Hydrolysis of starch by sorghum malt for maltodextrin production

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Introduction

Maltodextrin is a mixture of saccharides with a molecular weight between polysaccharides and oligosaccharides with DE lower than 20.Maltodextrin is more soluble in water than native starches, also is cheaper in comparison with other major edible hydrocolloids. Maltodextrin is obtained by partial enzymatic or acidic hydrolysis of starch. The hydrolysis of starch, catalyzed by amylases, is the most important commercial enzyme process. The hydrolyzed products are widely applied in food, paper and textile industries. Because of the increasing demand for these enzymes in various industries, there is enormous interest in developing enzymes with better properties, such as raw starch-degrading amylases suitable for industrial applications and their cost-effective production techniques. Sorghum (*Sorghum bicolor*) is a widely grown crop in Africa. Obtaining enzymes from sorghum requires a transformation. The objective of this study was application of sorghum amylase for maltodextrin production and evaluation of its industrial uses.

Keywords: Maltodextrin; dextrose equivalent; enzymatic hydrolysis; sorghum amylases

Materials and methods

Raw materials

Corn starch was supplied by Roquette (France); wheat starch from Sigma, sorghum seeds (var.F-2-20) were supplied by the ISRA (Bambey, Senegal).

Table 1: Average values of enzymatic activities in sorghum malt

Cultivar	F-2-20
Alpha -amylase activity	312 ± 11,7 U/g
Beta- amylase activity	62,7± 4,4 U/g
Pullulanase activity	1,3 ± 0,02 U/g

Parameters of hydrolysis:

Starch concentration in the slurry : 30%

Sorghum malt concentration :1-1,5%

pH of hydrolysis : 6

Temperature of hydrolysis: 65° C

Agitation : 300 rpm

Malting sorghum

Sorghum seeds were selected and germinated in the laboratory at 30°C for 72 h. The sorghum malt was dried at 40°C for 48 h and stored at 5°C

Starch hydrolysis

Corn and wheat starches hydrolysis were assayed in a bioreactor of 2L at a temperature of 65°C gently stirred. Raw starch was slurred in water (30% w/v) and sorghum malt was introduced, pH was adjusted to 6 with sodium hydroxide 0.1 N.. The evolution of the hydrolysis of corn and wheat starches, was followed each 15 min during with 120 minutes by determination of soluble solids (° Brix) (refractometery method)

Fig.1: Bioreactor used in hydrolysis assays of corn and wheat starches by amylases from sorghum malt

Results

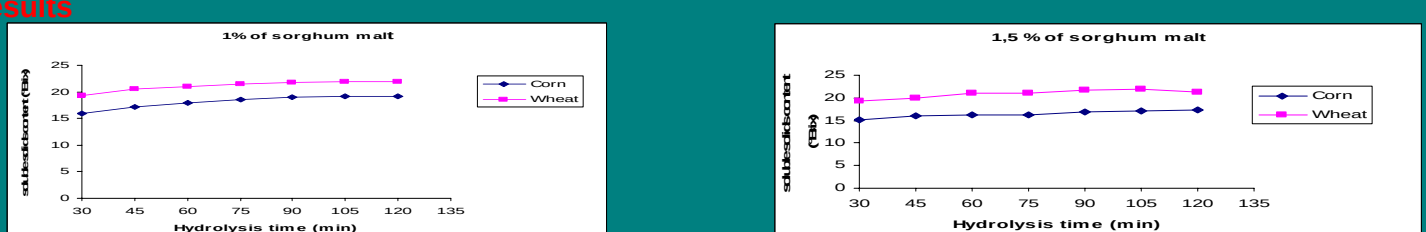

Fig. 2: Soluble solids content (°Brix) of maltodextrin from corn and wheat starches hydrolysis with two different concentrations of sorghum malt

Discussion

This work showed condition to hydrolyse corn and wheat starches by amylases from sorghum malt to produce maltodextrin. The soluble solids suspension of corn and wheat starches were evaluated during the enzymes action. During these experiments , respectively 60% and 70% of corn and starches were solubilised after 60 min hydrolysis. Results of soluble solids content obtained with different concentration of sorghum malt (1-1,5%) were very similar.

Perspectives

Further studies should be made: Determination of the viscosity of starches during the hydrolysis. Determination of the DE (Dextrose Equivalent) by measurement of the glucose concentration released. Study of the kinetic of hydrolysis of engineering parameters

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