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UTILIZATION OF MULTIFLOUR MIX FOR THE DEVELOPMENT OF IDLIS TO SUIT OBESITY AND OTHER LIFESTYLE DISEASES

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Abstract

Globally, lifestyle diseases are increasingly recognized as a major cause of morbidity and mortality. The increasing burden of lifestyle diseases, particularly in developing countries including India, threatens to overwhelm limited health services. Several diseases come under the umbrella of non-communicable diseases and more common cause is obesity. Chronic lifestyle diseases are assuming increasing importance among the adult population in both developed and developing countries. The prevalence of chronic lifestyle disease is showing an increasing trend in most countries and for several reasons this trend is likely to increase. Developing countries are now warned to take appropriate steps at avoid the "epidemics" of lifestyle diseases likely to come simultaneously with socio-economic and health development. In the present research work, an attempt has been made to assess the nutritional and sensory attributes of the commonly used breakfast snack idlis using healthy cooking methods of fermentation and steaming incorporating multiflour mix (kuttu ka atta or buckwheat flour, soyabean flour, lotus stem flour and flaxseed flour) to prevent and control the obesity and associated lifestyle diseases. The results showed that the most overall acceptable experimental treatments was T_2 (10% Kuttu Ka Atta, 10 % Soyabean Flour, 10% Lotus Stem Flour, 1.5% Flaxseed Flour) for the prepared *Idlis*. $\mathbf{T_3}$ is highest in Fiber, Calcium, Iron, Vitamin A, Vitamin C and reduction in carbohydrate and overall energy in comparison to $\mathbf{T_0}$, $\mathbf{T_1}$ and $\mathbf{T_2}$, respectively. The cost of the manufacture of control *idli* $\mathbf{T_0}$ was lowest *i.e.* 8.60 Rs/100g. as to compared to experimental *idli* samples, $\mathbf{T_1}$ (12.71 Rs/ 100 g), $\mathbf{T_2}$ (16.50 Rs/ 100 g) and $\mathbf{T_3}$ (20.62 Rs/100 g) due to incorporation of multiflour mix yet affordable by the individuals of all socio – economic groups. Hence, it can be recommended for middle aged people suffering from obesity and associated lifestyle diseases.

Key words : Chronic lifestyle diseases, epidemics, multiflour mix, obesity.

Introduction

Morbidity and mortality due to chronic lifestyle diseases such as obesity, type 2 diabetes mellitus, metabolic syndrome, non-alcoholic fatty liver disease and coronary artery disease are continuously increasing in developing countries like India. These are associated with industrialization, dietary and lifestyle changes and increased life span. Obesity is among lifestyle factors, including diet, smoking, alcohol and stress, may directly or indirectly be responsible for increasing burden of these diseases which also include some forms of cancer. There has been an alarming increase in the occurrence of lifestyle disorders and non-communicable diseases (NCDs) in India. This is illustrated by the fact that 8 out of every 10 deaths in India are caused by non-communicable diseases, which is also observed in other South Asian countries. Constantly growing urbanization accompanied by rapidly changing life style and food habits has brought in its wake the ever-increasing demand for low calorie foods. Considering the link between alterations in intestinal mircobiota and lifestyle diseases, probiotics are claimed as potential modulators of gut-microbiota that change gut-microbiota composition in a beneficial manner and exert various health beneficial effects *i.e.* anti-hyperglycaemic, anti-hyperlipidaemic, anti-oxidant and anti-inflammatory. The role of probiotics like curd in the prevention and treatment of a variety of disorders that go beyond gut health (cancer, metabolic diseases, etc.) which is increasingly being recognized. There is emerging evidence that the microbiota residing in the mucosa of the body cavities (*e.g.* gastrointestinal, respiratory, genitourinary) may influence the development of cancers by various mechanisms.

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Dairy by-products are important because they contain useful nutrients like protein, lactose, total solids, calcium, iron etc, which could be utilized as human food. If these by- products are utilized economically then economic burden will decrease, which will be good for health point of view for human population.

Kuttukaatta/Buckwheat flour also known as *Fagopyrum esculentum* contains Protein, B Vitamins, dietary fibres, magnesium, manganese, phosphorus, copper, iron, zinc, selenium, rutin, taninsand good for cardiovascular system, better blood sugar control and a lowered risk of diabetes, help prevent gallstones, health promoting potential equal to or even greater than that of vegetables and fruits.

Soybean is obtained from "glycinemax or soy max" of family leguminaceae. It is rich in almost all essential nutrients, contain 8.1g a rich source of good quality protein (32-42%) with highest content of lysine (6.8%). The amino acid contents of soy flour are as follows:- Lysine-6.8%, Phenylalanine-5.3%, Leusine-8.0%, Methionine-1.7%, Isoleucine-6.0%, Cystine-3.1%, Threonine-3.%, Arginine-0.2%, Histidine-0.2%. Nutritionally, 1 table spoon of soy flour solution in 15 ml of water is equal to that of an egg. 100g of soybean -moisture, 43.2g-protein, 1.5g-fat, 20.9g-carbohydrate, 240mg-calcium, 10.4mg-iron and 60mg-phosphorus (Gopalan, 2010).

Semolina is a good source of carbohydrate and protein and average source of dietary fiber.100 gram of semolina contains about 72.83g of carbohydrates, 3.9g of dietary fibre, 1.05g of fat (0.15g of saturated, 0.124g of monounsaturated, 0.43g of polyunsaturated), 12.68g of protein, 12.67g of water, 0.28mg (22%) of thiamine (vit B_1), 0.08mg of riboflavin (vit B_2), 3.31mg of niacin (vit B_3) and 0.1mg of vitamin B_6. Though, it lacks vitamin C and vitamin B_{12} yet it is quite rich in some essential minerals like Phosphorus (19%), Magnesium (13%), Iron (10%) and Zinc (11%) (Nutrition Data, 2008).

Lotus stem (*Nelumbo nucifera*) contains active constituents such as starch, tannateprotein, asparagine, pyrocatechol, d-gallic-catechin, neochlorogenic acid, leucocyanidin, leucodephinidin, peroxidase, vitamins B and C. It is used in the treatment of fever, diarrhoea, haemorrhages, dysentery, tonning of heart muscle, lowering blood pressure, excessive menstruation and nosebleeds.

Flaxseed powder contain Energy 530 kcal, protein 20.3g., carbohydrate 28.9g., fat 37.1g., fibre 4.8g., iron 2.7 mg., calcium 170 mg., phosphorus 370 mg. , Sodium 30 mg. and Potassium 813 mg (Gopalan *et al*., 2010). *British Journal of Nutrition* reported that flax oil was beneficial in helping to regulateblood glucose levels in diabetics. Because most Americans consume highly processed refined oils, many are deficient in Omega-3 fatty acids that may provide numerous health benefits to people with high cholesterol, heart disease, stroke, angina, high blood pressure, rheumatoid arthritis, multiple sclerosis, psoriasis and eczema, and cancer. Flaxseeds, an unrefined food, provide the richest source of Omega-3 fatty acids.

Dikshit and Kumari (2016) attempted to make the drink low in calorie and high in nutritional value, so that the Diabetic population and the Health conscious strata can relish it utilizing Whey and stevia rebaudiana as natural sweetner. With India launching a comprehensive programme to prevent and control lifestyle diseases, the utilization of idlis made from healthy cooking method like fermentation and steaming using Buckwheat flour, Soyabean flour, Lotus stem flour and Flaxseed flour as a preventive intervention to be integrated in our lifestyle practices is significant.

Materials and Methods

The detail of materials experiments, procedure and techniques followed during the course of the present investigation has been elaborated under the following heads:

Experimental site

The investigation was conducted in the Department of Foods and Nutrition, Ethelind School of Home Science, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Allahabad (U.P.), India.

Procurement of raw material

The raw materials for the recipe development like Buckwheat flour, Soyabean flour, Lotus stem flour, Flaxseed flour, Semolina and Curd were purchased from the local market of Allahabad district.

Experimental design

The basic recipe was standardized and served as control ($\mathbf{T_0}$) three treatment *i.e.* incorporation of multi flour (Buckwheat flour, Soyabean flour, Lotus stem flour and Flaxseed flour) at different level was referred to as $\mathbf{T_1}$, $\mathbf{T_2}$ and $\mathbf{T_3}$, respectively for the prepared Idlis.

Method of Preparation of Idlis

The semolina was soaked in enough water for 3 hours and drained. It was blended in a mixer till smooth and frothy, removed and keep aside. Then it was mixed with curd together in a bowl and covered and keep aside to ferment overnight. Once the batter was fermented salt was added to the batter and mixed well. Spoonfuls of the

Table 1 : Details of treatments for Idli.

Product/treatment	T_0	T_1	T_2	T_3	Replication
KuttuKa Atta	-	5	10	15	5
Soyabean flour	-	5	10	15	5
Lotus Stem flour	-	5	10	15	5
Flaxseed flour	-	1.5	1.5	1.5	5
Total % of incorporation	**-**	**16.5%**	**31.5%**	**46.5%**	

Soyabean Flour, 10% Lotus Stem Flour, 1.5% Flaxseed Flour and 68.5g of Semolina in 100g of Curd and T_3 was prepared by mixing 15% KuttuKa Atta, 15% Soyabean Flour, 15% Lotus Stem Flour, 1.5% Flaxseed Flour and 53.5g of Semolina in 100g of Curd.

Sensory evaluation of Idlis

The organoleptic characteristics of the healthy beverages and snacks was analysed,using 9 point hedonic scale by five panel member randomly selected from the Department of Food and Nutrition, Ethelind School of Home Science. The products was judged for the qualities such as- Body and Texture, Flavor and Taste, Color and Appearance, Overall acceptability. The mean scores for each product and each treatment was calculated.

Table 2 : Average sensory scores of different parameters in control and treated sample of *Idli.*

Sensory characteristics/ treatment	Scores on 9 point hedonic scale			
	Colour and Appearance Mean±S.E	Body and Texture Mean±S.E	Taste and Flavour Mean±S.E	Overall acceptability Mean±S.E
T_0 (Control)	7.60 ± 0.24	7.12 ± 0.20	7.64 ± 0.16	7.48 ± 0.13
T_1 (5%)	7.36 ± 0.14	7.52 ± 0.17	7.68 ± 0.26	7.71 ± 0.23
T_2 (10%)	7.16 ± 0.22	7.40± 0.26	7.72 ± 0.14	7.52 ± 0.09
T_3 (15%)	7.36 ± 0.21	7.76 ± 0.22	8.08 ± 0.25	8.07 ± 0.21
F Value	0.309^{NS}	0.287^{NS}	1.287^{NS}	2.484^{NS}
CD Value	-	-	-	-

a) Colour and Appearance : Fcal = 0.309 F 3, 12 (5%) = 3.49 non- significant, P≤0.05.
b) Body and Texture : Fcal = 0.287 F 3, 12 (5%) = 3.49 non -significant, P≤0.05.
c) Taste and Flavour : Fcal = 1.287 F 3, 12 (5%) = 3.49 non - significant, P≤0.05.
d) Overall acceptability : Fcal = 2.484 F 3, 12 (5%) = 3.49 non - significant, P≤0.05.

Table 3 : Nutritional composition in control and treatment sample of *Idli.*

Nutrients/100g	Treatments			
	T_0	T_1	T_2	T_3
Energy (kcal)	408.00	407.98	405.23	402.48
Protein (g)	13.50	12.71	11.77	10.83
Carbohydrate (g)	77.80	72.76	68.41	64.06
Fat (g)	4.80	6.38	7.42	8.46
Fiber (g)	0.20	2.10	3.94	5.77
Calcium (mg)	165.00	200.36	233.41	266.46
Iron (mg)	1.80	5.90	9.98	14.06
Vitamin 'A' (mg)	31.00	52.75	74.05	95.35
Vitamin 'C' (mg)	1.00	1.15	1.30	1.45

batter was put into greased idlimoulds and steamed for 10 – 12 minutes. The remaining batter was used to make more idlis. It was Served hot with coconut chutney.

Variations : Idli was prepared by mixing 5% KuttuKa Atta, 5% Soyabean Flour, 5% Lotus Stem Flour, 1.5% Flaxseed Flour and 83.5g of Semolina in 100g of Curd in T_1, T_2 was prepared by mixing 10% KuttuKa Atta, 10%

Calculation of nutritive value of the Idlis

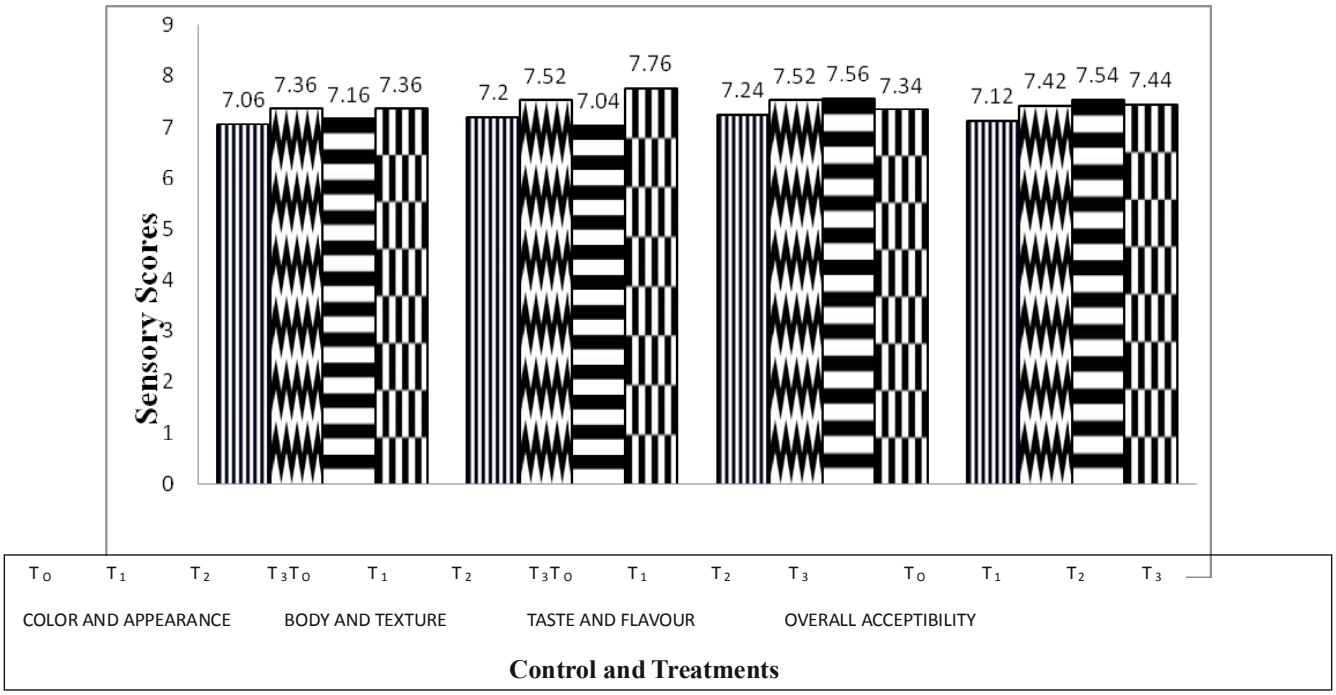
Calculation of Energy, Protein, Carbohydrate, Fat, Fiber, Calcium, Iron, Vitamin A and Vitamin C was calculated as per the reference value given in food composition table (Gopalan *et al*., 2010).

Statistical analysis

The data collected were tabulated and analyzed statistically with the help of approved statistical techniques (Imran and Coover, 1983). Frequency, percentage, mean scores, paired t-test, critical difference and analysis of variance were applied.

Results and Discussion

Organoleptic evaluation of value added food product : The most acceptable treatment in terms of colour and appearance was T_2 (10% Kuttu Ka Atta, 10% Soyabean Flour, 10% Lotus Stem Flour, 1.5% Flaxseed Flour), the most acceptable treatment in terms of Body and Texture was T_3, the most acceptable treatment in



Fig, 5 : Average Sensory Scores for different attributes of Idli.

terms of Taste and Flavor was T_2 (10% Kuttu Ka Atta, 10% Soyabean Flour, 10% Lotus Stem Flour, 1.5% Flaxseed Flour) andthe most acceptable experimental treatments was T_2 (10% KuttuKa Atta, 10% Soyabean Flour, 10% Lotus Stem Flour, 1.5% Flaxseed Flour) for *Idli*. The ANOVA value,shows non significant difference ($p \leq 0.05$) between five treatments of *treatments* because the calculated value of is lower than the tabulated value of F on 3 and 12 d.f and at 5% probability level. So, it can be concluded that all the treatments with admixture ofKuttukaatta, Soyabean flour, Lotus stem flour and Flaxseed flourand semolina in different proportion which were liked very much and were highly acceptable by the panel of the judges regarding the overall acceptability.

Nutritive value of value added food product : T_0 in Idli contained 408.0 Kcal energy, 13.50 percent protein, 77.80 percent carbohydrate, 4.80 percent fat, 0.20 percent fiber, 165 mg calcium, 1.80 mg iron, 31.0 mg Vitamin A and 1.0 mg Vitamin C, T_1 contained 407.98 Kcal energy, 12.71 percent protein, 72.76 percent carbohydrate, 6.38 percent fat, 2.10 percent fiber, 200.36 mg calcium, 5.90 mg iron, 52.75 mg Vitamin A and 1.15 mg Vitamin C, T_2 contained 405.23 Kcal energy, 11.77 percent protein, 68.41 percent carbohydrate, 7.42 percent fat, 3.94 percent fiber, 233.41 mg calcium, 9.98 mg iron, 74.05 mg Vitamin A and 1.30 mg Vitamin C and T_3 contained 402.28 Kcal energy, 10.83 percent protein, 64.06 percent carbohydrate, 8.46 percent fat, 5.77 percent fiber, 266.46 mg calcium, 14.06 mg iron, 95.35 mg Vitamin A and 1.45 mg Vitamin C.

Cost of value added food product : The cost of the manufacture of control *idli* T_0 was 8.60Rs/ 100g, T_1 was (12.71Rs/ 100 g), T_2 was (16.50Rs/ 100 g) and T_3 was (20.62Rs/ 100 g). The cost of the developed product is increasing due to incorporation of Kuttu ka atta, Soyabean flour, Lotus stem flour and Flaxseed flour at different levels. Due to there addition nutritional value of *idli* was also increased.

Conclusion

The importance of food based approaches for the prevention and control of micronutrient deficiencies as well as for the improvement of nutrition in general lifestyle diseases is growing concern of FAO such as: fortification, dietary value addition, diversification and modification for utilization of unconventional nutritious ingredients, and biofortification etc. Making use of idlis prepared with triple methods of dietary value addition, diversification and modification of unconventional nutritious ingredients by incorporation of Kuttu ka atta or Buckwheat flour, Soyabean flour, Lotus stem flour and flaxseed flour will improve the nutritional quality of the products making it suitable for people suffering from obesity and associated lifestyle diseases. It will not only help in the prevention of micronutrient deficiencies but also help in prevention and control of obesity and associated lifestyle diseases like diabetes, cardio – vascular diseases, cancer, stress etc. by increase in Fiber, Calcium, Iron, Vitamin A, Vitamin C

and reduction in carbohydrate and overall energy with the incorporation of the multiflour mix (Kuttu ka atta or Buckwheat flour, Soyabean flour, Lotus stem flour and flaxseed flour) especially in middle aged peoples.

References

Dikshit, S. C. S. and S. Kumari (2016). Nutrient Content of Drink prepared by Whey and *Stevia rebaudiana*. ISBN No. 978 – 3 -659- 83583-4, Lap Lambert Academic Publishing, Germany, 2016, pg. no.6-8.

Dikshit, S. C. S., S. Kumari and P. K. Singh (2015). Sensory and Nutritional acceptibility of low fat paneer prepared by optimization of milk by skim milk powder. *Int. J. Multidiscpilnary Res. Dev*., **2(11)** : 9 – 11.

Gopalan, C., B. V. Ramasastri and S. C. Balsubramanium (2010). Food Composition tables. Nutritional Value of Indian foods. Revised Edition, National Institute of Nutrition. Indian Council of Medical Research, Hyderabad-India.

Park, K. (2007). *Text book of preventive and social medicine*. Seventeenth Edition, pp. 186-187.

Kumari, S. and S. C. S. Dikshit (2015). Impact of consumption of Niger seeds Chikkies on heamoglobin level.ISBN No. 978 – 3-659-80779-4, Lap Lambert Academic Publishing, Germany, 2015, pg. no. 6.

Kumari, S., S. C. S. Dikshit and P. K. Singh (2016). Impact of laser induced breakdown spectroscopy on value added snacks of coarse grains. *Asian Journal of Bio Sciences*, **1(11)** : 232-234.[Special issue of AFBSAH – 2016].

Kumari, S. and S. C. S. Dikshit (2015). Prevalence and Nutritional Status of metabolic syndrome related chronic renal failure patients in Allahabad District. *Int. J. Multidiscpilnary Res. Dev*., **2(11)** : 578 – 579.

Imran, R. L. and W. V. Coover (1983). *A modern approach to statistics*. New York: John wiley and sons inc, 497.

Krishnaja, U. and P. M. Ukkuru (2013). Functional food supplement (FFS) for the management of lifestyle diseases. *The Indian Journal of Nutrition And Dietetics*, **50 (9)**.

Logaraj, M., S. B. Hegde, K. John and R. Balaji (2014). A study on risk factors for lifestyle diseases among patients attending fixed mobile clinic in a rural block in Tamil Nadu. *Int. J. Health Allied Sci*., **3** : 199-203.ep. 2013.

Puneeth, A., P. A. Manjrekar, A. Hegde, M. S. Rukmini, M. G. Rajan and M. T. Shenoy (2015). Are uric acid values surrogate for insulin resistance in apparently healthy subjects across a spectrum of body mass index?. *Int. J. Health Allied Sci*., **4** : 141-7.

Ramesh, K. (2012). Body weight/image perceptions and prevalence of obesity among adolescents-Kerala, India. *Int. J. Health Allied Sci*., **1** : 92-7.

Rao, D. S., S. Jayashree, A. Priti and K. Asawari (2014). Central and overall adiposity among adolescents from different socio – economic classes in urban India. *The Indian Journal of Nutrition And Dietetics*, **51(3)**, July – September 2014.

Sahani, N. C., P. R. Moharana, A. Sahu, D. M. Satapathy and R. M. Tripathy (2013). Nutritional status and its effect on prevalence of Diabetes Mellitus among rural population. *The Indian Journal of Nutrition And Dietetics*, **50(2)**: Feb. 2013.

Singh, R. (2007). Super Health Foods that Provide Complete Nourishment. *J.A mouthful of MANNA*, **40** : 23-23.

Srilakshmi, B. (2007). *Food Science*. 2nd Edition, Delhi: New Age International Limited, Publishers, 70-71.

Srivastava, R. P. (2007). *A text book on principles of food preservation*. Pp. 62-90.

Staceychil (2011). *Lower cholesterol and blood sugar levels*.