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A Study on Development and Evaluation of Functional Herbal Wafer Biscuits

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Abstract
Herbal extracts are often used by the folk medicinal practitioners, rural peoples of Bangladesh for the treatments of various ailments for the primary health care. Now-a-days its uses are going more frequent with an established scientific literature. Low cost nutritive wafer biscuits made of ayurvedic or herbal extracts such as shatavari, ashwagandha and yastimadhu powder was developed and evaluated for its chemical composition for nutritive parameters. Brief microbiological studies were also planned to evaluate the shelf life and safety of the product. Finally a sensory evaluation was conducted to ascertain its overall acceptability amongst the population. It was shown that newly developed wafer biscuits were rich in carbohydrate (65%), energy and fat (24% fat). The results indicate that newly formulated biscuits were surprising high in protein (8.20%), dietary fiber (1.5%) and widely accepted by the consumers mainly due to its low cost and health benefits with respect to sensory qualities, high nutritive values . The results also indicated that the newly formulated biscuits were high in self-life ranking and it was agreed that this type of initiative could more effective for growing children as well as in certain therapeutic conditions when general malaise dominates the diseases and such type of fortified foods can be industrially launched as a social business.

Key words: Development, Evaluation, Functional herbal wafer biscuits

Introduction

Herb is a medicinal plant containing active component to inhibit the growth of microorganism whereby controlling the health complaints (Kukreja, *et al*., 2001). Most ayurvedic medicines are made up of a combination of herbs. Some herbal medicines may interact with treatments from doctors, including chemotherapy, radiotherapy, biological therapy or hormone therapy. Shatavari has active constituents such as galactose, arabinose, steroidal, glycosides and saponins (Sharma, *et al*., 2011; Sharma U, *et al*., 2009). Shatavari is considered to be the best general tonic for women and is used as a natural regulator (Singh *et al*., 2000). It helps to stimulate the immune system and useful in Cancer, convalescence, cough, dehydration, diarrhoea, and dysentery, fevers (chronic), stomach ulcers, rheumatism, protects from the effects of chemotherapy. Ashwagandha has many beneficial elements, including flavonoids (Ahmad, *et al*., 2010 ; Ven Murthy *et al*., 2010). Ashwagandha contain different natural antioxidants: superoxide dismutase, catalaze and glutathione peroxidase which are responsible as a health promoters. The antioxidant has anti-stress, cognition-facilitating, anti-inflammatory and anti-aging effects (Govindarajan, *et al*., 2005). Yastimadhu has glycyrrhizinic as active component (Størmer *et al*., 1993). In ayurveda, yastimadhu is used as an anti-inflammatory agent. Animal studies indicate its preventive action in cirrohosis of liver and triglyceride accumulation in liver.Baking technique is probably the earliest and oldest of all other techniques and is still going steady over food processing field. Wafer biscuits, biscuits cookies and crackers represent the largest category of snack items among the baked foods in Bangladesh. Wafer biscuits have been a popular product the world over with its rich eating qualities and it has made its presence in the Bangladeshi market as an organized industry product. Functional foods are foods that have a potentially positive effect on health beyond basic nutrition. A familiar example of a functional food is oatmeal because it contains soluble fiber that can help lower cholesterol levels. The Food and Drug Administration regulates the claims that manufacturers can make about functional foods' nutrient content and effects on disease, health or body function. The Institute of Medicine's Food and Nutrition Board (IOM/NAS. 1994) defined functional foods as "any food or food ingredient that may provide a health benefit beyond the traditional nutrients it contains." The study was aimed to formulate wafer biscuits which are functional with optimum nutritional and sensory attributes. In the present research few herbal plants are investigated for their medicinal and therapeutic use to cure health disorder. The entire work was planned with following objectives.

Materials and Methods

Study place

The study was conducted in different laboratories of Ceylon Biscuits Bangladesh (Pvt.) Ltd and laboratory of food technology and Nutritional science, Mawlana Bhashani Science and Technology University, Tangail, Bangladesh during the period June to November 2015.

Sample collection

Wheat flour collected in 1kg sealed plastic bags from Fresh brand, harbal powder (Ashwagandha, Shatavari, Yastimadhu) from Moulovi bazar, Old Dhaka and other ingredients from reputed supplier and reputed brand.

Manufacturing process of wafer biscuits

For manufacture of wafer biscuits first mixing the ingredient about 5 minute and make batter. At the same time cream is also prepared by mixing all ingredients about 30 minute and put it into cream holding tank. Then batter is pumped to oven to make wafer sheet. Then the sheet is creaming and cut into desired size according to consumer demand. The final product is packing with wrapping paper and store in both controls (Temp $<24^0$ C) condition and normal conditions (ambient conditions).

Sampling analysis

The stored samples were drawn at monthly intervals for four months and moisture, ash, fat, crude fiber, protein, and P^H were determined by oven drying, muffle furnace, Soxhlet apparatus, Kjeldhal method and P^H meter. Microbiological analysis was performed by standard plate count method as follows (Frazier and Westoff, 1995). Sensory evaluation for the color, texture, taste, odor and overall acceptability were done in order to determine consumer acceptability. A numerical hedonic scale ranging from 1 to 9 (1 is Excellent and 9 for Very poor) was used for sensory evaluation (Larmond, 1977). The obtained results of sensory evaluation were statistically analysed using SPSS statistical package (Version 20).

Results and Discussion

The results of the experiments conducted on development, value addition, assessment of storage quality and consumer acceptability evaluation of functional wafer biscuits are presented in Table-1. The Table-1 indicate that, In herbal powder the moisture content of the yastimadhu was maximum, while that of ashwagandha was minimum. The vegetable fat and palm oil used for the preparation of wafer biscuits have lower acidity value. It has only 0.09% titrable acidity in terms of lactic acid supports the quality of newly formulated wafer biscuits. The obtained result of Table 2 was below the standard specification. So, this parameter indicate that this product is safe for human health and not affected the self-life. The trend indicated that wafer biscuits absorbed moisture very low after four month in both normal and control condition Table 3. So, moisture does not affected self-life after four month if it is packed properly. But after four month, the product P^H is slightly down that can the affected self-life. Other parameters were within standard limit. Fig. 1 indicates that moisture is bellow from the standard level until the end of four month with proper packing in both normal and control temperature. This moisture level does not effect on self-life. It showed that, after the end of one and two month total ash contain was same store in both normal and control condition. After the end of three month the total ash contains was increasing store in both normal and control condition. The increasing of total ash contain was higher in normal condition than control condition during storage after two month. The result indicate that wafer biscuit has small growth of microorganism in terms of TPC and yeast and mold count as well as total coliform, E-Coli, Stahylococcusaureus and Salmonella count does not show any growth Table 4.

Table 1. Analysis of raw material

Raw material	% Moisture	P^H	%Total Ash	% Acid insoluble ash	% Water soluble ash	% Alcohol extract	Titrable acidity
Shatavari powder	9.01	6.3	3.35	-	49.0	21.0	-
Ashwagandha powder	7.35	5.6	4.45	-	15.5	18.2	-
Yastimadhu powder	10.16	6.1	4.60	-	22.9	27.4	-
Wheat flour	12.4	6.4	0.57	0.047	-	-	0.09
Corn starch	12.9	6.4	0.27	0.1	-	-	-
Soya lecithin	0.5		-	-	-	-	-
Palm oil	0.09		-	-	-	-	0.09
Vegetable fat	0.09		-	-	-	-	0.09
Sugar	0.17		-	-	-	-	-
Dextrose monohydrate	8.5		-	-	-	-	-

It is very clear that wafer biscuits are safe to eat and does not prolife any microorganism on its consumption. The mean value of sensory parameters are analyzed for control and normal temperature and found that the p value for first month is 0.203; second month is 0.497; third month is 0.038 and fourth month 0.034 (Table 5). This result indicates that there is no difference between first and second month's storage product in control and normal temperature. But, there is highly significance difference between third and fourth month's storage product in both control and normal temperature.

Table 2. Chemical parameters of the newly formulated wafer biscuit

Parameters		BSTI –Specifications	Result obtained
Moisture		Max. 6.00	1.87 %
Free fatty acid value		1.00	0.35%
Rancidity		Negative	Negative
Edible fat contain		Min. 5.00	24.05%
Acid insoluble ash		0.05	0.03%
Heavy Metal	Lead (mg/Kg)	Max. 2	1.09 %
	Arsenic (mg/Kg)	Max. 1	0.24 %

BDS 1001:2010

Table 3. Effect of storage on various chemical parameter

% Parameters	1st month		2nd month		3rd month		4th month	
	C	N	C	N	C	N	C	N
Moisture	1.90	1.99	1.94	2.12	2.04	2.21	2.13	2.29
Total ash	1.00	1.00	1.00	1.03	1.55	1.78	1.94	2.10
Acid Insoluble ash	0.03	0.03	0.03	0.03	0.039	0.043	0.049	0.071
P^H	7.1	7.1	7.1	6.9	7.00	6.8	6.8	6.7

C= Control Temperature; N = Normal Temperature

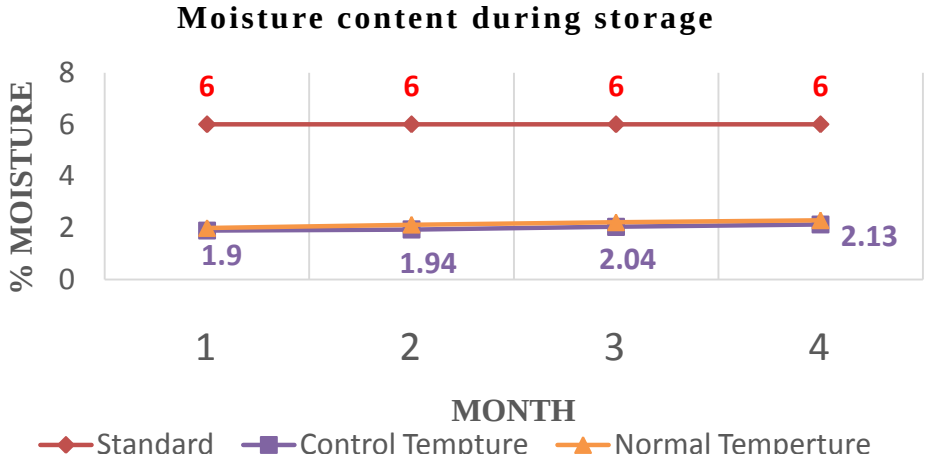

Fig. 1. Effect of storage on moisture Parameter

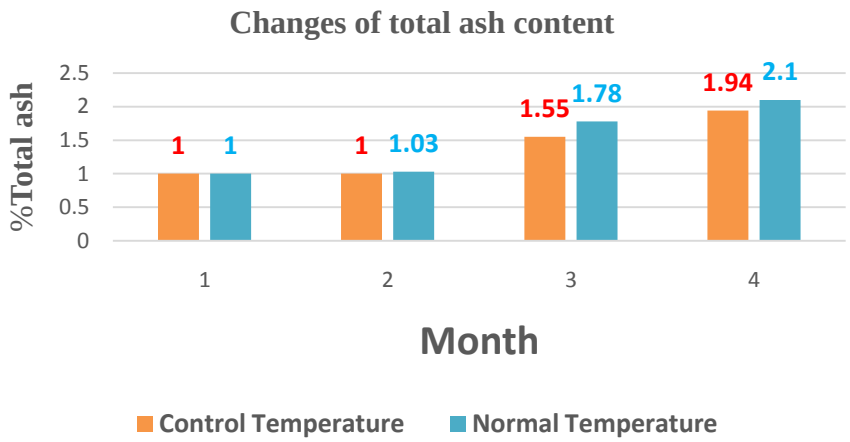

Fig. 2. Effect of storage on total ash content

Table 4. Microbiological investigation

Parameters	Standard	Result obtained
Total plate Count, **cfu/mL**	Max. 10^4	<100
Yeast & mold, per g	Max. 10^3	<100
Coliform, per g	Max. 10^2	Absent
E-Coli , per g	Absent	Absent
Stahylococcusaureus, per g	Absent	Absent
Salmonella, per 25 g	Absent	Absent

Table 5. Effect of storage on various sensory parameters

Quality Parameters	**Maximum Score**	**1st month**		**2nd month**		**3rd month**		**4th month**	
		C	**N**	**C**	**N**	**C**	**N**	**C**	**N**
Colour	20	13.2	13	14	14	14.6	13	13.8	13
Flavour	10	6.6	6.6	6.2	6.2	6.3	6.1	5.7	5.5
Texture	20	14.3	14.3	14.2	14.2	13.9	13.2	13.7	13
Taste	20	14.7	14.7	13.7	13.2	13.6	10.6	12.2	10.5
Crispness	20	15.6	15.6	14.6	14.3	14.2	13.2	13.8	13
Acceptability	10	6.7	6.3	6	6.3	5.6	5.1	5.2	5.2
P value		**0.203**		**0.497**		**0.038**		**0.034**	

C= Control Temperature, N = Normal Temperature

Conclusions

In recent times, bakery products have become increasingly popular among all age groups in all sections of the society. Among these, wafer biscuits are most popular and can be used as a means to contribute health promoting nutrient and/or nutraceutical components. In this regard herbal powder like Ayurvedic powder of Shatavari, Ashwagandha and Yastimadhu is a good source of macronutrients, micronutrients and nutraceutical components. The present investigation undertaken in the Ceylon Biscuits Bangladesh (Pvt.) Ltd. to develop herbal enrich wafer biscuits, to enhance nutrients and/or nutraceutical components through incorporation of traditional or novelin gredients, to analyze nutrient composition and asses consumer acceptability of the most accepted value added wafer biscuits.

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