Phytic Acid Content of Solid State Fermented Lathyrus Sativus Seeds by Rhizopus Oligosporus

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Introduction

In beans a considerabl portion of the total phosphorus content is known to be present in the form phytate. These mixed Calcium and Magnesium salts of myo-inositol 1, 2, 3, 4, 5, 6 hexakis dihydrogen phosphate have the ability to form insoluble chelates with various trace and macro elements such as zinc, iron, calcium and hence reduce the amount of phosphorus and associated metal iron available for absorption in the intestine of an animal[1]. Phytate possess eight negetively charged phosphoric acid residues per molecule between PH 6.3 and 9.7 and six negetive groups between PH 1.8 and 6.3 As a result of theis polyvalent nature, it is strongly associated withe soy-proteins above their isoelecitric point (PH 4.5) especially in the presence of ca++ and Mg++ ions. Phytate is also associated withe soyproteins at PH values below their isoelectric point by electrostatic inetersections involving their cationic lysil, histidyl, arginyl and terminal amin groups (Okubo et al, 1975, 1976)[2].

Since commercial soy-protein products normally contain 2-3% phytate, there is some concern theat they may adversly alter the bioavailability of Fe and other in wheat and other cereals. Even very small amount of phytate markedly reduce iron absorption. The addition of sodium phytates are present in wheat and other cereals. Even very small amount of phytate markedly reduce iron absorption[3]. The addition of sodium phytate can reduce iron absorption in[4,5]. The addition of phytic acid to casein diets can reduce zn retention to thet in soybean protein diets.[6,7] This subjects has been reported by numerous workers. Additionally, it is highly likely that removal of phytat from commercial soy-proteein products would drastically alter their basic physiochmical and functional properties. Research efforts to remove phytat from soyprotein include (a) phytase enzymatic treatment with and without ultrafiltration b) alkaline extraction of PH 11-12 (c) ultrafiltration and (d) dialysis and anion exchange treatments are used by some authors.

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There are other methods of improving the nutritional qualities of foods by fermentation. Fermentation is one of the oldest method of food processing. Interst in solid fermentation technology for food procssing has greatly increased due to the demand of human food from plant origin, Fermentation brings desirabl changes in the legume such as texture and organoleptic characteristics (Flavor, aroma, appearance) elimination of of flavours, improves digestibility, keeping quality and safety, increase nutrition and reduction in cooking time which make them more attractiv to consumer thean the raw legumes[8].

Fermented foods are essential components of diets in all parts of the world specially Southe East Asia, the Near east and parts of Africa. Dhokla and dosa are some of the popular beans based fermented foods in India. The Nutritional quality of the fermented foods fed to weanling rats exhbited superior weight gain, PER and Nitrogn retention than unfermented batter. Fermented foods from chickpea resulted decrease in phytate phosphorus. Fermented food by Rhizopus oligosporus also involve in the deliveratoon of stimulating part of Natural floraby providing condition of good taste[9].

Though Lathyrus sativus seeds contain toxins which causes Lathyrism in human, there are metheods to remove the toxicity by washing, cleaning etc. (V. S. Mohan et al K. Jahan & K. Ahmad (Simple Procedure for the removal of these factors in Lathyrus sativus.[10,13]

Materials and Methods

Fermentation Method

Lathyrus sativus seeds were purchased from the local market of Dhaka, Bangldesh, cleaned manually and then stored at room temperature until tests were completed. To prepare control and sample, the seeeds were soaked in water overnight (Seed to water ratio bring 1 : 3). After soaking, water was drained off, seeds were washed twice. Tempeh was prepared from the seeds by modifying metheod of william Shurtleft and Akiko Aoyagi.[11]

Extraction and determination of phytic acid : the phytic acid : the phytic acid from the samples were extractd withe 1.5% HCl and 10% Na_2SO_4 by shaking for 2 hours and precipitated from filtrate by the solution of 0.2% $FeCl_3$, $6H_2O$ in 1.2% HCl as Ferric phytate. The precipitates were then dissolved in Nitric acid and Iron was determined by spectrophotometre (PYE Unicom, Sp 6-550 UV/VIS) at 515 according to the method of Beal and Mehta (1985). The phytic acid was

calculated by the formula % phytic acid = (660, 224) (M. W, phytic acid), 4XA. W Iron) X Iron

Results

Phytic acid content in unfermented (Table-1) Lathyrus sativus was 1.46 (% PA). After 36 hours of fermentation phytic acid conten in Lathyrus sativus was 1.20 (% PA). So percentage of decrease was 18%. After 48 hours of fermentation phytic acid was 0.90 (% PA), it means almost one-third than that of unfermented control. Here percentage of decrease of phytic acid was 38%

Discussion

Phytic acid content of unfermented and fermented Lathyrus sativus seeds were estimatd. From the results (Table-1) it shows that in 36 hours the phytic acid content of the seeds were decreased about 19% and after 48 hours the phytic acid content decreased about 38%. In soybean, by fermentation of Rhizopus oligosporus, the phytic acid content also decreaed similar way.[10] From the reesults, it shows theat by fermentation, the probable phytase enzyme is producd by the mold and complex is broken by the enzyme. In theis case, the mixed complex phosphorus, calcium and magnesium complex in broken and phytatc is decreased.

The decrease of phytic acid was accompanied by an increase in inorganic phosphate and disapparance of phytic acid. Disappearance of phytic acid suggested the activity of enzyme phytase. the origin of this enzyme in the fermented product must be the mold since it appears that most of the oil seeds and legumes including soybean contain no phytase.[11,12]

The Lathyrus sativus seeds are cheap in Bangladesh. If by fermentation and other methods, seeds toxic and other antinutritive factors are reduced or removed, and at the same time other

Table 1. Phytic acid content of unfermented and solid state fermented product from Lathyrus sativus seeds by Rhizopus oligosporus inoculum (Dry weight basis).

	Unfermented control	Fermentation time		
	(O)	24 hrs.	36 hrs.	48 hrs.
Phytic acid (%PA)	1.46	–	1.20	0.90
% decrease of phytic acid	–	–	18%	38%

* *Each figure is the average of duplicates*

vitamins are increased, then they can be useful in removing the nutritional deficiency diseases in the 3rd world countries.[13]

Summary

Phytic content of unfermented and fermented Lathyrus sativus seeds were analysed. The phytic acid content was decreased 19% in 36 hours of fermentation and 38% in 48 hours of fermentation by using Rhizopus oligosporus.

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