Phytic Acid Quantification In Agroindustrial Residues And Their Potential As Inducers For Phytase Production In Solid State Fermentation

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INTRODUCTION

Researches has been focused in phytase production from agroindustrial residues rich in phytic acid, but phytic acid extracts from row material have not been used as inducers. Analytical determination of phytate levels in feed raw materials is considered "primitive", since most methods for photometrical determination of phytate are based on indirect measurements (inositol phosphate) or establishment of stoichiometric ratio between phytate and some cations easy to determine with a direct tool. Several methods have been published for phytate quantification. Most of them (Bartlett, 1959) with acidic extraction carried out with HCl, H_2SO_4, or trichloroacetic acid (TCA) with different concentrations and extraction times, followed by precipitation with Fe^{3+} [1]. Unprecipitated ferric ions are determined by spectrophotometry. The difference between initial and remaining ferric ion concentration is then used to calculate phytate concentration. Acid extraction is preferable, because raw materials such as wheat might contain high levels of endogenous phytase, which could degrade phytate if allowed. A well-known photometrical phytate method is the protocol developed by Haug and Lantzsch that uses 2,2′-bipyridine as a complexing chromogenic agent to quantify ferric ions [2]. In the present study phytic acid extracts were obtained from agroindustrial residues: corn husk, cottonseed meal and wheat bran. The Haug-Lantzsch modified method was used for quantification. Subsequently phytic acid extracts were tested as inducers for phytase production by solid state fermentation. The best conditions for extracting phytic acid were: 0.2M of HCl, 25°C and 1:20 ratio for the three agroindustrial residues, finding 0.57 %, 0.45 % and 0.67 % of phytic acid for corn husk, cottonseed meal and wheat bran, respectively (Fig. 1). The three extracts obtained were assayed as inducers for phytase production in SSF. The maximum phytase activity reached was 0.39±0.09 U/gDM at 24 h of fermentation using a wheat bran extract as inducer, followed by corn husk extract with 0.35±0.01 U/gDM at 24 h of fermentation; cottonseed meal extract used as SSF inducer, does not present significant phytase activity (Fig. 2).

METHODOLOGY

PHYTIC ACID EXTRACTION

HCl

H_2SO_4

TCA

PHYTIC ACID QUANTIFICATION

Material	Concentration
Corn husk	0.57% (567 mg PA/gM)
Cottonseed meal	0.45% (447 mg PA/gM)
Wheat bran	0.67% (665 mg PA/gM)

CONDITIONS OF SSF:

A. nigger

8 days, pH 6.5, 60% moisture and 30°C. (3X10^7 spores/g*DM*)

RESULTS

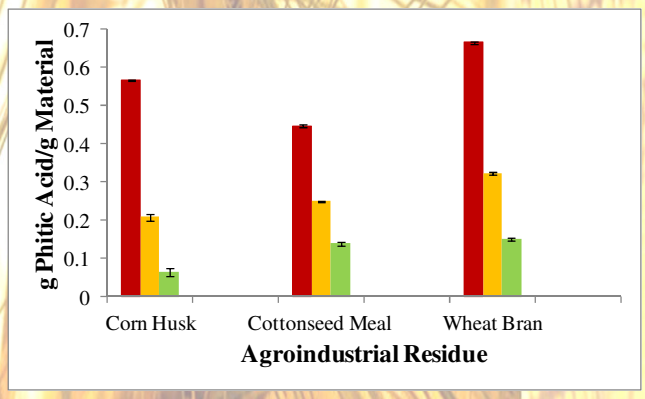

Figure 1. Ratio (residue/acid) (w/v) for phytic acid extraction in agroindustrial residues.
Extractions were carried out with 0.2M of HCl at 25°C, for 1 hour at 200rpm.
Where ■ is 1:20 ratio; ■ is 1:10 ratio; ■ is 1:5 ratio.

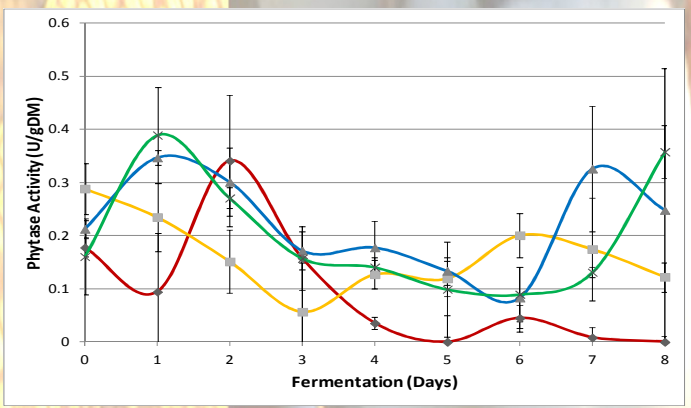

Figure 2. Effect of phytic acid extracts on phytase production by *Aspergillus niger* in SSF.
Where phytic acid; cottonseed meal; ,corn husk; and , wheat bran.

CONCLUTIONS:

It was possible to implement a quantification methodology for phytic acid in agroindustrial residues and the extracts obtained proved their potential as inducers in phytase production..

REFERENCES:

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2. Haug, W. and H.-J. Lantzsch, *Sensitive method for the rapid determination of phytate in cereals and cereal products.* Journal of the Science of Food and Agriculture, 1983. **34**(12): p. 1423-1426.

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