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Research Article

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

S. Chandraju[*1], Venkatesh R.[1] and C. S. Chidan Kumar[2]

[1]Department of Studies in Sugar Technology, Sir M. Vishweshwaraya Post-graduate Center, University of Mysore, Tubinakere, Mandya, Karnataka, India
[2]Department of Engineering Chemistry, Alva's Institute of Engineering & Technology, Shobhavana Campus, Mijar, Moodbidri, South Canara District, Karnataka, India

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ABSTRACT

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

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

INTRODUCTION

Sorghum is drought tolerant and resistant to water logging [1] and grows in various soil conditions [2]. Sorghum husk is the outer most layer of sorghum grain, also called sorghum hull. Burning of sorghum husk produced sorghum husk ash (SHA). Sorghum husk is an agricultural waste material obtained from threshing of the sorghum grain and constitutes about 15% of 500 million tons of Sorghum grain produced annually in the world [3].

Sorghum husk predominantly contains hemicelluloses (appox.26.4%), and cellulose (appox.29.8%) the lignocelluloses biomass are hydrolyzed to convert hemi cellulose and cellulose into sugar [4]. According to Badger [5] there are two types of hydrolysis i.e. enzymatic and chemical hydrolysis. Chemical hydrolysis was selected because it is relatively low cost and fast[6,7].The dilute acid hydrolysis of lignocelluloses biomass was run with operating condition of 0.2 N Sulphuric acid Concentration, 65-70˚C, at various amount of Sorghum husk.

The standard methods adopted for estimation are;
(i) Bertrand's method [8] 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 [9] 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)[9]

(iii) Benedict quantitative reagent gives a visual clear end point which turn blue to white by using potassium thiocyanate which converts the red cuprous oxide to white crystals of cuprous thiocyanate, it helps in visual view.[10]

EXPERIMENTAL SECTION

The hydrolysis of sorghum husk was carried out at constant stirring using 50 ml 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 20 mesh sorghum 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 sorghum 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 sorghum husk	Sugar Estimation Benedict's method(g)	Sugar Estimation by Bertrand's Method(g)	Sugar Estimation by Lane-Eynon Method(g)
1.016	0.321	0.319	0.318
2.006	0.646	0.642	0.636
3.026	0.968	0.964	0.961
4.008	1.288	1.279	1.273
5.004	1.606	1.602	1.598

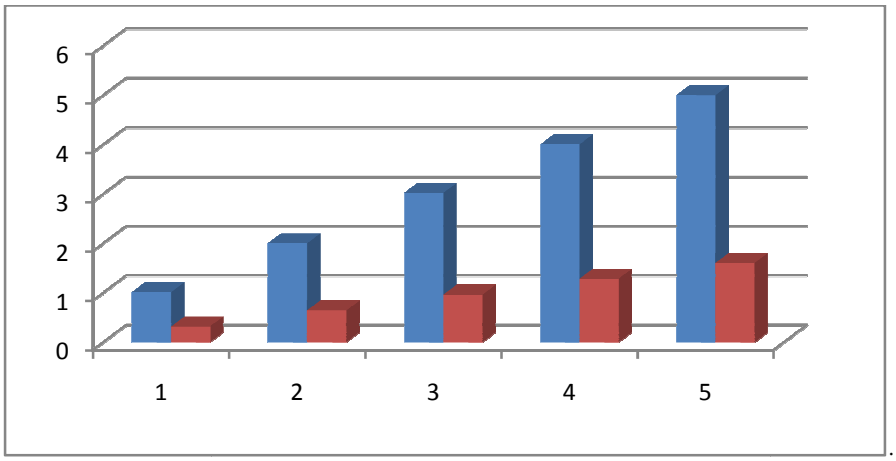

Figure 1: Estimation of reducing sugar by Benedict's method

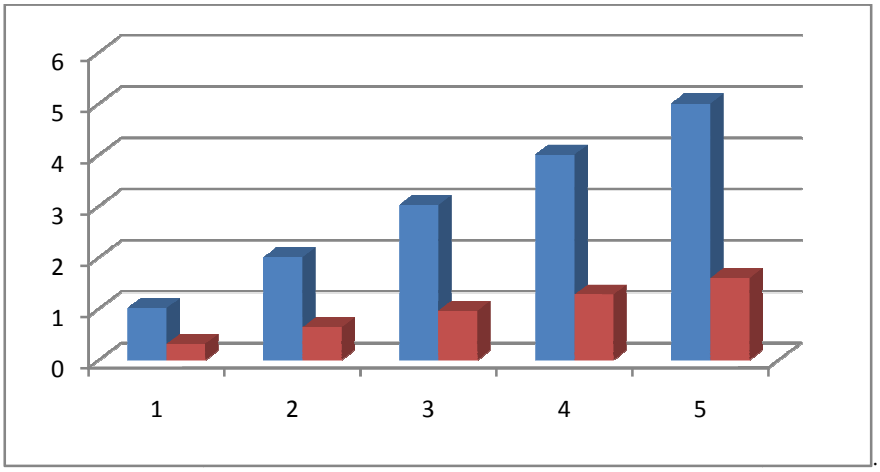

Figure 2: Estimation of reducing sugar by Bertrand's method

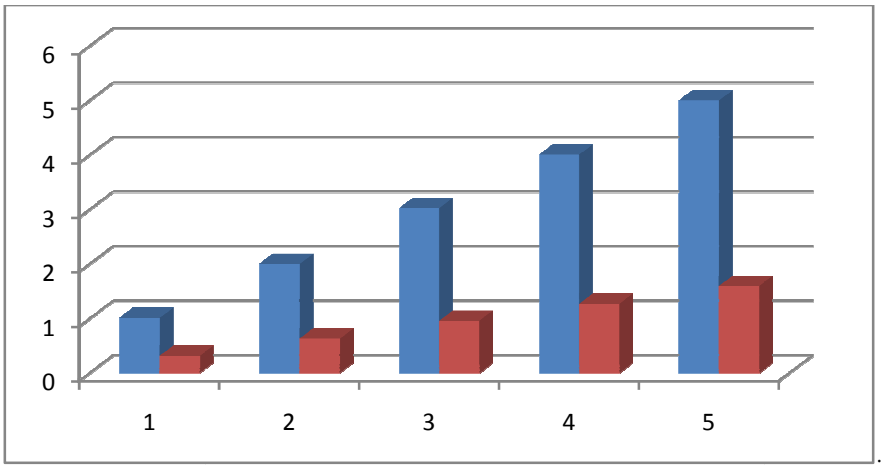

Figure 3: Estimation of reducing sugar by Lane-Eynon's method

▪ *Amount of sorghum husk taken*

▪ *Amount of reducing sugar estimated*

CONCLUSION

While there are some uses generally, sorghum husk is used as fuel but it is still often considered a waste product in the 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 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.

REFERENCES

[1] Doggett, H **(1998)**, Sorghum, 2nd ed. Longman scientific and Technical, London pp 1-3.

[2] Dillon, S.L., Shapter, F.M., Henry R.J., Cordeiro, G., Izquierdo, L., and Lee, L.s**.(2007).** *Annals of Botany* 100(5); 975-989;dio: 10 1093/aob/mcm192

[3] Board on science and technology for international Development, office of international affairs, National Research council**,(1996),** lost crops os Africa;vol 1; Grains, The National Academy press. Washington. Dc

[4] Hahn-Hagerdal, B., Galbe, M. F. M., Gorwa-Grausland,Liden, G., and Zacchi, G., Science Direct, Elseveir, **2006.**

[5] Badger, P. C,; *Trends in New Crops and New Uses*, ASHS *Press., Alexandria* VA, **2002**, 17-21.

[6] Palmqvist. E., and Hagerdal..H,; *Bioresource Technology, Elsevier*, **2000,** 74,25-33.
[7] Taherzadeh, M. J., Eklund, R., Gustafsson, L., Niklasson, C., and LIden., G,*; Ind. Eng. Chem. Res., American Chemical Society*, **1997,** 36,4659-4665.
[8] http://www.raktuo-kasei.net/textile/8.index.htmL
[9] Sausen Silmi., Canarsie, H.S. and Brooklyn,; Summer Research Programe for Teachers, Determining the Concentration of Solution: Beer's Law **1997**
[10] Davis, G. R. F.; *Clinica Chimica Acta*, **1963,** 8,635-636.