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Contents:

Quality assessment of stored soybean flour (*Glycine max.* (L). marr)

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Soybean seeds (TGX 536-02D) were oven dried at 55°C for 18 hours and were then ground into fine powder. The flour so prepared was dispensed in 10 polythene bags each containing 10 grams and were stored at room temperature for 90 days. Two of the samples were taken at regular intervals for microbiological and biochemical analysis purpose over the 90 days of storage. The pH range was 6.77-6.28 over the period of 90 days. The bacterial isolates on 0 day of storage were *Bacillus cereus* and *Bacillus subtilis* while the isolates identified on 90th day of storage were *Bacillus cereus, Bacillus subtilis, Staphylococcus aureus* and *Escherichia coli*. The fungal isolates in soybean flour on 0 day of storage were *Aspergillus* sp., *Penicillium* sp., *Candida* sp. and *Trichoderma* sp. The total bacterial count (TBC) was $1.00x10^2$ cfu/g on 0 day of storage and $8.59x10^{10}$ on 90th day of storage. The moisture content (%) was in the range of 17.10 to 16.37. The reduction in protein content was significant (LSD 0.753) over the 90 days of storage. The reduction in fat content over the first 14 days of storage was significant (at prob. of F 0.01) whereas the change was not significant from 14 to 60 days of storage period. However, the change in fat content was significant over the last 30 days of storage (LSD 0.579). So it can be concluded that stored soybean flour may not be safe for consumption, hence proper preservation of soybean seeds using chemical and natural preservative is recommended.

Key words: *Glycine max.*(L) marr.; *Soy bean seeds, TBC.*

I. INTRODUCTION

Several alternatives to animal protein are being investigated to alleviate protein energy malnutrition problem in developing countries. Soybean is considered one of the best options. Worldwide in most low cost diets the amino acids lysine, tryptophan and threonine are available only in limited quantities. Since soybean is a good source of lysine, tryptophan and threonine its addition to a mixed diet greatly improves the quality of the diet's protein. Compared with other sources of plant protein, soybean has a superior amino acid profile but it is deficient in methionine and cystine (Okaruwa and Dashiell, 1997). Soybean flour has many applications all over the world namely Com-Soy milk (CSM), wheat soy blend, soft cheese and soy sauce (Obatolu *et al.*,1993). Because of the wide uses of soybean flour, it will be interesting to know the nutritional and microbiological changes of soy flour during storage and how it could be preserved to increase the shelf life. The objective of this study therefore is to determine the quality of soybean flour stored for 90 days.

II. MATERIALS AND METHODS

II.1. Preparation of Materials

Five hundred grams of washed soybean seeds (TGX 536-02D) were oven dried at 55°C overnight and then ground into fine powder using a milling machine (Konan and Agbo,1997). The soybean flour was then sieved and kept in a sterile container for further use. Ten grams of soybean flour was dispensed in each of 10 polythene bags and then the polythene bags were sealed with an electric sealer. The sealed polythene bags containing soybean flour were kept for 90 days at room temperature (30 – 32 °C) for quality assessment purpose. Two of the samples were taken on 14th, 30th, 60th and 90th day for microbiological and biochemical analysis purpose.

II.2. Quality assessment of stored samples

TABLE 1: Determination of TBC, pH, moisture content (%), protein content (%) and fat content (%) of stored soybean samples.

Days	Total bacterial count	pH	Moisture	Fat	Protein
0	$1.01x10^2$	6.77	17.10	20.00	40.15
	$1.02x10^2$	6.77	17.12	20.05	40.11
	$0.98x10^2$	6.79	17.10	20.04	40.13
Mean	$1.00x\ 10^2$	6.77	17.10	20.03	40.13
14	$1.38x10^{10}$	6.42	16.75	19.23	35.69
	$1.36x10^{10}$	6.46	16.72	19.23	35.66
	$1.38x10^{10}$	6.45	16.73	19.25	35.67
Mean	$1.37x10^{10}$	6.44	16.73	19.23	35.67
30	$7.87x10^{10}$	6.49	16.40	18.30	31.01
	$7.84x10^{10}$	6.51	16.40	18.30	31.05
	$7.86x10^{10}$	6.48	16.41	18.31	31.03
Mean	$7.85x10^{10}$	6.49	16.40	18.30	31.03
60	$9.06x10^{10}$	6.34	16.22	17.95	25.88
	$9.01x10^{10}$	6.35	16.24	17.96	25.93
	$9.03x10^{10}$	6.34	16.23	18.00	25.89
Mean	$9.03x10^{10}$	6.34	16.23	17.97	25.90
90	$8.63x10^{10}$	6.30	16.39	25.92	22.66
	$8.56x10^{10}$	6.28	16.36	25.89	22.69
	$8.58x10^{10}$	6.28	16.36	25.91	22.66
Mean	$8.59x10^{10}$	6.28	16.37	17.23	22.67

maximum counts specified for the flour used in various food range from $5.0x10^3$ to $1.5x10^4$. The reduction in crude protein from 40.13 to 22.67 for the samples over 90 days was significantly high (at prob. of F 0.01) and could attributed higher microbiological activities resulting from increased bacterial and fungal load. So, it may be concluded that soybean that soybean flour prepared by using this roasting technique is of high nutritional quality but stored soybean flour is a cause of concern especially due to presence of *Bacillus cereus* and the high bacterial load on 90th day of storage ($8.57x10^{10}$).

TABLE 2: Determination of TBC, pH, moisture content (%), protein content (%) and fat content (%) of stored samples (biostatics was done using SAS system).

Days	Total bacterial count	pH	Moisture	Fat	Protein
0	$1.00x10^{2}$	6.77	17.10	20.03	40.13
14	$1.37x10^{10}$	6.44	16.73	19.23	35.67
30	$7.85x10^{10}$	6.49	16.40	18.30	31.03
60	$9.03x10^{10}$	6.34	16.23	17.97	25.90
90	$8.59x10^{10}$	6.28	16.37	17.23	22.67
Mean	$5.37x10^{10}$	6.46	16.57	18.55	31.08
Prob. of F	0.01				
S.E.D.	$1.56x10^{9}$	0.016	0.138	0.178	0.231
L.S.D.	$7.42x10^{9}$	0.052	0.449	0.579	0.753

TBC values used for analysis of variance were transformed using log transformation

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