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Micronutrient fortification of traditional Indian food preparations by incorporation of fresh as well as dehydrated spinach leaves

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Abstract

Micronutrient deficiencies are common among women and children in low- and middle-income countries. To address micronutrient deficiency through dietary diversification and household access to green leafy vegetables, two traditional Indian preparations like Vada and Namakparas were fortified through incorporation of fresh as well as dehydrated spinach leaves. Standardization of both recipes was done by preparing the food item using three different proportions of ingredients and the most acceptable proportion found through sensory evaluation was used for final product. Microbial analysis was done to check the shelf life of developed fortified food products. Namakparas fortified with dried spinach leaves as well as Vada prepared with fresh spinach leaves were found acceptable and were graded above good for all sensory characteristics. Both fortified food products had increased micro nutrient composition when compared with the original food products. Change in cost of food products was affordable to low income group. Thus food based approaches like incorporation of green leafy vegetables in food products can become a sustainable solution to combat vitamin A deficiency.

Keywords: Micronutrient deficiency, green leafy vegetables, fortification, Namakparas, vada

Introduction

Micronutrient deficiencies are common among women and children in low- and middle-income countries. Globally, one in three preschool-aged children and one in six pregnant women are deficient in vitamin A due to inadequate dietary intake (1995–2005 data). (UNICEF) child malnutrition rate is unacceptably high in India. With one sixth of the global population residing in India, one third of about two billion people suffering from vitamin and micronutrient deficit are in India. (Kotecha, 2008) Micronutrient deficiencies are often the result of lack of enough habitual food in the household rather than to the poor quality of such foods. National Nutrition Monitoring Bureau (NNMB) data over the last three decades have consistently shown that more than 70% of pre-school children consume less than 50% of the RDAs for vitamin A, iron, folic acid and riboflavin. (Sesikeran, 2013) There are four types of approaches to elevate micronutrient intake. 1) Pharmaceutical supplements, 2) Food fortification 3) Biofortification and 4) Food - food fortification (dietary diversification). The problem of micronutrient deficiency can to a great extent be addressed by encouraging dietary diversification and

household access to micronutrient rich foods. (Indian National Science Academy, 2011) Green leafy vegetables are rich sources of carotenoids and are also good sources of folate, vitamin C, iron, calcium and many other micronutrients and bioactive compounds. A food-based approach in non-clinically deficient areas could be a sustainable and cost effective solution through increasing local production and consumption of green leafy vegetables. (Kapil and Sachdev, 2013) In India, the most commonly used leafy vegetables are spinach, fenugreek, drumstick leaves, coriander and curry leaves etc. Suitable processing and preservation can prevent wastage and increase availability of these green leafy vegetables in the diet during off season. Traditional Indian preparations when prepared by incorporating green leafy vegetables could serve a means of enhancing nutritive value of food. (Khan and Mahesh, 2015) Spinach is good source for phytochemicals, contain high percentage carotenoid compounds, those are lutein and zeaxanthin that are protecting against eye diseases and is one of the most important antioxidative vegetables. (Ramu et al, 2016) Hence this study was an attempt to increase the micronutrient content of traditional Indian preparations like Vada and Namakparas through incorporation of fresh as well as dehydrated spinach leaves and to assess the organoleptic qualities of fortified food preparations.

Materials and methods

Spinach leaves and other raw ingredients were procured from the local market of Modinagar city, Uttar Pradesh and research work was conducted at Food and Nutrition laboratory of G.D.M.PG College Modinagar, Uttar Pradesh. Experiment was done in following parts (i) Preparation of dehydrated spinach powder, (ii) Preparation of food products, (iii) Standardization of recipes incorporating spinach powder, (iv) microbial analysis, sensory evaluation and cost analysis of fortified food preparations.

Preparation of dehydrated spinach powder

Spinach leaves were separated from stalks, cleaned and washed under running tap water followed by distilled water. The clean leaves were blanched in boiled distilled water for 10- 15 seconds and dried at room temperature for 1- 2 hours by spreading on filter paper followed by drying in hot air oven at 40 ± 50^0 C for 6- 8 hours. The dried leaves were ground in grinder to a fine powder.

Preparation of Food products

Food products were developed using the method described in Figures 1 and 2.

Fig 1: Flow chart for method used for preparation of Vada fortified with fresh spinach leaves

Ingredients : Bengal gram dhal - 50 grams
Soyabean dhal - 50 grams
Fresh Spinach leaves-100 grams
Onion – 50grams
Green chilli - 4 pieces
Salt and red chilli powder - According to taste

Method: Soak Bengal gram dhal and soybean in water overnight.

↓

Grind both dhal to make a thick paste.

↓

Add chopped spinach leaves (fresh), green chilli, salt and red chilli powder.

↓

Make balls of the paste.

↓

Deep fry in oil till golden brown.

Fig 2: Flow chart for method used for preparation of Namakparas

Ingredients : Refined wheat flour- 60 grams
Semolina- 20 grams
Spinach powder -20 grams
Ghee- 7 -10 grams
Salt and ajwain- According to taste

Method: Make a dough of ingredients using water.

↓

Roll the dough into thin layer (like chapatti).

↓

Cut the thin layer into small triangular pieces.

↓

Deep fry till golden brown.

Standardization of recipes

The recipes were standardized by doing three trials for both food preparations by changing the proportion of spinach leaves/powder and cereals for preparation of per 100 grams of raw material. For standardize Namakparas, the proportion of Refined Wheat Flour : semolina : spinach powder was used as 40:20:40, 50:20:30 and 60:20:20 in grams where as for the preparation of Vada the proportion of Bengal gram dhal, soybean and spinach leaves (fresh) was 80:20+50, 75:25+75, 50:50+100 in grams.

Sensory evaluation of food products

Sensory characteristics such as taste, flavor, texture and appearance of developed food products were evaluated by hedonic scale method comprising 9 points. Sensory evaluation was done by preschool children and college teachers with a total of 20 members.

Nutritional value of fortified food products was calculated on the basis of the nutritive value of ingredients used in preparation using ICMR handbook, "Nutritive value of Indian food products." A comparison was made with the nutritive value of original food products.

Microbial analysis of food products

Shelf life of developed food products was analyzed by using the spread plate method on samples kept under appropriate storing conditions.

Cost analysis

The cost of fortified food products was calculated on the basis of price of ingredients used in the preparation. A comparison was made between the cost of original food products and fortified food products.

Results and discussion

After standardization of Namakparas, the proportion of Refined Wheat Flour : semolina : spinach powder as 60:20:20 (gm) was found most acceptable and for Vada, the proportion of Bengal gram dhal, soybean and spinach leaves (fresh) 50:50+100 in grams was found most acceptable. Sensory evaluation of food products revealed that 40% respondent graded the taste of Namakparas as excellent, 45% graded as very good and 15% graded as good where as 55% respondent graded the taste of vada as excellent, 40% as very good and 10% respondent graded the taste as good. The overall response for all the characteristics was above good. Analysis of nutritive value of Namakparas showed an increment of 11157 µg β-carotene content and 2.1 mg iron content where as vada had an increased amount of 5717 µg β-carotene, 4 mg iron and 92 mg calcium after fortification. Microbial analysis of Namakparas showed that no microbial growth was observed for 15 days where as microbial growth started

on second day in Vada. Thus the shelf life of namakparas was observed as 15 days and Vada as only one day. Cost analysis revealed that fortification cause only minimum increase in the cost of food products which was affordable to low income group population.

Thus food based approaches to combat vitamin A deficiency can become a sustainable solution through increasing local production and consumption of green leafy vegetables. Incorporation of these leaves into daily food items can increase the micronutrient intake of vulnerable population. Through dehydration of green leafy vegetables these can be easily available during off season also.

References

1. Micronutrient Nutrition; UNICEF http://unicef.in/Whatwedo/8/Micronutrient-Nutrition assessed on 23/5/2017.
2. Kotecha, P. V. 2008, Micronutrient Malnutrition in India: Let Us Say "No" to it Now. Indian Journal of Community Medicine : Official Publication of Indian Association of Preventive & Social Medicine, 33(1), 9-10. http://doi.org/ 10.4103/0970-0218.39235).
3. Sesikeran B, 2013, The Changing Scenario of Micronutrient Deficiencies in India, Bulletin of the Nutrition Foundation of India, 34 (2).
4. Micro-nutrient security for India– priorities for research and action; 2011, Indian National Science Academy, Bahadurshah Zafar Marg, New Delhi, Angkor Publishers (P) Ltd., Noida-201301.
5. Kapil U, Sachdev HPS, 2013; Massive dose vitamin A programme in India - Need for a targeted approach; Indian J Med Res. 138(3): 411–417.
6. Khan MA, Mahesh C et al, 2015; Effect of spinach powder on physico-chemical, rheological, nutritional and sensory characteristics of chapati premixes; J Food Sci Technol 52(4):2359–2365.
7. L. Ramu et al. 2016; Physical, Chemical and Sensory Properties Of Spinach Paste Fortified Instant Noodles; International Journal of Innovative Technology and Research Volume No.4, Issue No.6, 5318-5322.
8. Prevalence of micronutrient deficiencies; NNMB Technical Report No. 22 National Nutrition Monitoring Bureau; National Institute of Nutrition, Indian Council of Medical Research; http://nnmbindia.org/NNMB%20MND%20REPORT%202004-Web.pdf).