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Microbial analysis of protein-rich nutritious porridge during storage.

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Abstract

Food scarcity is not only a major problem in our country but also prevails in the world. The main reason for this problem is decreasing availability of agricultural land and day by day increasing population. Besides this malnutrition, a state of improper nutrient balance in the body; affects health. A vast majority of the population in developing and underdeveloped countries do not have adequate nutrition to sustain a healthy life. In India, protein-energy malnutrition is still a major problem in all the segment of the population.

Porridge is also known as Dalia, Cracked wheat, Bulgar, Facia, Lapsi, and Ogi. It is a wheat product made from whole wheat kernels which are crushed or cut into smaller pieces. Porridge is a typical means of preparing cereal crops-based food products for the table. Porridge is a traditional food in much of Northern Europe and Russia. In India porridge is blended coarse granules of wheat and various types of pulses; obtained by the size reduction process. Size reduction of solids involves creating smaller mass units from large mass units of the same material. To bring this about, the large mass units need to be subjected to stress by the application of force. Three types of forces may be applied i.e. compression, impact, and shear. In general, a plate mill is used for the development of porridge.

The basic technology for the preparation of composite dalia refers to a process of mixing wheat porridge with cereals and legumes to produce high-quality food products economically. The composite porridge containing wheat and legumes are being utilized in many parts of the world.

In addition to whole grain benefits, the multigrain concept can provide breakfast food with these grains. These multigrain blends help to mix different whole grains to maximize their nutritional, functional, and sensory properties. Apart from health sacrifices, convince is also a recent trend in the international as well as an Indian food market. Conveniences products are quick and easy to prepare, thus saves cooking time and require few cooking skills. (Mandge *et al.*, 2011).

Wheat (*Triticum aestivem*) is an important source of energy and protein in the diets of the population in developing countries (Hira *et al.*, 1991). The world's total annual production of wheat is 469 million metric tons (FAO, 2011). Wheat is one of the most widely cultivated crops in the world. It is a staple food for a large segment of the world population. The grains contain about 8-12% protein, carbohydrates 72-73%, fat 1-2%, and fiber 1-2.2%. Wheat porridge is integral to the everyday diet of health-conscious consumers. Wheat porridge is a high protein and high dietary fiber contains food of wheat, which is highly nutritious with a nutty flavor. Wheat porridge is generally sold as parboiled, dried, and partly de-banned. This highly nutritious food variety of wheat is not only low in glycemic index level but also rich in vitamins such as B and minerals such as iron, phosphorous, manganese. Wheat porridge is a whole grain and it is a well-understood fact that whole grain foods are always more healthy than regular foods. Besides the health factor, wheat porridge has many advantages which make it ideal for regular use. One important aspect of the processing and using this wheat in our daily diet is the less cost involved in processing the wheat. It is highly delicious, palatable with easy digestibility. It has very little loss of nutrition during processing with a very good shelf life and it is easy to cook. If one is looking for a perfect and healthy option of whole grain, then one ingredient stands out –wheat porridge.

In general; cereals are limited in essential amino acids such as lysine even though rich in threonine and tryptophan while most oil seeds and legumes are rich in lysine and deficient in Sulphur containing amino acids (Many and Shadaksharaswamy; 2008). It is also known that pulses are a good source of protein (17-24%); therefore, the combination of cereals and pulses in the formulation of porridge gives a nutritious food containing all the amino acid.

Soybean (Glycine max) also mention as the gold crop of America is known for protein. Production of soybean is about 10.97MT in India. This crop contains a higher amount of protein (40-42%) and oil (20-22%). This crop also contains all the three macronutrients required for good nutrition, as well as fiber, vitamins, and minerals. In addition to nutritive value; soybean has many medicinal and therapeutic values. It contains 15-45% protein and 17-22% fat (Swaminathan; 1985). The protein content of soybean is about twice that of other pulses; four times then wheat; six times then rice grains; four times then egg and twelve times of milk. It is a good source of all indispensable amino acids (Serrem et al; 2011). According to De Ruiter (1974), soy flour in composite flours is emphasized and is quite understandable concerning the worldwide cultivation of soybean, its protein content, and nutritional protein quality. The addition of soy flour to that of sorghum, maize, and wheat will overcome their deficiency of some nutritional composite like some nutritional characteristics of the flours.

Besides this, it is a general fact that food products based on either cereals or pulses alone are nutritionally inferior. Therefore, the present study was planned to develop a nutritious porridge, by mixing wheat and soybean in various combinations.

Introduction

Microbiological analysis covers the use of biological, biochemical or chemical methods for the detection, identification or enumeration of microorganisms. It is often applied to disease causing and spoilage microorganisms.

Key words

Microbail analysis, Wheat-Soya, blend of cereal and pulse, deterioration.

Total plate count

Total Plate Count (TPC) is a method of estimating the total number of microorganisms (mold, yeast, bacteria) in a material. The research begins with dilution phase of the sample until it reaches 10-5 dilution.

The total plate count (TPC) in the sample was estimated by the official method as described in AOAC (1995).

Media for Bacteria

A.	Peptone	5g
B.	Beef extract	3g
C.	Agar powder	20g
D.	NaCl	5g
E.	Distilled water	1000ml

Procedure

The desired amount of the sample will be mixed in the nutrient solution. 15-17ml of this media will be poured into each Petri dish. Different dilutions (10^{-3}, $10^{-7,}$ and 10^{-10}) of samples will be used for assaying the bacterial population. With the help of a minor pipette, 0.2 ml of such dilution will be mixed with 50 ml of molten media (40˚C), mixed homogeneously and three plates will be poured with this mixture. After solidification, the plates will be kept for incubation at 25˚C in B.O.D. incubator. After 3 days, the colonies grown on the samples will be counted, thereby determining the number of aerobic, mesophilic organisms per g or ml of sample. The result will be given in colony-forming units (cfu/g or cfu/ml).

$$N = \frac{\sum C}{(N_1 \times 0.1\, N_2) \times D} \quad \text{…..3.9}$$

Where:

$\sum C$ = Sum of colonies counted on all dishes retained

N_1 = Number of dishes retained in the first dilution

N_2 = Number of dishes retained in the second dilution

D = Dilution factor corresponding to the first dilution

Microbial analysis

The data presented in the following indicated that total bacterial counts during 0 to 30 days were same and no change in population was observed in all the combinations. However, there was increase in population between 30 to 60 days and 60 to 90 days. Minimum increase 1.2×10^4 was recorded in composition 95:05 and maximum of 1.7×10^4 in composition 80:20.

Table 1: Total bacterial count (CFU) in different blends of wheat and soybean during different storage periods

	Storage periods (days)			
	0	**30**	**60**	**90**
95:05	1.0×10^4	1.0×10^4	1.0×10^4	1.2×10^4
90:10	1.0×10^4	1.0×10^4	1.2×10^4	1.3×10^4
85:15	1.0×10^4	1.0×10^4	1.2×10^4	1.5×10^4
80:20	1.0×10^4	1.0×10^4	1.3×10^4	1.7×10^4

Result

- The microbial analysis did not show any deterioration during storage periods.

	0	**30**	**60**	**90**
R1	1	1	1.0	1.2
R2	1	1	1.2	1.3
R3	1	1	1.2	1.5
R4	1	1	1.3	1.7

	R1	R2	R3	R4
0	1	1	1.0	1.0
30	1	1	1.0	1.3
60	1	1	1.2	1.5
90	1	1	1.3	1.7