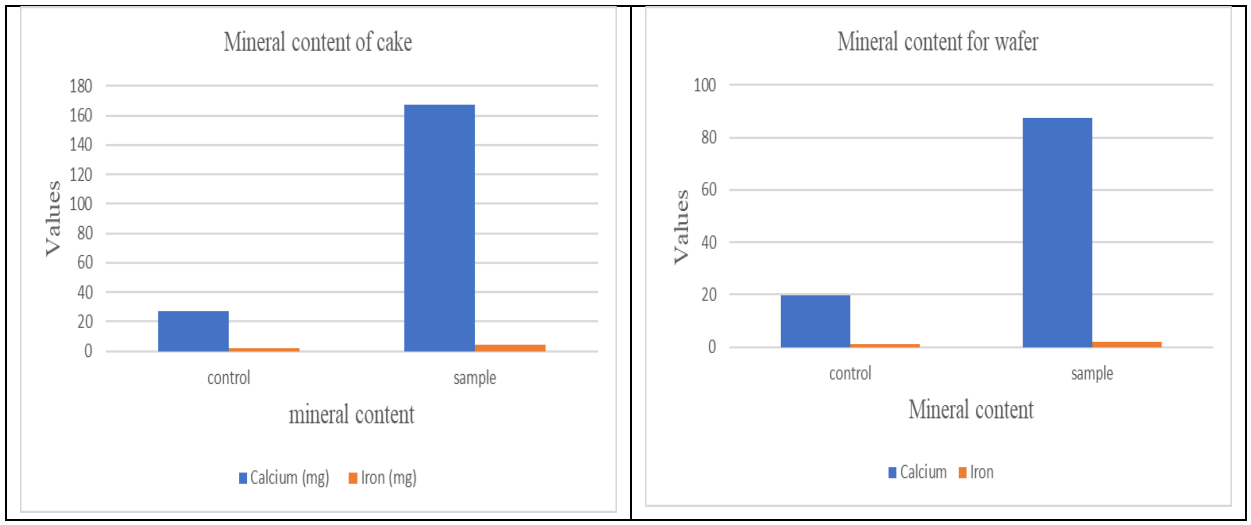
The Thiamine and Niacin contents of control and sample were observed 0.37,0.85,0.53and 1.16mg/100gms respectively. The Thiamine and Niacin contents of control and sample were observed 0.294,0.469,0.37 and 0.84mg/100gms respectively.



Graph of Vitamin analysis of cake and wafer Mineral contents of cake and wafer

MINERALS (mg)	**cake**		**wafer**	
	control	**sample**	**control**	**sample**
Calcium	27.36	167.60	19.71	87.28
Iron	1.97	3.98	1.091	2.09

The Calcium and Iron contents of control and sample were observed 27.36,1.97,167.60 and 3.98mg/100gms respectively. The Calcium and Iron contents of control and sample were observed 19.71,1.091,87.28 and 2.09mg/100gms respectively



Graph of Mineral analysis of Cake and Wafer

Microbial analysis for cake and wafer

Days	Cake		Wafer	
	Control	Sample	Control	Sample
	Colony forming unit (CFU/ gm) X 10^{-2}			
0	0	0	0	0
15	0	0	0	0
30	2	1	2	0
45	10	3	3	1

As per microbial analysis for cake, control and sample C4 for 0th and 15th day is '0' (CFU/gm) X 10^{-2}, 30th day control has formed 2 and sample C4 formed 1 (CFU/gm) X 10-2 and 45th day control sample has formed 10 and sample C4 has formed 3 (CFU/gm) X 10^{-2} . As per microbial analysis for Wafer, control and sample C4 for 0^{th} and 15^{th} day is '0' (CFU/gm) X 10^{-2}, 30^{th} day control has formed 2 and sample C4 formed 0 (CFU/gm) X 10^{-2} and 45^{th} day control sample has formed 3 and sample C4 has formed 1 (CFU/gm) X 10^{-2} .

Shelf-life studies of cake

Product	Duration	Appearance	colour	texture	Taste	Overall acceptability
Control (Sample (C4)	0th day	7.5 ± 0.01 (8.2±0.05)	7.4 ±0.03 (8.2±0.02)	7.5 ± 0.01 (8.3±0.03)	7.7±0.02 (8.3±0.01)	7.8±0.03 (8.5±0.02)
	15th day	6.9±0.03 (7.8 ±0.02)	6.5±0.01 (7.7±0.02)	7.0±0.01 (7.6±0.03)	7.3±0.02 (7.5±0.02)	7.0 ±0.02 (7.4 ±0.06)
	30th day	6.1 ±0.04 (7.0 ±0.03)	5.9 ±0.03 (6.9±0.02)	6.6 ±0.03 (6.9±0.01)	6.6±0.06 (6.9±0.06)	6.2 ±0.03 (6.7 ±0.07)
	45th day	4.6 ±0.04 (5.2 ±0.04)	4.4±0.02 (5.3±0.01)	4.4±0.02 (5.2±0.01)	4.9±0.05 (5.2±0.06)	4.5 ±0.01 (5.0 ±0.07)

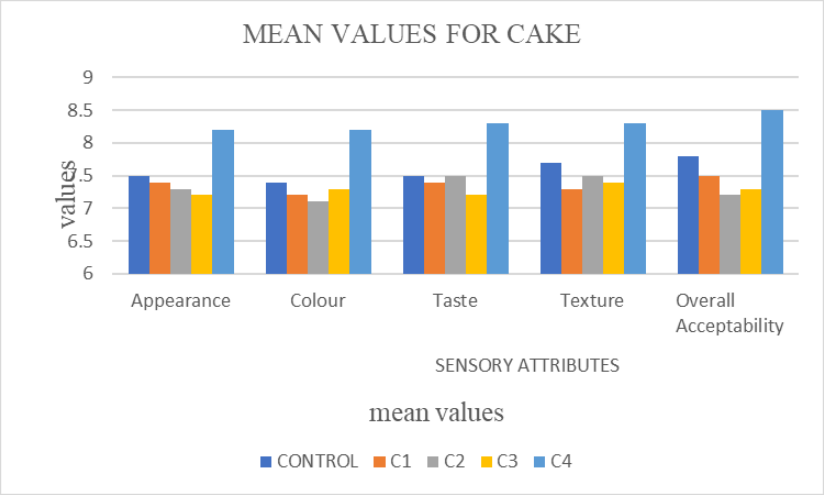
shelf-life studies of wafers

Product	Duration	Appearance	colour	texture	Taste	Overall acceptability
Control (Sample (W4))	0th day	7.8 ±0.03 (8.6 ± 0.02)	7.6 ±0.02 (8.5±0.03	7.6 ±0.01 (8.4± 0.05	7.6 ± 0.02 (8.6±0.06)	7.6 ±0.02 (8.8 ±0.03)
	15th day	7.0 ±0.03 (7.9) ±0.02)	6.8 ±0.03 (7.0±0.04)	6.7±0.02 (7.1±0.01)	6.8 ±0.05 (7.3±0.07)	6.7 ±0.06 (7.9 ±0.07)
	30th day	5.2 ±0.01 (6.5) ±0.02)	5.0 ±0.06 (6.2±0.05)	5.9 ±0.01 (6.8±0.03)	5.4 ±0.03 (6.6±0.04)	5.6 ±0.04 (6.9 ±0.05)
	45th day	4.5 ±0.05 (5.5±0.07)	4.6 ±0.04 (5.3±0.02	5.1 ±0.01 (5.6±0.02)	4.7 ±0.05 (5.4±0.02)	4.6 ±0.02 (5.3 ±0.01)

Statistical analysis:

statistical analysis of cake

SAMPLE	SENSORY ATTRIBUTES				
	Appearance	**Colour**	**Taste**	**Texture**	**Overall Acceptability**
CONTROL	7.5± 0.01	7.4± 0.03	7.5± 0.01	7.7± 0.02	7.8± 0.03
C1	7.4± 0.03	7.2± 0.04	7.4± 0.02	7.3± 0.04	7.5± 0.02
C2	7.3± 0.06	7.1± 0.08	7.5± 0.04	7.5± 0.05	7.2± 0.06
C3	7.2± 0.04	7.3± 0.01	7.2± 0.06	7.4± 0.02	7.3± 0.04
C4	8.2± 0.05	8.2± 0.02	8.3± 0.03	8.3± 0.01	8.5± 0.02

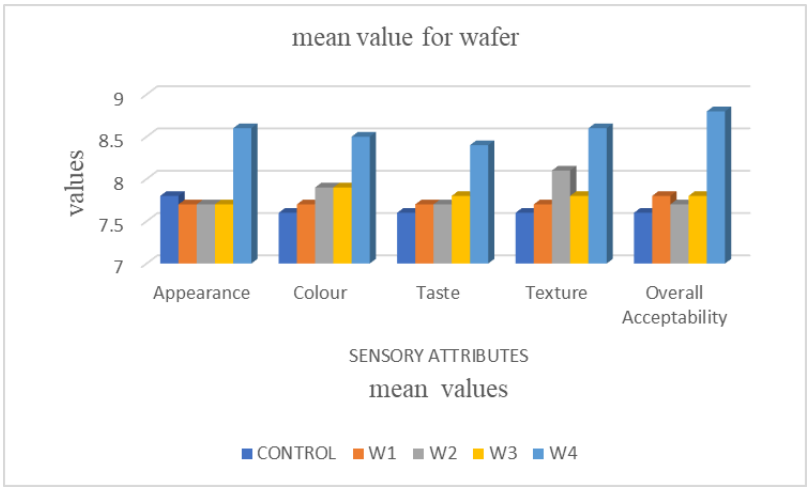


Graph of mean values for cake

As per statistical analysis the highest mean score of sample 4 is superior, so we consider sample C4 was made from., Maida -17gm, millet powder (ragi, jowar) – 40 + 40 gm, moringa leaves powder – 3gm, butter – 25gm, sugar 90 gm

statistical analysis of wafers

Sample	Sensory attributes				
	Appearance	**Colour**	**Taste**	**Texture**	**Overall Acceptability**
CONTROL	7.8 ± 0.03	7.6± 0.02	7.6±0.01	7.6± 0.02	7.6± 0.02
W1	7.7 ± 0.02	7.7± 0.03	7.7±0.06	7.7± 0.04	7.8± 0.01
W2	7.7± 0.05	7.9± 0.02	7.7±0.02	8.1± 0.08	7.7± 0.05
W3	7.7± 0.07	7.9± 0.05	7.8±0.04	7.8± 0.06	7.8± 0.02
W4	8.6 ± 0.02	8.5± 0.03	8.4±0.06	8.6± 0.05	8.8± 0.03



Graph of mean value for wafer

As per statistical analysis the highest mean score of sample 4 is superior, so we consider sample C4 was made from., Maida -10gm, millet powder (ragi, jowar) – 20 + 20gm, moringa leaves powder – 3gm, butter – 12.5gm, sugar 45gm.

Summary

The main aim of the project work presented was related to development and evaluation of millet-based products from finger millet and great millet incorporated with moringa leaves powder. Millet flour products prepared and evaluated were cakes and wafers. Millet flour products are developed by incorporating major millet i.e., finger millet and great millet. Various formulations of these products are standardised through various proportions of ingredients and compared with control products through sensory evaluation. The sensory qualities of developed products are judged by semi-trained panel members on 9-point hedonic scale rating test. The best acceptable products obtained through sensory evaluation are analysed for physico-chemical parameters like proximate analysis, shelf life of developed products was studied for a period of 45 days The physico-chemical parameters revealed that the developed millet products are excellent source of macro and micronutrients especially in terms of protein, calcium and dietary fibre when compared against control products.

Conclusion:

Nutritionists are encouraging incorporation and utilization of non-glutinous ingredients in different recipes with least effort and low cost for combating malnutrition. The novelty of this project work is utilisation of millets for development of various traditional and value-added products. Due to urbanisation and increase in consumption of processed foods, people in the society are facing the issues of non-communicable diseases like obesity, diabetes, and hypertension. The major issues related to occurrence of lifestyle disease are high consumption of wheat and rice based processed products which are devoid of fibre. Lifestyle diseases can be minimised to large extent by creating awareness among consumers to consume millet and millet products which are good source of dietary fibre, complex carbohydrates and minerals like calcium and iron. By consumption of millets and millet products, nutritional security can be provided to the citizens in the country. Millets can contribute to healthier society. Millets can prevent diseases related to malnutrition. The developed products can be consumed by all age groups and are highly recommended for people suffering from diabetes, hypertension etc.

References

1. J.L.Rockwood,B.G. Anderson, D.A.Casamatta, (2013). Potential uses of Moringa oleifera and an examination of antibiotic efficacy conferred by M. oleifera seed and leaf extracts using crude extraction techniques available to underserved indigenous populations, Int. J. Phytothearpy Res. 3, 61–71.
2. J.N. Kasolo, G.S. Bimenya, L. Ojok, J. Ochieng, J.W. Ogwal-okeng, (2010). Phytochemicals and uses of Moringa oleifera leaves in Ugandan rural communities, J. Med. Plants Res. 4, 753–757.
3. M.D. Thurber, J.W. Fahey, (2010). Adoption of Moringa oleifera to combat undernutrition viewed through the lens of the diffusion of innovations theory, Ecol. Food Sci. Nutr. 48, 1–13.
4. L.Berkovich, G. Earon,I.Ron, A.Rimmon, A. Vexler, S. Lev-Ari, (2013). Moringa oleifera aqueous leaf extract down-regulates nuclear factor-kappaB and increases cytotoxic effect of chemotherapy in pancreatic cancer cells, BMC Complement. Altern. Med. 13, 212–21.
5. R. Yang, L. Chang, J. Hsu, B.B.C. Weng, C. Palada, M.L. Chadha, V. Levasseur, (2006). Nutritional and functional properties of moringa leaves from germplasm to plant, to food, to health, Am. Chem. Soc. 1–17.
6. I.J. Asiedu-Gyekye, S. Frimpong-Manso, C. Awortwe, D.A. Antwi, A.K. Nyarko, (2014). Micro- and macroelemental composition and safety evaluation of the nutraceutical Moringa oleifera leaves, J. Toxicol. 2014, 1–13.
7. C. Sutalangka, J. Wattanathorn, S. Muchimapura, W. Thukham-mee, (2013). Moringa oleifera mitigates memory impairment and neurodegeneration in animal model of age-related dementia, Oxid. Med. Cell. Longev. 2013, 1–9.
8. O.S. Adeyemi, T.C. Elebiyo, (2014). Moringa oleifera supplemented diets prevented nickel-induced nephrotoxicity in Wistar rats, J. Nutr. Metab. 2014, 1–8.
9. T.G. Monera, C.C. Maponga, (2012). Prevalence and patterns of Moringa oleifera use among HIV positive patients in Zimbabwe: a cross-sectional survey, J. Public Health Africa 3 6–8.
10. Singh Y, Prasad K. (2013). Maringa Oleifera Leaf as Functional Food Powder: Characterization and Uses.In International Journal of Agriculture and Food Science Technology. 4:317-324.
11. Parameswaran KP, Sadasivam S. (1994). Changes in the carbohydrates and nitrogenous components during germination of proso millet, Panicum miliaceum. Plant Foods for Human Nutrition. 45(2):97-102.
12. Antony Ceasar S, Ignacimuthu S. (2011). Agrobacterium-mediated transformation of finger millet (Eleusine coracana (L.) Gaertn) using shoot apex explants. Plant Cell Reports. 30(9):1759-1770.
13. Ashwini Bidwe, Tasneem Naheed Khan. (2013). Effect of drumstick (MoringaOliefera) leaves powder chutney on blood pressure. International Journal of Food and Nutritional Sciences, 2(3), e-ISSN 2320 –7876.
14. Khawji TM., et al. (2010). "Moringa oleifera: A natural gift-A review". Journal Pharmaceutical Science and Research 2: 775-781.
15. Devi, P B, Vijayabharathi R, Sathyabama S, Malleshi N G & Priyadarshini V B, (2011). Health benefits of finger millet (Eleusine coracana L.) polyphenols and dietary fibre: a review, J Food Science &Technology, 51 (6) 1021–1040.
16. Changmei S and Dorothy J, (2014). Millet- the Frugal Grain, Int J Scientific Res Rev, 3 (4) 75 – 90.
17. Mal B, Padulosi S, & Ravi SB, (2010). Minor millets in South Asia: learnings from IFAD-NUS Project in India and Nepal, Maccarese, Rome, Italy: Diversity Intl and Chennai, India: M.S. Swaminathan Research Foundation, 1–185.
18. Devi, P B, Vijayabharathi R, Sathyabama S, Malleshi N G & Priyadarshini V B, (2011). Health benefits of finger millet (Eleusine coracana L.) polyphenols and dietary fibre: a review, J Food Sci Technology, 51 (6) 1021–1040.

19. Karnika Prakash and Rajni Chopra. (2016). "Development of Healthy Snacks from Finger Millet (Eleusine Coracana) Malt: An Alternative Approach to Functional Foods". International Journal for Innovative Research in Science and Technology 3.01.

DOI:10.31579/2637-8914/271