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Full Length Research Paper

Isolation and Characterization of Starch from Moth Bean

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The dry seeds contained 47.9% starch. The starch was isolated from seeds using cold water, hot water and alkali solution (NaOH, 1.5%) as extractant with 28.1, 32.8 and 29.9%, recovery respectively. The purified starch contained 0.06% nitrogen, 0.09% ash, and 0.16% lipids. The isolated starch contained 27% amylose with 4.0%-damaged starch. Water and fat absorption capacity and gelatinization temperature of isolated starch were 80.2%, 72.5% and 66.5 ^{0}C, respectively. Swelling factor increased from 1.7% at 50 ^{0}C to 21.4% at 95 ^{0}C while amylose leaching was observed above 70 ^{0}C (7.7%) and it was maximum 14.4% at 95 ^{0}C. Enzymatic hydrolysis within 24 hr was 24.9% while the acid hydrolysis observed upto 40.1% within 20 days.

Keyword: Moth bean, Starch, Isolation, Chractrization.

INTRODUCTION

Moth bean (*Vigna acontifolium* L) is an underexploited Indian legume grown mostly in rainfed region on low fertility soils. It is a very rich source of carbohydrate and proteins. Mostly sprouted seeds and dhal are used for preparation of different types of curries. Starch is a principal constituent of many foods and it constitutes not only a major energy source, but also essential to the gross texture or consistency of many food preparations. Moth bean can be processed into value added products like protein concentrate and food-grade starch. The information on starch extraction from moth bean seeds and its physio-chemical properties is quite limited. This investigation describes a simple process for extraction of starch from moth bean seeds and its properties.

MATERIAL AND METHODS

The moth bean seeds of local cultivar were procured from Senior Research Scientist (Pulse Breeder), Dryland Research Centre, Solapur, Maharashtra State. Total starch content in moth bean was determined by method of Mc Cready et al. (1950). For starch extraction, the seeds were soaked separately in water, hot water (40 ^{0}C) and alkali solution (1.5%) at the ratio of 1:3, w/v) for 24 hrs (Fig.1). The starch was separated from soaked seeds (Chavan et al., 1999) The starch was then characterized for various physico chemical properties such as moisture, ash, lipids, nitrogen, amylose, starch damage, enzymatic and acid hydrolysis and functional properties such as swelling factor, amylose leaching, water and fat adsorption and gelatinization temperature as described earlier (Chavan et al., 1999).

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RESULTS AND DISCUSSION

Total starch content in moth bean seeds was 48 per cent. Hot water extraction exhibited highest (32.8%) recovery of starch. Ash, nitrogen, lipids, amylose and damaged starch contents (Table 1 and figure 1) of moth bean starch are similar to starches from other legumes. (El-Faki et al., 1983; However and Manuel, 1996). Swelling factor of moth bean starch was found double when temperature increased from 70 to 80 ^{0}C. Amylose leaching also increased as temperature increased. These results showed that there is a two-stage swelling and amylose leaching as temperature increased from 50 to 95 ^{0}C (Table 2 and 3). The swelling factor and amylose leaching values of moth bean starch are similar to the values

Table 1. Chemical composition of moth bean starch

Parameter		Content (%)
Total starch		47.9
Starch yield		
a.	Normal water	28.1
b.	Hot water	32.8
c.	NaOH, 1.5% solution	29.9
Moisture		9.91
Ash		0.09
Nitrogen		0.06
Lipids		
a.	Surface lipids	0.05
b.	Bound lipids	0.11
c.	Total lipids	0.16
Amylose		27.00
Starch damage		3.99
Water absorption		80.2
Fat absorption		72.5
Gelatinization temperature (^{o}C)		66.5

Table 2. Swelling factor and amylose leaching of moth bean starch at different temperatures

Temperature (^{0}C)	Swelling factor (%)	Amylose leaching (%)
50	1.7	-
60	3.0	-
70	6.2	7.7
80	12.5	8.1
85	14.2	8.6
90	17.2	11.3
95	21.4	14.4

- No amylose leaching

Table 3. Enzymatic and acid hydrolysis of moth bean starch

Time (hr)	Enzymatic hydrolysis (%)	Time (days)	Acid hydrolysis (%)
3	2.6	1	3.1
6	6.8	4	10.6
12	12.8	8	21.9
15	18.0	12	32.6
20	21.8	16	37.2
24	24.9	20	40.1

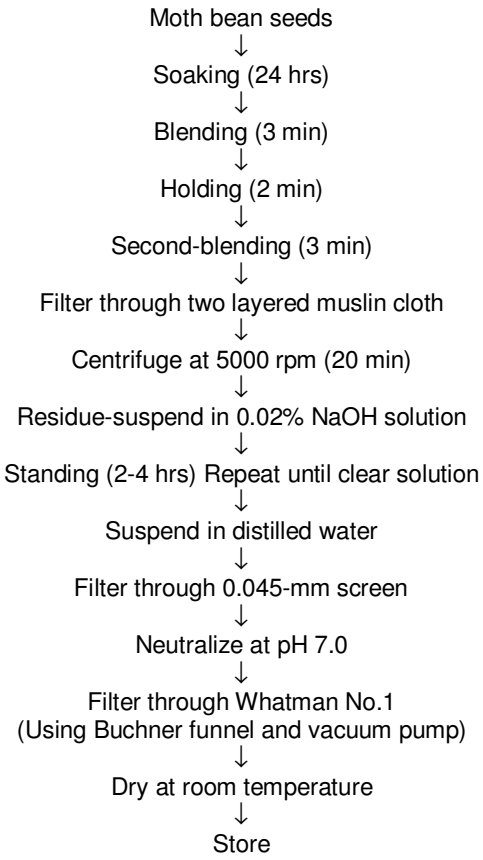

Figure 1. Flow chart for extraction of moth bean starch

reported earlier for other legume starches (Hoover and Manuel, 1996). The water and fat absorption capacity of moth bean starch was 80.2% and 72.5%, respectively. The gelatinization temperature of starch was 66.5 ^{0}C which is in agreement with Great Northern bean, faba bean, lentil, smooth pea, kidney bean and mung bean starches (Billiadiens et al., 1979)

The starch hydrolysis with porcine pancreatic α-amylase and 2.2 N HCl showed two-stage degradation. First stage is the hydrolysis of loosely organized amylose chains and in second stage, hydrolysis of the crystalline region occurs (Cairns et al., 1990). These results showed that the moth bean starch is more susceptible to enzyme than acid hydrolysis (Table 3). Similar findings have been reported for other legumes (Hoover and Manuel, 1996; Chavan et al., 1999), cereals and tuber starches (Hoover and Vasanthan, 1994). These results indicate that moth bean starch possess similar properties to most other legumes and it can be used as a substitute for such starches.

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