

FORTIFICATION OF MATHRI WITH FRESH AND DEHYDRATED VEGETABLES AND ASSESSMENT OF NUTRITIONAL QUALITY

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ABSTRACT

Green leafy vegetables are the micronutrient wealth of India and form an important component of balanced diet. Traditional preparations when modified like mathri when incorporated with vegetables could serve a means of enhancing nutritive value of food. The study was undertaken with three objectives (i) to standardize the method mathri incorporating with fresh and dried green vegetables dehydrated (ii) to assess the organoleptic quality of fortified mathri (iii) to determine its nutritional composition. Organoleptic evaluation of mathri was done by a panel of ten judges using 9 point hedonic scale. Levels of incorporation of fresh greens (spinach, mint and carrot) in mathri were 8 per cent whereas powder of dry green vegetables (spinach, mint, carrot and lotus stem) was added in mathri at 7 per cent. Result shows that the fresh vegetables mathri showed the highest overall acceptability (7.8 ± 0.199) attributes and the score was fall in the range of like very much. Nutritional analysis shows that protein and iron content of dried vegetables mathri i.e. 7.44 g and 5.37 mg was higher as compared to fresh vegetables mathri. Thus, it can be concluded that dry vegetable powder mathri being good source of proteins, iron and energy may be incorporated in the daily diets of vulnerable sections of population.

INTRODUCTION

Balanced diet is not accessible to a large population of the world, particularly of developing countries. In India malnutrition is a major health problem, which is responsible for about 40-50% of infant death (Rai et al 1999). Micronutrient malnutrition poses a serious threat to the health of vulnerable groups of population. Dietary approaches are needed to replace supplementation programme, ensuring sustainability and adequate coverage. In the recent years there is growing concern regarding the nutritive value of foods and to nourish the ever increasing population and the inadequacy of essential nutrients can be improved through fortifications and enrichment of food vehicles. Traditional preparations when modified like mathri when incorporated with vegetables could serve a means of enhancing nutritive value of food. Mathri is popular deep fat fried Indian snack traditionally prepared from refined wheat flour (Arya 1998). The food based approach for combating

micronutrient malnutrition, is difficult and of a long duration, although its effect is predicted to be long lasting. Green leafy vegetables (GLV) are micronutrient dense nature's gift to mankind that provides more vitamins per mouthful than any other food. GLV are known to be rich sources of micronutrients such as vitamin A, iron, β -carotene, etc. and utilizing them is one way of ensuring the micronutrient intake (Allen, 2006). It is the dry demand that locally available materials which are inexpensive but highly nutritious be used as a vehicle to improve the nutritional status (Negi and Roy 2004). The basic idea is to find novel methods by which consumption of greens can be increased. This study was therefore planned with objectives (i) to standardize the method mathri incorporating with fresh and dried green vegetables dehydrated (ii) to assess the organoleptic quality of fortified mathri (iii) to determine its nutritional composition.

RESEARCH METHODOLOGY

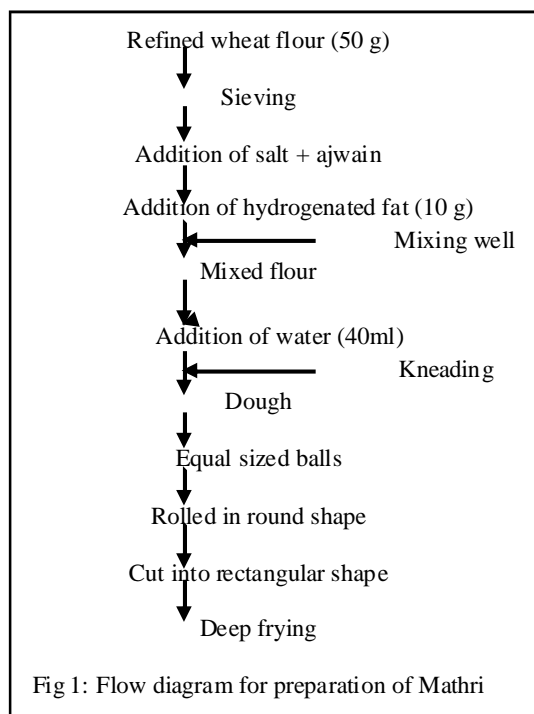
Fresh vegetables (carrot, spinach and mint)

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and other raw materials were procured from local market of Udaipur city. Experiment was done in three parts, standardization of mathri as reference product, incorporation of fresh and dried vegetable powder in mathri and evaluation of nutritional quality.

Standardization of Mathri recipe: A survey was done on 10 families residing in Udaipur city to find out the recipe used for the preparation of mathri. Mathri is a refined wheat flour based deep fat fried product, which is generally eaten as a snack was selected for the further study. A common method of preparing mathri was standardized for one serving size (plate 1). Refined wheat flour (50 g), shortening (10 g), salt (2g), and ajwain (1 g), were all mixed together. Water (30 ml) was added and kneaded well to make stiff dough. The dough was kept aside for 10 min, kneaded again and divided into small portions. The dough was rolled to about 5.2 mm thick and cut into diamond shape using a knife. Mathri was deep fried in oil (150 g) for 5 min until they were golden brown in color. The thickness of the fried mathri was about 5.3 mm. The recipe adopted in present investigation was similar to kumar et al (2001).



Optimization of fresh vegetables Mathri:

Weigh all the vegetables separately viz, 10, 15, and 15 of carrot, spinach, and mint respectively. The edible portions of the green vegetables were separated from stalks, cleaned, washed under running tap water followed by distilled water and boiled for 10 minute. Boiled vegetables were grind to the paste of thick consistency. 20 g of paste was obtained after grinding, and 8 gm of paste was added to the flour for better acceptability (Plate 2).

Incorporation of dried vegetables powder

Dried powder of vegetables which consists spinach (1.5g), mint (1.5g) carrot (1 g) and lotus stem (6 g) was obtained from the All Indian co - ordinate research project, Udaipur (Raj.). Dry powders of all the vegetables were mixed properly with maida and 4 gm of powder was incorporated in the recipe (Plate 3).

Sensory evaluation: The formulated products were subjected to sensory analysis. For this group of 10 volunteers were selected and evaluation was done on the basis of 9 point hedonic scale for color texture, appearance, taste, and over all acceptability.

Nutritional evaluation: The proximate composition viz, moisture, crude fiber, crude protein fat, ash and carbohydrate, of prepared products were determined by AOAC (1980) 6method. Iron could not be estimated. The value of iron content was calculated on dry weight basis.

RESULTS AND DISCUSSION

Phase I: Standardization of Mathri

A common recipe of mathri was standardized as shown in Table 1 and Fig 1. Mathri without incorporated Green Leafy Vegetables (dried and fresh) served as control recipe and further, incorporation of fresh and dried vegetables was done in the standardized recipe of mathri. Fresh vegetables paste was prepared as described earlier and 8 gm powder was added in the standardized recipe. Dried powder was procured from the AICRP Center Udaipur, and 4gm of powder was added in standardized recipe. Standardized and incorporated mathri was evaluated for sensory quality by a 10 panel members.

Table 1. Standardization of Common Recipe of Mathri

Food preparation	Control Mathri
Weight of dough (g)	77
Thickness of chapatti	5.03
Thickness of mathri (raw)	5.156
Thickness of mathri (cooked)	6.53
Cooked weight	59

Phase II: Incorporation of fresh and dried vegetables and Sensory Evaluation

The result of sensory evaluation of mathri prepared with fresh and dry vegetables are listed in (Table 2). According to the result, the fresh vegetables mathri showed the highest overall acceptability attributes i.e. 7.8 ± 0.19 and the score was fall in the range of like very much, where as dried vegetables mathri sample shows the lowest acceptability score i.e. 7.3 ± 0.66 , followed by control mathri samples. Mean value for color was highest

Table 2. Mean±S.E. scores of sensory attributes of mathri

Sensory attributes	Control mathri	Fresh vegetable mathri	Dry vegetable mathri
Color	7.4 ± 0.359	$8 \pm 0.299^*$	$7.5 \pm 0.591^*$
Flavor	7.4 ± 0.359	8.1 ± 0.214	7.1 ± 0.513
Texture	6.5 ± 0.296	7.4 ± 0.231	6.8 ± 0.856
Taste	7.2 ± 0.790	8 ± 0.258	7 ± 0.656
Overall acceptability	6.9 ± 0.627	7.8 ± 0.199	7.3 ± 0.660

*,** Significant at 5% and 1% respectively

in fresh vegetables mathri i.e. 8 ± 0.299 followed by dried vegetables mathri 7.5 ± 0.591 and control mathri 7.4 ± 0.359 . Fresh vegetables mathri scored highest in other sensory attributes as compared to dried vegetables mathri and control mathri, although significant differences at $p < 0.05$, was observed in color. It has also been noticed that when the level of incorporation of greens increased beyond the accepted levels in preparations, the mean scores for the organoleptic evaluation for appearance, color, texture, taste, flavor and overall acceptability decreased. The same result was found in the study conducted by Kaveri et. al (2004) that papad containing highest per cent of defatted soy flour

obtained lowest scores.

Phase III Nutritional composition: The proximate composition of control, fresh vegetables and dried vegetables mathri, were presented in Table 3. Moisture content of different mathri varied significantly ($p < 0.05$) and ranged from 30.50 per cent to 39.85 per cent. The mathri prepared from dried and fresh vegetables varied significantly for iron content. Iron content was found to be highest in dried vegetables mathri (5.37%) followed by fresh vegetables mathri (4.09 g) and control mathri (1.35 g). Dried powder mathri contains higher amount of iron, this may be due to addition of dry lotus stem powder along with other dried vegetables. The fat content of mathri varied significantly and ranged from 4.11 percent, 10.6 percent to 4.55 percent for dried, fresh and control respectively. Sadhna et al. (2001) reported 12.99 per cent protein and 5.7 per cent fat in spinach parathas on dry matter basis.

Table 3. Nutrient Composition of Mathri

Nutrients	Control mathri	Fresh vegetable mathri	Dry vegetable mathri
Moisture (g)	6.6 ± 0.23	$3.10 \pm 0.20^*$	$3.0 \pm 0.18^*$
Protein (g)	8.3 ± 0.12	3.5 ± 0.05	7.4 ± 0.10
Fat (g)	4.5 ± 0.75	6.8 ± 0.08	4.1 ± 0.52
Crude fiber (g)	2.6 ± 0.32	6.87 ± 0.08	2.9 ± 0.02
Ash (g)	1.4 ± 0.08	2.0 ± 0.08	2.1 ± 0.05
Carbohydrate (g)	76.3 ± 0.35	76.4 ± 1.5	78.9 ± 1.3
Energy (Kcal)	379.9 ± 5.8	381.5 ± 9.4	382.7 ± 11.1
Iron (mg)	1.3 ± 0.50	$4.09 \pm 0.29^{**}$	$5.37 \pm 0.11^{**}$

*, ** Significant at 5% and 1% respectively

Mathri prepared with dried vegetables powder content high protein 7.44 gm as compared to fresh mathri 3.5 g, this may be due to high content of fiber in mathri, which bind other nutrient and make them unavailable. The Khichri and Mathri containing spinach leaf powder have been reported to contain 25.73 per cent and 9.19 per cent protein (Malhotra et al., 2002). The carbohydrate content of control, dried and fresh vegetables mathri were found to be 76.37, 73.87, and 80.2 g respectively. Methi and spinach paratha have been reported to contain 73.99, 74.90 per cent carbohydrate and 404 & 402 Kcal energy.

CONCLUSION

The value addition enriched the nutritive value of traditional recipe appreciably. There was a substantial increase in the nutritional value of all the products enriched by green vegetable. Food products developed with incorporation of greens either in dry form or fresh form were organoleptically acceptable. Iron content in all food preparations increased significantly ($P < 0.01$) with incorporation of fresh as well as dry greens. Analysis of data further showed that increase of iron was more in food preparations which were prepared with incorporation of dry greens vegetables compared to fresh greens vegetables. It may be concluded that dry vegetable powder mathri being good source of proteins, iron and energy may be incorporated in the daily diets of vulnerable sections of population

REFERENCES

- Rai L.P.W, Selwa M, Sahni R.C and Bhatia B. 1999. Physical and mental fatigue may be due to iron deficiency anemia. 1st edition, Anubav Rai Publication, 38 : 210.
- Arya S.S, Natesan V, Parihar D.B and Vijayaraghvan P.K. 1979. Stability of β -carotene in isolated system. Journal of Food and Technology. 14 : 571 - 578
- Allen, L., De Benoist, B., Dary, O. and Hurrell, R.F. 2006. In Guidelines on food fortification with micronutrients. Geneva, World Health Organization and Food and Agricultural Organization of the United Nations.
- Negi Pradeep Singh, Roy Susanta Kumar 2004. Changes in beta carotene and ascorbic acid content of fresh amaranth and fenugreek leaves during storage by low cost technique. Plant Foods Hum Nutr, 58: 225-230
- Kumar S., Nirankar N. and Tyagi R.K. 2006. Development and evaluation of button mushroom (*Agaricus bisporus*) mathri using response surface methodology. Journal of Food Science and Technology, 43(5): 501 -504
- AOAC: Official Methods of Analysis. 1980. Association of Official Analytical Chemists. Washington DC, USA.
- Kaveri, G. V., Gupta, S., Lakshmi, J. A. and Prakash, J. 2004. Physiochemical characteristics and sensory attributes of wheat-based "Papads" incorporated with green leafy vegetables. Journal of Food Quality 27: 459 - 470.
- Sadhna S., Malhotra, S.R. and Kalia, M. 2001. Nutrient content of some cereal based preparations of H.P. Beverage and Food World, 28: 31-32.
- Malhotra, S.R., Singh, Sadhna, Bhamra, S. and Sharma, A. 2002. Nutritional intervention of selected rural school children (6-12) years of Kangra District (H.P.) India. Proceedings of II International Conference on Sustainable Agriculture for Food, Energy and Industry. Sept.8-13 Beijing, China pp. 400-403.

