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Study of Microbial Flora on Germinated Wheat and Mungbean Seeds Flour

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Abstract

Microbiological purity is an important quality criterion in the production of materials for use in weaning food formulation .In germination process always risks are present to increase the microbial load in the germinated food product. The aim of the present study was to analyze the total microbial load in germinated wheat and mungbean seed flour for preparing of weaning foods. For preparation samples of germinated wheat and mungbean seed flour, seeds were soaked in water for 12hours at 30± 20C germinated at 30- 37 ℃ ± 1 for 48-72h in a seed germinator and germinated seeds dried at 600C for 8hours dehulled roasted at 1450C 2 mints and milled 25mm mesh. The total viable counts were determined by the pour plate method, using Plate Count Agar (DIFCO, 0479 – 17) as the medium. The plates were incubated at (35 ± 1) ℃ for 48h, and the numbers of bacterial colonies and of yeast and mould colonies are counted on the respective films. The results are expressed separately as the total colony number per gram dry mass of the sample. The results show that the total viable counts were ranged from 1.7 x 102 cfu/g -9.3 x 102 for wheat seed flour cfu/g, , and1.7 x 102 - 6.0 x 102 cfu/g for the mungbean seed flour. It was concluded that flour was prepared at 33℃ for 60 hour was safe in sense of microbiological purity and can be used for weaning food preparation.

Keywords: Microbial load, Germinated flour, Weaning food, Purity, Viable count.

Introduction

Legumes and cereals play an important role in the agriculture and diet of many developing countries and are a major source of dietary nutrients for many people. However, their role appears to be limited because of several factors including low protein, starch digestibility poor mineral bioavailability Preet and Punia (2000) and high antinutritional factors. It has been reported that proteins thiamin, mineral bioavailability and starch digestibility in increased, whereas phytic acid and tannin decreased during germination of legumes and cereals Kamchan (2004).

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The problems are microbiological growth and development of toxic compounds during germinating. These problems have been tackled through roasting of germinated grains at 60-80C and removal of sprouts and shots before milling Dada (1987). The main objective of this work was to study the microbial load on wheat and mungbean seed flour germinated at different time and temperature

Microorganisms can also lead to diseases and food spoilage whenever they exceed their threshold as a result of increase in certain parameters such as moisture DeLong (2001). The most obvious way to determine microbial numbers is through direct counting by using a counting chamber. Using a counting chamber is easy, inexpensive, and relatively quick; it also gives information about the size and morphology of micro organisms. The number of micro organisms in a sample can be calculated by taking into account the number of colonies formed and any sample dilutions required Plating techniques are simple, sensitive, and widely used to count bacteria and other micro organism

in samples of food, water and soil. Low counts will results if clumps of cell are not broken up and the micro organism well dispersed. Because it is not possible to be absolutely certain that each colony arose from individual cells, the results are often expressed in terms of colony forming units (Cfu/g) rather than the number of micro organisms. The sample should yield between 25 to 250 colonies for best result Prescott (1999).

Material and Methods

Materials

Wheat and munbean seeds were collected from Bangladesh Institute of Nuclear Agricultural Mymensingh, Bangladesh and brought to department of food technology and rural industries and kept in an airtight polyethylene bags at room temperature in a dry place.

Preparation of germinated seed flour

Wheat and mungbean seeds were germinated; following the procedure described by (Frias et al 2005), 500 g f mungbean seeds were soaked in distilled water (1:5 w/v) for 10 hours at room temperature (30±2) seeds were germinated in germinating tray in a seed germinator (G-120 Snijders, The Netherlands) at 30 to 37 ℃ for 48 to 72 hours and relative humidity was 99%. The sprouts were washed and dried in an electric air draught oven (VEB MLW Medizinische Geräte, Berlin Germany) at 60± 2 ◦C for 08 hr. The dried samples were ground to pass through 0.25 mm sieve then packed in kilner jars and kept in a refrigerator at 4 ◦C until used for microbial analysis analysis.

Microbiological examination:

Total viable counts of microorganisms in the wheat and mungbean germinated seed flour were done by pour plate technique, whereby one grame flour were dissolve in 10ml sterilized water and 0.1ml of the appropriate dilution was plated out on nutrient agar plates. The plates were incubated at 35℃ for 48h and colony forming units grame sample (cfu /g) was estimated by use of colony counter NACMC (1999).

Experimental design

Variation effects in germination time and temperature were analyzed using the response surface methodology (RSM), with a 2 central composite rotational design. The independent variables studied were germination time (48-72h) and germination temperature (30- 37◦C).

Results and Discussion

Microbial analysis was conducted and observed that there was general decrease in the microbial load counts with changes in time and temperature of germination. The microbial load count in germinated wheat seed flour ranged between 1.7 x 10^2 to 9.3 x 10^2 and which presented in Fig.1. The microbial load count in germinated mungbean seed

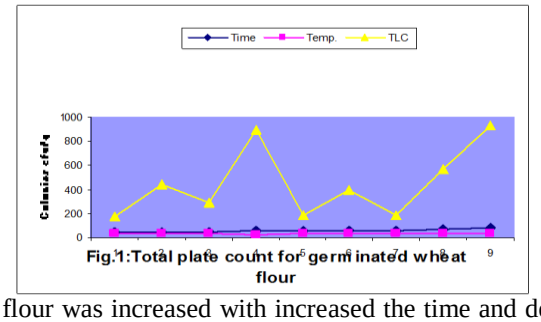

Fig.1:Total plate count for germinated wheat flour

flour was increased with increased the time and decrease in temperature during germination due to high moisture and ranged between 1.7 x 10^2 to6.0 x 10^2 which presented in Fig.2

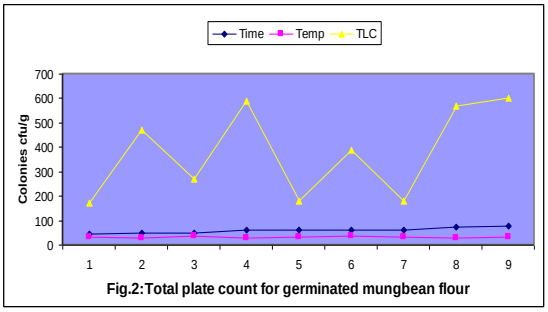

Fig.2:Total plate count for germinated mungbean flour

Preliminary processes such as roasting at high temperature eliminated a large number of micro-organisms. However, the population of micro-organisms in relation to moisture content was not high enough to produce any harmful. The results obtained fell below the recommended range of 25-250 Cfu/g (Prescott *et al.*, 1999). This makes the product acceptable for formulation of weaning foods. A food product for consumption should have microbial count below 1 x 10^4cfu/ml. The International Microbiological Standard recommended limit of bacteria contaminants for food of less than 10^6 cfu/g (Anon, 1974) whereas Rombouts and Nouts (1995) revealed that bacterial counts obtained in plants food were in the order of 12 x 10^7 to 108 cfu/g. Low bacteria counts were obtained as a result of high standard of personal hygiene and quality maintenance of good manufacturing practices observed during the food formulation process. A compilation of a number of studies reported that *B. cereus* positive samples in infant formulas ranged from 1.9% to 100%. Levels of *B. cereus* ranged from 5 to 1000 CFU/g (Becker et al. 1994) and from *0.3* to 600 CFUig Granum (1994).

Table: Microbial load on germinated wheat and mungbean flour

Run	Coded level		Response Value(cfu/g)	
	X_1(h)	X_2(◦C)	Wheat Flour	Mungbean Flour
1	72	30	7.9 x 10^2	5.7 x 10^2
2	48	30	4.4 x 10^2	4.7 x 10^2
3	60	28.55	8.9 x 10^2	5.9 x 10^2

4	60	33.5	1.9×10^2	1.8×10^2
5	60	38.44	4.3×10^2	3.9×10^2
6	72	37	8.1×10^2	5.2×10^2
7	43.02	33.5	1.7×10^2	1.7×10^2
8	60	33.5	1.9×10^2	1.8×10^2
9	76.97	33.5	9.3×10^2	6.0×10^2
10	48	37	2.9×10^2	2.7×10^2

The results for germinated flour prepared for weaning food were in agreement with 26 Italian and 78 Japanese infant formulas, which also did not exceed the recommended $l0^4$ CFU g^{-1} (Fininoli and Rondini 1989; Veda et al. 1980).Milk based powders used in the preparation of nasogastric feeds in Scottish hospitals contained 50 to 300 *Bacillus cereus* cells per gram (Anderton 1993). Nikodemusz (1978) reported that of 5 18 infant milk powder samples, 1 1.3% were contaminated with the level of *B. cereus* in the range of 10 to 1000 CFU g^{-1} Only 17% of British dined infant milk formulas contained *B. cereus* (Rowan et al 1997).

Conclusion

This study showed that germinated wheat and mungbean flour provides alternatives ingredient to the weaning foods in the Bangladesh market as well as other third countries. The optimum levels of microbial load count found in the flour germinated at 33.5 oC for 60h for wheat(1.9 x 102)and mungbean (1.8 x 102)flour and acceptable for` weaning food formulation for infants.

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