

Degradation properties of phytin from soybean and rice bran by phytases produced from *Aspergillus* sp. 5990

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INTRODUCTION

Phytic acid (myo-inositol 1,2,3,4,5,6-hexakisdi-hydrogen phosphate) is one of the major storage form of phosphorous in the seeds of plants, which are the principal components of feed stuffs. Monogastric animals like pigs and poultry as well as fish lack phytase activities in their digestive system and most undigested phytic acid was excreted in their manure. The presence of phytic acid in dietary feed may work as antinutritional factor in animals, since the phosphate moieties of phytic acid chelate essential minerals such as Zn^{2+} , Ca^{2+} , Mg^{2+} , and Fe^{2+} ion, and their possibly binding to proteins. Inorganic phosphate, an essential element for the growth of all organisms, has to be supplemented to the diets to meet the phosphate requirements of monogastric animals, which causes a higher cost for feed processing. Another problem is the high levels of undigested phytic acid in the fecal waste, which can be discharged in the sewage and become a primary cause of algal blooms in water environments.

The degradation of phytic acid in animal feed may increase the absorption of phosphate as well as liberated minerals. Many attempts to enzymatic hydrolysis of phytic acid have been made to improve the nutritional value of food or feed stuffs and to decrease the amount of phosphate excreted by monogastric animals (Liu et al., 1997; Kornegay and Qian, 1996).

The major objective of the presentation is to establish the enzymatic degradation conditions of phytin in rice bran and soybean meal to provide utilization of phytases in animal feed industry.

MATERIALS AND METHODS

Phytase activity was determined by a modified method of Greiner et al. (1993) at 37°C. The phytase activity (U) was expressed as 1 mol phosphate liberated per min per ml of enzyme solution at 37°C. Determination of phytate from soybean and rice bran was carried out by the method of Harland and Oberleas (1977). The phytase concentration for hydrolysis of phytin in soybean and rice bran were determined with 1, 3, 5, 7, and 10 phytase unit at 37°C. Optimum pH of hydrolysis

of phytin was determined at 37°C in the pH range of 2.0 and 7.0. Temperature dependence of the phytases were measured at pH 5.0 from 40 to 65°C.

RESULTS AND DISCUSSION

Degradation of phytin was highest in the pH range of 4.5 ~ 5.5 in soybean meal and rice bran. Optimum pH for the degradation of phytin by crude phytase was different with that by purified phytases as previously reported. Optimum temperature for the degradation of phytin in soybean meal and rice bran was determined to be at 55 ~ 65°C for soybean meal and at 55°C for rice bran. Degradation of phytin in rice bran and soybean meal with a corporation of pepsin, trypsin, and pancreatin accerelated catalytic activity of phytase. This result gives an information that protease may help degradation of phytin.

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