A Report

on

Nutrition analysis of bakery products (bread, biscuit and cake) using puree of four BARI released OFSP varieties

International Potato Center (CIP)

Development and Delivery of Biofortified (DDBIO) Crops at Scale Program

Bangladesh

Introduction

Malnutrition is common phenomenon in Bangladesh. The children of Bangladesh suffer from high rates of micronutrient deficiencies, particularly vitamin A, iron, iodine and zinc deficiency. Bangladesh should be commended for making significant progress in reducing vitamin A deficiency (VAD) among preschool children over the past 15 years; however, consumption of vitamin A rich foods is still low, suggesting that the underlying causes of VAD require further attention and support. Anemia is also highly prevalent among children in Bangladesh and few programs have been initiated to improve their iron status.

Orange fleshed sweetpotato (OFSP) contains a diverse array of vitamins and minerals with potential nutritional benefits to meet easily the intake needs and reduce VAD and under-nutrition (Jaarsveld *et al.,* 2006). However, the utilization is very low and commonly consumed in the limited form like boiled and cooked meals in traditional dishes of Bangladesh. The limited information on processing OFSP to other products or considering it as additional ingredients for baked foods (Assefa *et al.,* 2007; Bezabih and Mengistu, 2011) is the also limiting factor for OFSP consumption. Numerous studies have been conducted to develop nutritious food products from OFSP and other supplementary food sources (ADA, 2002; Coronel *et al*., 2005). Snack foods such as biscuits and crackers are widely consumed, relatively longer in shelf life, good in eating quality and highly palatable foods that can be modified to suit specific nutritional needs of any target population (Elkhalifa and Ei-Tinay, 2002; Okoye *et al.,* 2008; Vitali *et al.,* 2009).

The production of bakery products is mainly based on wheat flours. In recent studies, new ingredients were included in the production of biscuit products such as black gram flour (Hooda and Jood, 2005), mustard flour (Tyagi *et al*., 2007), soy flour (Vitali *et al.,* 2009), fibers from different cereals and fruits (Sudha *et al.,* 2007; Bilgicli *et al*., 2007) to study changes on nutritional and organoleptic characteristics of biscuits. Biscuits can also be prepared by incorporating sweet potato flours to wheat flour (Srivastava *et al.,* 2012).

The sweet potato could be considered as an excellent novel source of natural health-promoting compounds, such as β-carotene, zinc and iron, for the functional food market. Also, the high concentration β-carotene in sweet potato, combined with the high stability of the color extract make it a promising and healthier alternative to synthetic coloring agents in food systems. Bread prepared from OFSP Puree can create new economic and employment activities for farmers and

rural households and can add nutritional value to food systems. However, the introduction of foods is to be made with caution, and issues such as safety, acceptability and nutrient bioavailability need to be considered. The demand for bakery products and importation of wheat are increasing replacing relative proportion of puree from OFSP could have an advantage on the nutritional and economical aspects. Therefore, the aim of this study was to develop pro-vitamin A and energy rich bakery foods (bread, cake and biscuit) from puree of OFSP and wheat flours.

Methodology

The bakery products were developed in GUK Super Tasty Food Product factory, Nasratpur, Gaibandha. The following steps were followed for making bakery products (bread, biscuit and cake) and nutrition analysis:

Step-I: Processing of orange flesh sweetpotato roots into puree

Firstly, four BARI release orange fleshed sweetpotato varieties (BARI SP 4, BARI SP 8, BARI SP 12 and BARI SP 15) were collected from DDBIO project areas of Gaibandha. The roots were washed and cleaned to remove all soil and dust particles and then boiled. After boiling, the skins of the root were removed, and purees were prepared from each variety using an electric mixer.

Fig.1: Making OFSP Puree

Step-II: Development of bakery products

For preparation of bakery products, the following three basic ingredients were used:

For Bread: 50% OFSP Puree+ 50% Wheat Flour, 30% OFSP Puree+ 70% Wheat Flour and 100% Wheat Flour).

For Biscuit: Three basic ingredients 40% OFSP Puree+ 60% Wheat Flour, 20% OFSP Puree+ 80% Wheat Flour and 100% Wheat Flour).

For Cake: Three basic ingredients (viz. 50% OFSP Puree+ 50% Wheat Flour, 30% OFSP Puree+ 70% Wheat Flour and 100% Wheat Flour) for making bread.

Other ingredients were used as same for any products of bread, biscuit and cake. The standard bread, biscuit and cake making procedure of the GUK Super Tasty Food Product factory were followed.

Fig.2: Bread, Biscuit and Cake prepared from OFSP puree

Step-III: Nutrient Analysis of Bakery Products

Nutritional analysis of bakery products was done at Food Technology Lab, Hajee Danesh Science and Technology University, Dinajpur and Soil Research and Development Institute, Dinajpur. Beta-carotene was determined by high performance liquid chromatography (HPLC) method as described by Rodriguez-Amaya (1988). Ascorbic acid content of the product was estimated by titration method (Ranganna, 1986) using 2, 6- dichlorophenol indophenol dye solution. Iron and Zinc content were determined by Atomic Absorption Spectrophotometric methods directly in the undiluted filtrate following analytical method described by Peterson (2016).

Fig.3: Sample preparation for beta carotene estimation

Fig.4: Homogenetion of the sample

Fig.5: Taking Absorbance through Spectrophotometer

The Analytical Result of the experiment has mentioned in the table below:

Table1. Beta Carotene, Vitamin C, Zinc and Iron content of Bread making with OFSP puree

Name of variety	Ingredient Use	Beta Carotene (mg/100g)	Vitamin-C (mg/100g)	Zn (mg/100g)	Fe (mg/100g)
BARI SP-4	50%F+50%OFSP	1.336	2.821	2.662	4.15
BARI SP-4	70%F+30%OFSP	0.796	1.659	2.721	6.07
BARI SP-8	50%F+50%OFSP	0.316	2.039	2.896	7.46
BARI SP-8	70%F+30%OFSP	0.203	1.199	4.399	5.18
BARI SP-12	50%F+50%OFSP	0.978	2.523	2.865	5.56
BARI SP-12	70%F+30%OFSP	0.597	1.484	2.644	6.84
BARI SP-15	50%F+50%OFSP	2.909	2.605	2.514	4.74
BARI SP-15	70%F+30%OFSP	1.688	1.532	2.830	5.88
Control	100%F	0.032	0.001	4.144	3.66

From table 1, it's indicated that Beta carotene content of bread content was the highest when 50% wheat flour was replaced with BARI SP 15 puree and it was lowest when bread prepared from only wheat flour. Vitamin C also found maximum in bread prepared with 50% BARI SP 15 puree and 50% wheat flour and it was the lowest in bread prepared from 100% wheat. Zinc content was maximum when ingredient used 30% OFSP of BARI SP 8 and 70% wheat flour (Table-1). There is no remarkable difference regarding Zinc content and Iron content of all breads.

Table 2. Beta Carotene, Vitamin C, Zinc and Iron content of Biscuit making with OFSP puree

Name of variety	Ingredient Use	Beta Carotene (mg/100g)	Vitamin-C (mg/100g)	Zn (mg/100g)	Fe (mg/100g)
BARI SP-4	60%F+40%OFSP	0.805	1.742	1.298	3.695
BARI SP-4	80%F+20%OFSP	0.401	0.913	1.224	4.307
BARI SP-8	60%F+40%OFSP	0.188	1.259	1.317	6.434
BARI SP-8	80%F+20%OFSP	0.105	0.660	1.707	4.366
BARI SP-12	60%F+40%OFSP	0.591	1.548	1.839	6.518
BARI SP-12	80%F+20%OFSP	0.305	0.816	1.534	6.086
BARI SP-15	60%F+40%OFSP	1.672	1.609	1.147	2.837
BARI SP-15	80%F+20%OFSP	0.841	0.843	1.633	3.619
Control	100%F	0.014	0.001	2.045	3.825

From the Table 2 showed that highest beta carotene content was found in 40% wheat flour was replaced by OFSP puree of BARI SP 15 and the lowest was found in when bread was produced from 100 wheat flour. Similar trend also found in case of vitamin C. In case of zinc,

the highest zinc content was found when bread prepared from 100% wheat flour. The iron content was found maximum in bread prepared from BARI SP 12 and the lowest was recorded in bread produced from 100% wheat flour.

Table 3. Beta Carotene, Vitamin C, Zinc and Iron content of Cake making with OFSP puree

Name of variety	Ingredient Use	Beta Carotene (mg/100g)	Vitamin-C (mg/100g)	Zn (mg/100g)	Fe (mg/100g)
BARI SP-4	50%F+50%OFSP	0.483	1.037	0.907	4.606
BARI SP-4	70%F+30%OFSP	0.295	0.633	1.211	4.447
BARI SP-8	50%F+50%OFSP	0.117	0.517	1.004	4.177
BARI SP-8	70%F+30%OFSP	0.076	0.450	1.214	5.372
BARI SP-12	50%F+50%OFSP	0.369	0.927	0.942	3.587
BARI SP-12	70%F+30%OFSP	0.220	0.556	1.171	4.682
BARI SP-15	50%F+50%OFSP	1.043	0.958	1.023	3.948
BARI SP-15	70%F+30%OFSP	0.627	0.575	1.252	4.261
Control	100%F	0.016	0.001	1.430	5.530

From the Table 3 showed that highest beta carotene content also found in 40% wheat flour was replaced by OFSP puree of BARI SP 15 and it was minimum when bread was produced from 100% wheat flour. In case of Vitamin C, it was found maximum when ingredient was used 50% OFSP puree of BARI SP 15 and 50% wheat flour. No remarkable variation was found regarding Zinc content of cake made from different ingredient. The iron content was slightly high when bread prepared from 100% flour compare to bread prepared from others ingredient.

Conclusion

From the above study, we can summarize that all bakery products (bread, biscuit and cake) made from OFSP puree enriched with Beta carotene and Vitamin C. There were no remarkable changed of Zinc and Iron content in the bakery products prepared from OFSP puree. Based on their overall nutrient contribution, OFSP puree from the variety BARI SP 15 was shown as good source of beta carotene and Vitamin C for the development of nutrient rich value added bakery products specially bread, biscuit and cake, as well as it’s a good substitute for wheat flour and possibly for other bakery products.

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