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Research Article

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Estimation of sugars by acid hydrolysis of paddy husk by standard methods

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ABSTRACT

Paddy husk is a lignocelluloses source that can be converted to reducing sugars. Paddy husk was hydrolyzed using sulphuric acid (0.2N) at a temperature 65-70 °C. It was observed that the degradation has significant effects with respect to amount of husk taken and in turn sugar yield is around 40-50% each which is estimated by Bertrand's, Benedict's and Lane-Eynon methods.

Keywords: degradation, hydrolysis, paddy husk, sugar, estimation.

INTRODUCTION

Paddy husk is the outermost layer of the rice grain, also called rice hull. It is separated from the brown rice in rice hulling. Burning of paddy husk produced *paddy husk ash* (RHA). If the burning process is incomplete *carbonized paddy husk* (CRH) is produced [1]. Paddy husk is an agricultural waste material obtained from the threshing of the rice and constitutes about 20% of 650 million tons of rice produced annually in the world [2].

Paddy husk is a source of lignocelluloses biomass that may be utilized as raw material for sugar manufacturing. Paddy husk predominantly contains hemi-cellulose (approx. 29.3%) and cellulose (approx. 34.4%). The lignocelluloses biomasses are hydrolyzed to convert hemi-cellulose and cellulose into sugars [2]. According to Badger [3], there are two types of hydrolysis, i.e. enzymatic and chemical hydrolysis. Chemical hydrolysis was selected because it is relatively low cost and fast [4, 5]. The dilute-acid hydrolysis of lignocelluloses biomass was run with operating condition of 0.2N sulphuric acid concentration, 65-70 °C, at various amount of paddy husk.

The standard methods adopted for estimation are;
(i) Bertrand's method [6] is based on the reducing action of sugar on the alkaline solution of tartarate complex with cupric ion; the cuprous oxide formed is dissolved in warm acid solution of ferric alum. The ferric alum is reduced to $FeSO_4$ which is titrated against standardized $KMnO_4$; Cu equivalence is correlated with the table to get the amount of reducing sugar.
(ii) In Lane-Eynon method [7] sugar solution is taken in the burette and known volume of Fehling solution is taken in conical flask. This is titrated at a temperature 65-70°C. Titration is continued till it acquires a very faint blue color; add 3 drops of methylene blue indicator. The dye is reduced to a colorless compound immediately and the color changes from blue to red (at the end point) [8] and

(iii) Benedict quantitative reagent gives a visual clear end point which turns blue to white by using potassium thiocyanate which converts the red cuprous oxide to white crystals of cuprous thiocyanate, it helps in visual view. [8]

EXPERIMENTAL SECTION

The hydrolysis of paddy husk was carried out at constant stirring using 50ml of 0.2N sulphuric acid temperature in a hotplate, equipped with a temperature controller, and continuously shaken during the operation. Initially, 50mL of 0.2 N sulphuric acid solution and 20 mesh paddy husk were put into the beaker and kept under hot plate as well as the temperature controller was adjusted such that the temperature of the mixture is about 65-70°C. The reaction was expected to be at constant temperature (isothermal), but before that temperature was achieved, reaction has occurred. The hydrolyzate was neutralized to bring the pH to 7 by the addition of calcium carbonate and activated carbon, followed by filtration. The concentration of reducing sugar was analyzed by Benedict's, Bertrand's and Lane-Eynon standard procedures.

RESULTS AND DISCUSSION

By varying the amount of paddy husk 1, 2, 3, 4 and 5g respectively at constant temperature (65- 70°C) and concentration of sulphuric acid is 0.2N is fixed constant. The experiment resulted in the data of reducing sugar concentrations at 3 hour were reported below **Table 1** and there corresponding data are plotted which are shown in **figure 1, 2 and 3** respectively.

Table 1: Amount of Reducing Sugar Estimated by different methods

Weight of Paddy husk taken (g)	Sugar Estimation by Benedict's method (g)	Sugar Estimation by Bertrand's Method (g)	Sugar Estimation by Lane-Eynon Method (g)
1.012	0.426	0.422	0.421
2.002	0.851	0.848	0.839
3.023	1.278	1.272	1.268
4.003	1.704	1.697	1.693
5.001	2.13	2.126	2.129

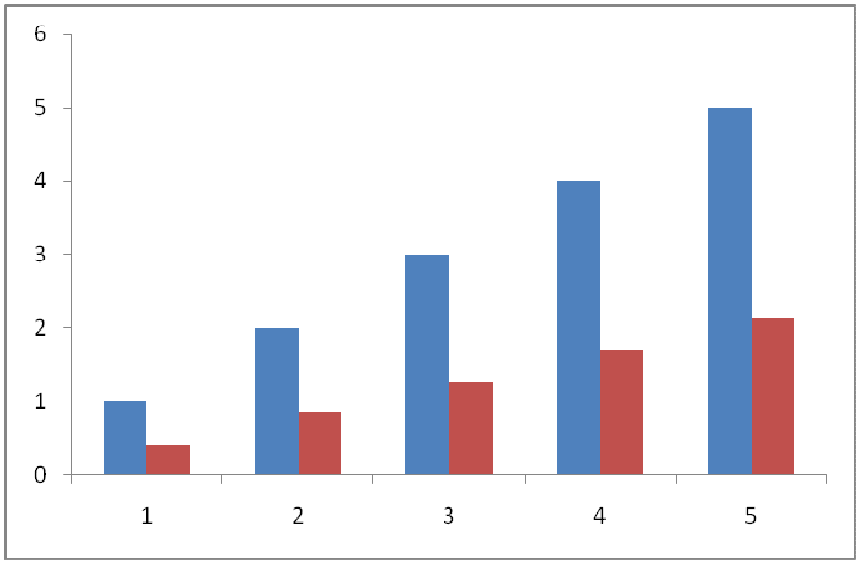

Figure 1: Estimation of reducing sugar by Benedict's method

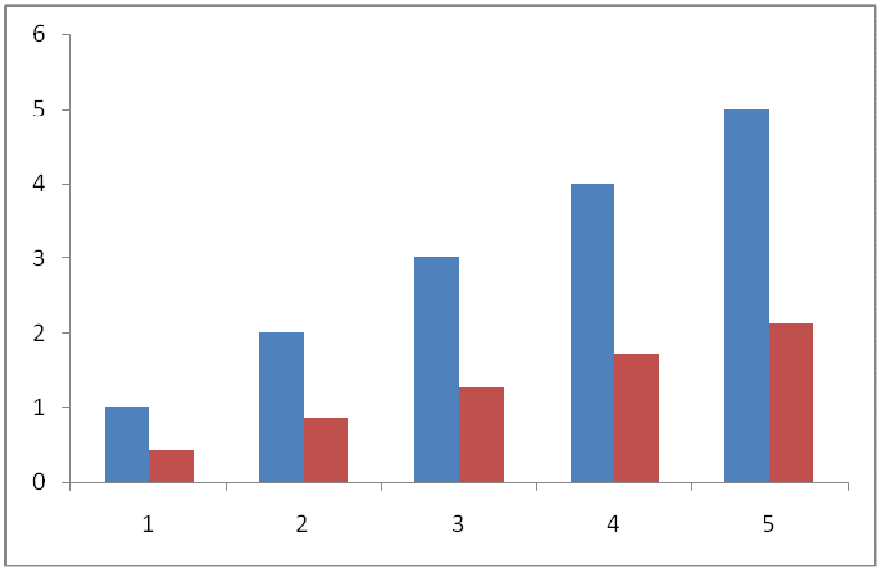

Figure 2: Estimation of reducing sugar by Betrand's method

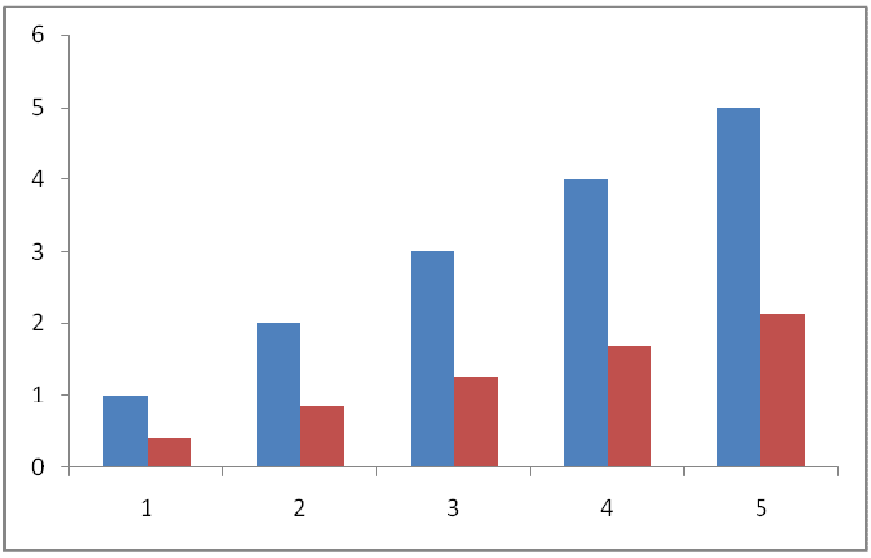

Figure 3: Estimation of reducing sugar by Lane-Eynon's method

- Amount of paddy husk taken.
- Amount of reducing sugar estimated.

CONCLUSION

While there are some uses generally, paddy husk is used as fuel but it is still often considered a waste product in the rice mill and therefore often either burned in the open or dumped on wasteland. In the present work, we have applied simple hydrolysis process to obtain reducing sugars which is a very good consumable source of energy and the yield percent also runs up to 40-50% which is authentically reported by analytical standard procedures in an economical way.

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