PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 7 (3): 493-496, 2008
ISSN 1680-5194

Effect of Processing Treatments on Quality of Cereal Based Soyabean Fortified Instant Weaning Food

Maruf Ahmed, M. Burhan Uddin, Sorifa Akter and Jong-Bang Eun[1]
Department of Food Technology and Rural Industries,
Bangladesh Agricultural University, Mymensingh-2202, Bangladesh
[1]Department of Food Science and Technology, Chonnam National University,
300 Yonbong-dong, Buk-gu, Gwangju 500-700, Korea

Abstract: The study reports on processing of weaning food using different proportions of wheat flour and Soybean flour, with whole milk powder and sugar. The raw materials and processed weaning food samples were analyzed for their moisture, protein, fat, ash and total carbohydrate content. Six samples of weaning food were prepared using 5% and 10% Soya flour and control sample were processed without Soya flour. The moisture content of the processed weaning food was found lower than that of control. The protein ash and fat of the samples with Soya flour were higher and carbohydrate contents were lower than that of control sample. No remarkable change in moisture content, peroxide value, fatty acid value and flavor were observed up to 4 months of storage in ambient condition indicating that the products were shelf stable up to 4 months of storage. The bacterial count increased with the increase of storage time.

Key words: Soya bean, wheat, milk powder, sugar, weaning food

Introduction

Weaning is a gradual process the infant becomes accustomed to the adult diet. Weaning foods should be given to the baby at about the age of four to six months. At four months most babies start to need extra food in addition to breast milk; because they grow fast and breast milk is no longer enough to support their growth (Srivastava, 2002). The weaning period, from around 4-6 months until 2 years of age, is a critical period of a child's life when it is mostly at risk from malnutrition and disease. Protein energy malnutrition is the one of serious problem in Bangladesh. One main reason is scarcity and high price of foods of animal origin. Among the plant protein sources pulses and soybean have immediate potential for alleviating malnutrition because of their relatively high protein content. The children between the age of 4 months and 2-3 years are suffering from malnutrition because they are neither getting mothers milk nor the supplementary foods. To combat this situation soybean based weaning food may be an alternative. Major problems are generally low incomes, poor environmental conditions and lack of education. The need to educate families to exploit locally produced foods to produce nutritionally adequate products is stressed (Cameron and Hofvender, 1983). Another studies reported semi-solid infant foods using α-Rice flour and Modified Potato starch is effective for retro gradation prevention and physicochemical stability (Choi and Sohn, 2000). A normally growing child doubles its birth weight by the time it is six months old and triples its birth weight by the time it is one year. A rapid growth and tissue build up is very necessary during this period and unless proper type of protein rich foods are provided during this period, protein malnutrition and under nutrition will develop, which when unattended will lead to kwashiorkor (Jon and Webb, 1964). This study was undertaken to achieve the objectives as follows: To analyze the composition of raw materials, to determine the effect of processing parameters on composition of the weaning food, to evaluate the sensory attributes of weaning food an to evaluate the shelf life of the processed weaning food at ambient condition.

Materials and Methods

Soybean was collected from Bangladesh Seed Foundation, Department of Plant Breeding and Genetics, Bangladesh Agricultural University, Mymensingh. Whole milk, powder and sugar were collected from the local market. The Department of Food Technology and Rural Industries, Bangladesh Agricultural University, Mymensingh supplied the other relevant materials for chemical analysis.

Preparations of soya flour: Soya flour was processed from the straw yellow variety of soybean free from immature, field damaged and black soybeans. Using grain cleaners, the foreign materials were removed. Heavy aspiration removed loose hulls, weed seeds and other light foreign matter. The clean and fresh soybean seeds were then soaked in water [water contained 0.25-0.5% sodium bicarbonate ($NaHCO_3$)] for over night and applied steam 10 min, 15 min and 20 min for measuring the acceptability and quality of the product.

Table 1: Formulation of weaning food

		Ingredients			
Samples No.	Heat treatment (Min)	Wheat flour (%)	Soya flour (%)	Milk powder (gm)	Sugar (gm)
A	10, 15, 20	100	0	3	5
S_1	10	95	5	3	5
S_2		90	10	3	5
S_3	15	95	5	3	5
S_4		90	10	3	5
S_5	20	95	5	3	5
S_6		90	10	3	5

A: control without Soya flour. S_1-S_6: Different Sample used different ratio Soya flour and heat treatment

Table 2: Composition of raw materials used for weaning food samples

Ingredients	Moisture (%)	Protein (%)	Fat (%)	Ash (%)	Total carbohydrate (%, By difference)
Wheat flour	12.80	11.80	1.50	1.50	72.40
Soybean flour	10.54	39.78	19.67	4.57	25.44
Milk powder	2.70	27.40	28.20	4.70	37.00

The main purpose of using $NaHCO_3$ was to remove the bitterness and anti-nutritional factors. The hulls were then removed and dried the dehulled soybean and grinded in a huller mill. The Soya flour was packed in a high-density polyethylene bags, sealed and stored.

Processing of weaning foods: The prepared soybean flour were mixed with milk powder, sugar and wheat flour at different percentage as shown in Table 1. The mixed sample was blended for uniform mixing. After mixing the finished products were packed in polyethylene bag, sealed and stored at ambient temperature.

Serving process: At first clean drinking water was boiled for 5 minutes and allowed to cool. Then 75 mL of water was added to 25 g of weaning food in a bowl and stirred until the weaning food was smooth.

Microbiological studies: The bacterial count was done according to the "Recommended Method for the Microbiological Examination of Food" published by American Public Health Association (APHA, 1967).

Sensory evaluation: Weaning foods were tasted by a panel of judges. The panelists were selected from the teachers, students and staff of the Department of Food Technology and Rural Industries, Bangladesh Agricultural University, Mymensingh. All the judges consisted the panel were conversant with the factors governing the quality of the products. The products were served to each judge who independently examined the following characteristics: a) Color b) Flavor c) Texture and d) Overall acceptability.

The hedonic rating test Rangana (Ranganna, 1994) was used to measure the consumer acceptability of the product. The relative importance of each factor was compared numerically on a scale of 9 (9 = like extremely, 1 = dislike extremely). Each judge gave a score. The average score of each sample was then calculated. To ascertain uniformity of judgments among the total score assigned by each of them for the sample product was calculated by adding up the scores for the various individual characteristics. ANOVA (Analysis of variance) and DMRT were adopted to select the best samples (Gomez and Gomez, 1984).

Storage studies: The samples were stored in the laboratory for 6 months in double polyethylene bags at ambient temperature (27-32°C). Properly sealed plastic bags are good moisture barriers (Goddard, 1980). The stored weaning food was analyzed initially at an interval of 15 days up to one month, then at an interval of 30 days for the rest period. During storage studies the change in moisture content, peroxide and fatty acid values and flavor were observed and the shelf life of the processed weaning foods were assessed.

Results and Discussion

Composition of raw materials: The raw materials used for the weaning food samples were analyzed for moisture, protein, fat, ash and total carbohydrate. The results are presented in Table 2. Moisture, protein, fat, ash, total carbohydrate of wheat flour were found 12.8%, 11.8%, 1.5%, 1.5% and 72.4% respectively whereas the same components in soybean were also found 10.54%, 39.78%, 19.67%, 4.57% and 25.44% respectively. Moisture, protein, fat, ash and total carbohydrate of whole milk powder were found 2.7%, 27.4%, 28.2%, 4.7% and 37.0% respectively. Protein, fat, ash content in soybean flour was maximum but moisture content was lower when compared with control. The moisture content of the raw materials ranged from 2.7% to 12.8%, protein content ranged from 11.8% to 39.78%, fat content ranged from 1.5% to 28.2% and total carbohydrate ranged from 25.44% to 72.4%.

Chemical analysis of weaning food: The weaning food was analyzed for moisture content, protein, ash, fat and total carbohydrate. All the determinations were done in triplicate and the results were expressed as average value. The results are presented in Table 3.

Sensory evaluation a panel of 10 judges evaluated the color, flavor, texture and overall acceptability of the weaning food prepared with water. The judges gave the score for preference of color, flavor, texture and overall acceptability. The mean scores for color, flavor, texture and overall acceptability of different samples with different heat treatment are presented in Table 4.

Storage studies of weaning foods: The shelf life of the processed weaning foods was studied for a period of 6

Table 3: Composition of prepared weaning food

Sample	Heat treatment (min.)	Composition (%)				
		Moisture	Protein	Fat	Ash	Carbohydrate (By difference)
A (control)	10, 15, 20	8.67	11.54	3.52	1.43	74.69
S_1	10	7.73	12.52	4.58	1.47	73.70
S_2		7.70	13.29	4.76	1.52	72.73
S_3	15	7.54	12.60	4.66	1.51	73.69
S_4		7.49	13.43	4.83	1.54	72.71
S_5	20	7.30	12.72	4.72	1.54	73.72
S_6		7.23	13.63	4.88	1.57	72.69

A = Control with 100% wheat flour; S_1 = 95% wheat + 5% soybean + 3 gm milk + 5 gm sugar; S_2 = 90% wheat + 10% soybean + 3 gm milk + 5 gm sugar; S_3 = 95% wheat + 5% soybean + 3 gm milk + 5 gm sugar; S_4 = 90% wheat + 10% soybean + 3 gm milk + 5 gm sugar; S_5 = 95% wheat + 5% soybean + 3 gm milk + 5 gm sugar; S_6 = 90% wheat + 10% soybean + 3 gm milk + 5 gm sugar

Table 4: Mean Scores of sensory evaluation for weaning food

Samples	Sensory attributes			
	Colour	Flavour	Texture	Overall acceptability
A (control)	7.9^{a}	7.6^{ab}	7.9^{a}	7.8^{a}
S_1	7.6^{a}	8.0^{a}	7.7^{ab}	7.1^{abcd}
S_2	6.1^{bc}	6.7^{bcd}	7.0^{bc}	6.6^{cd}
S_3	7.8^{a}	7.3^{abc}	7.6^{ab}	7.7^{ab}
S_4	6.9^{ab}	5.8^{dc}	6.8^{c}	6.8^{bcd}
S_5	5.5^{c}	6.5^{cde}	6.7^{c}	7.5^{abc}
S_6	5.1^{c}	5.5^{e}	6.6^{c}	6.4^{d}
LSD ($p<0.01$)	1.132	1.005	0.7263	0.9708

Mean with same superscripts within a column are not significant at $p<0.01$; A = Control with 100% wheat flour; S_1 = 95% wheat + 5% soybean + 3 gm milk + 5 gm sugar; S_2 = 90% wheat + 10% soybean + 3 gm milk + 5 gm sugar; S_3 = 95% wheat + 5% soybean + 3 gm milk + 5 gm sugar; S_4 = 90% wheat + 10% soybean + 3 gm milk + 5 gm sugar; S_5 = 95% wheat + 5% soybean + 3 gm milk + 5 gm sugar; S_6 = 90% wheat + 10% soybean + 3 gm milk + 5 gm sugar

Table 5: Storage studies of weaning foods with heat treatment

Period of storage (days)	Sample code	Observations					
		Moisture content (%)	Peroxide value mL. eq kg^{-1}	Free fatty acid value mg of KoH/kg of fat	Flavour	Microbial load cfu mL^{-1}	Remarks
0	A	8.67	8.47	2.88	Good	4.59	Good
	S_1	7.73	8.67	2.93		4.51	
	S_2	7.70				4.49	
	S_3	7.54				4.46	
	S_4	7.49				4.45	
	S_5	7.30				4.40	
	S_6	7.23				4.38	
15	A	8.62	8.40	2.89	Good	4.68	Good
	S_1	7.74	8.62	2.93		4.61	
	S_2	7.71				4.60	
	S_3	7.56				4.57	
	S_4	7.50				4.55	
	S_5	7.30				4.51	
	S_6	7.24				4.49	
30	A	8.60	8.34	2.89	Good	4.77	Good
	S_1	7.75	8.55	2.95		4.68	
	S_2	7.72				4.66	
	S_3	7.56				4.63	
	S_4	7.51				4.61	
	S_5	7.33				4.58	
	S_6	7.27				4.57	
60	A	8.65	8.27	2.92	Good	4.86	Good
	S_1	7.77	8.48	2.96		4.76	
	S_2	7.74				4.73	
	S_3	7.57				4.71	
	S_4	7.53				4.69	
	S_5	7.35				4.66	

Table continued

Period of storage (days)	Sample code	Observations: Moisture content (%)	Peroxide value mL. eq kg^{-1}	Free fatty acid value mg of KoH/kg of fat	Flavour	Microbial load cfu mL^{-1}	Remarks
	S_6	7.28				4.65	
90	A	7.72	8.22	2.94	Good	4.93	Good
	S_1	7.79	8.41	2.98		4.82	
	S_2	7.75				4.80	
	S_3	7.59				4.77	
	S_4	7.54				4.76	
	S_5	7.36				4.74	
	S_6	7.31				4.72	
120	A	7.77	8.22	2.94	Good	5.00	Good
	S_1	7.85	8.34	3.01		4.89	
	S_2	7.80				4.87	
	S_3	7.64				4.85	
	S_4	7.60				4.83	
	S_5	7.38				4.80	
	S_6	7.34				4.78	
150	A	7.89	8.18	3.01	Slightly	5.05	Fresh-ness
	S_1	7.94	8.35	3.06	rancid	4.96	declined
	S_2	7.89				4.96	
	S_3	7.73				4.93	
	S_4	7.71				4.91	
	S_5	7.45				4.87	
	S_6	7.30				4.85	
180	A	8.02	8.20	3.03	Rancid	5.11	Not
	S_1	8.06	8.37	3.14		5.06	acceptable
	S_2	8.02				5.03	
	S_3	7.92				5.01	
	S_4	7.83				5.00	
	S_5	7.54				4.98	
	S_6	7.41				4.97	

A = Control with 100% wheat flour; S_1 = 95% wheat + 5% soybean + 3 gm milk + 5 gm sugar; S_2 = 90% wheat + 10% soybean + 3 gm milk + 5 gm sugar; S_3 = 95% wheat + 5% soybean + 3 gm milk + 5 gm sugar; S_4 = 90% wheat + 10% soybean + 3 gm milk + 5 gm sugar; S_5 = 95% wheat + 5% soybean + 3 gm milk + 5 gm sugar

months at ambient condition. No remarkable change in moisture content, peroxide and fatty acid values and flavor were observed up to 4 months. After 4 months of storage greater increase in moisture content peroxide and fatty acid values were noticed and also rancid flavor was developed. These results are presented in Table 5. Observing the moisture, fat and ash contents, results of organoleptic evaluation and shelf life of the weaning food, it may be concluded that weaning foods may be processed substituting the wheat flour by soy flour up to 10%. Further investigation such as feeding program, effect on health is in progress for recommending the food for infants.

Acknowledgments

Financial support provided by Department of Food Technology And Rural Industries in Bangladesh Agricultural University, Mymensingh is greatly acknowledged.

References

APHA, American Public Health Association, 1967. Standard Methods for the Examination for Water and Waste Water. 13th Ed Method 781. Eighteenth Street, N.W. Washington DC. USA.

Cameron, M. and Y. Hofvender, 1983. Manual on feeding Infants and Young Children. 2nd Ed. Oxford University Press. Washington DC, USA.

Choi, H.S. and K.H. Sohn, 2000. Development of semi-solid Infant Foods with α-Rice Flour and Modified Potato Starch. J. Food Sci. Biotech., 10: 219-224.

Goddard, R., 1980. Flexible Plastic Development in Food Packing. 2nd Ed Appl. Sci. Pub. Ltd., New York, USA.

Gomez, K.A. and A.A. Gomez, 1984. Statistical Procedure for Agricultural Research. 2nd Ed. John Wiley and sons, New York, USA.

Jon, K.G. and B.M. Webb, 1964. Peanut protein and milk protein Blends in the Treatments of Kwashiorkor. Am. J. Clin. Nutr., 14: 331-341.

Rangana, S., 1994. Manual Analysis of fruits and vegetables production. 2nd Ed. Tata McGraw Hill Co. Ltd., New Delhi, India.

Srivastava, S.A., 2002. Physicochemical Properties and Nutritional traits of millet-based weaning food suitable for infants of the kumaon hills, Northern India. Asia Pacific J. Clin. Nutr., 11: 28.