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Isolation of Starch from the Brokens of Sona Masuri Rice (Oryza Sativa L.)

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***Abstract*— The sona masuri rice (*Oryza sativa L.*) is extensively grown food crop in southern india. The rice is good source of carbohydrate and protein. In the present study, the two samples broken raw rice (Sample A) and broken steamed rice (Sample B) were taken and firstly subjected to proximate analysis inclusive of moisture content, protein content, fat content, ash, crude fibre and carbohydrate content.the moisture content of sample A was 12.33% where as that of sample B was 11.87%. the protein content of sample A was 10.5% and sample B was 9.76%. the carbohydrate content of sample A was 75.61% and sample B was 76.98%. The starch was extracted from broken raw rice and broken steamed rice by alkali treatment. The starch was isolated by using 2%, 3% and 4% of sodium hydroxide solution for 24 and 48 hr. the highest amount of starch was obtained from broken steamed rice i.e. 50.63g. the obtained starch was then subjected to proximate analysis for purity determination.**

Keywords*— Broken raw rice, broken steamed rice,proximate analysis, alkali extraction, starch.

I. INTRODUCTION

Rice (*Oryza sativa* L.) is the most important cereal crop in the developing world and is the staple food of over half the world's population. It is generally considered a semi-aquatic annual grass plant. About 20 species of the genus *Oryza* are recognized but nearly all cultivated rice is *O. sativa* L. Unmilled rice contains a significant amount of dietary fibre.

Starch, the raw material required for the production of low molecular weight products (glucose/dextrose, maltose, maltotriose and dextrin is widely applied in sugar, spirits, textile as well as brewing. Starch is found in the endosperm of cereal grains, roots and tubers of crops. The conversion of starch to various sweeteners is achieved through a chemical (acid) or an enzymatic process. The use of enzymes however has more advantages to the former due to the formation of undesirably coloured and flavoured breakdown products, and the process appears to be totally random which is not influenced by the presence of α-1, 6-glucosodic linkages and its difficulty to control.[13]

Starch is the major dietary source of carbohydrates and is the most abundant storage polysaccharide in plants. It is present in high amounts in roots, tubers, cereal grains and legumes and also occurs in fruit and vegetable tissues. Starch is a polymer of glucose linked together by α-D-(1-4) and/or α -D-(1-6) glycosidic bonds. The starch granule mass comprises 70% amorphous regions, which consists of amylose and branching points of amylopectin molecules, and 30% crystalline, which is mainly composed of the outer chains of amylopectin.[7]

Most applications of starch in foods and nonfoods (pharmaceutics, papers, adhesives, packaging, and biofuels) require the disruption of starch granules through acid, alkaline, enzyme, or hydrothermal treatments (gelatinisation/melting). Enzyme hydrolysis of starch occurs in many biological and industrial processes such as starch metabolism in plants, digestion by mammals, malting, fermentation, glucose syrup, or bioethanol production. Enzymatic modification can change the physicochemical nature of starch including its morphological and crystalline properties. Starch is usually hydrolysed by three important amylolytic enzymes, namely, a-amylase, b-amylase, and amyloglucosidase. The a-amylase is an endoamylase that cleaves the a-1,4 glycosidic bonds of the amylose or amylopectin chain at internal positions (endo) to yield products (oligosaccharides with varying lengths and branched oligosaccharides called limit dextrins) with an a-configuration.[5]

II. MATERIAL AND METHODOLOGY

The broken raw rice and broken steamed rice used in this study was procured from local market of Kolhapur city of India. The samples of broken rice were cleaned manually to remove all extraneous matter.

A. Proximate analysis of rice

The proximate analysis of broken raw rice and broken steamed rice was carried out according to AOAC methods (1997).

B. Isolation of starch from rice

Rice grain (100 g) was steeped in 200 ml of 2% NaOH at 5°C for 24 h. The steeped grains were washed and ground with an equal volume of water using a blender for 3 min. The slurry was filtered through a 200-mesh screen. The residue on the sieve was rinsed with water. Grinding and filtering were repeated thrice on this material. After rinsing, residue was discarded. The filtrate was allowed to stand for 1 h. The filtrate was centrifuged at 6000 rpm. for 10 min. The grey colored, top protein-rich layer was removed using a spatula. Excess water was added to resuspend the sample, and centrifugation was done again for 5 min. Washing and centrifugation were repeated several times until the top starch layer was white. The starch was dried for 24 h at 40°C. Percentage recovery was determined on the basis of 100 gm sample.

C. Proximate analysis of broken rice starch

The proximate analysis of broken raw rice starch and broken steamed rice starch was carried out according to AOAC methods (1997).

Rice (100g)
↓
Steep in 200 ml NaOH at 5°C for 48 hrs
↓
Wash the steeped rice
↓
Grind with equal volume of water using blender for 3 min
↓
Filter the slurry through a 200 mesh screen
↓
Rinse the residue
↓
Repeat grinding and filteration thrice
↓
After rinsing discard residue
↓
Allow the filterate to stand for 1 hr
↓
Centrifuge at 6000 rpm for 10 min
↓
Resuspend by adding excess water and centrifuge at 6000 rpm for 5 min
↓
Repeat washing and centrifugation until starch layer is white
↓
Drying for 24 hrs at 40°C
↓
Starch

Fig 3.1: Extraction of starch

III. RESULT AND DISCUSSION

A.Proximate analysis of rice

The rice sample A (Raw broken rice) and Sample B (Steamed broken rice) is firstly subjected to the proximate i.e. moisture, protein, fat, ash, crude fibre, and carbohydrate. The results are as shown in table 1.

The sample A contains 12.33% moisture, 10.5% protein, 0.87% fat, 0.21% crude fibre, 0.51% ash and 75.61% carbohydrate. The sample B contains 11.87% moisture, 9.76% protein, 0.76% fat, 0.19% crude fibre, 0.44% ash and 76.98% carbohydrate.

Table 1: Proximate composition of broken raw and steamed rice

Parameter (%)	**Sample A**	**Sample B**
Moisture content	12.33±0.22	11.87±0.06
Protein	10.5±0.44	9.76±0.41
Fat	0.87±0.02	0.76±0.03
Ash	0.51±0.01	0.44±0.02
Crude fibre	0.21±0.03	0.19±0.02
Carbohydrate	75.61±0.33	76.98±0.27

Note: Values are mean ± S.D. of three replication

B.Isolation of starch from rice

This study was conducted, firstly to optimize the process of starch production from broken raw rice and steamed rice. Every step in the manufacturing of starch is a determinant of the quality of final product. The effect of soaking condition on yield of starch is shown in table 2.

The process was optimized for % NaOH and soaking time to determine the yield of starch. The highest yield was shown by 2% NaOH with soaking time of 48hr. The yield of sample B was 50.36g. The least yield of 33.12g was shown by 4% NaOH with soaking time of 48 hr.

Table 2: effect of soaking conditions on yield of starch

NaOH (%)	**Soaking time (hr)**	**Yield (g)**	
		Sample A	**Sample B**
2	24	41.19	45.19
	48	49.31	50.36
3	24	31.11	33.67
	48	37.18	39.43
4	24	27.67	30.28
	48	31.87	33.12

C.Proximate analysis of broken rice starch

The physico-chemical composition of rice starch is presented in table 3. The starch isolated from sample A contains 9.69% moisture, 0.51% protein, 0.09% fat, 0.12% ash and 89.61% carbohydrate of which 16.10% is amylase. The yield of starch isolated from sample A was 49.31 gm. The starch isolated from sample B contains 9.59% moisture, 0.47% protein, 0.08% fat, 0.13% ash and 89.73% carbohydrate of which 16.19% is amylase. The yield of starch isolated from sample A was 50.36 g.

Table 3: Proximate analysis of broken rice starch

Parameters	Sample A	Sample B
Moisture content (%)	9.69	9.59
Protein (%)	0.51	0.47
Fat (%)	0.09	0.08
Ash (%)	0.12	0.13
Amylase (%)	16.10	16.19
Carbohydrate (%)	89.61	89.73
Yield (g)	49.31	50.36

IV. CONCLUSION

The following conclusions are drawn from investigation on isolation of starch from broken sona masuri rice (*Oryza sativa L.*)

1.The Sona masoori rice is a good source of protein and carbohydrate.

2.The starch isolated from broken rice by using 2% NaOH solution for 48hr.

3.The highest amount of starch 50.63g was isolated from sample B (steamed broken rice).

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