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Short Communication

Estimation of reducing sugar by acid hydrolysis of Green Cardamom (Elettaria Cardamom) husk by standard methods

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ABSTRACT

India is the largest producer of Green Cardamom in the world with an annual production of 4000 tons, followed by Nepal (2500 tons/year) and Bhutan (1000 tons/year). More than 85% of the production within India is from Sikkim. Cardamom husk is a lignocelluloses source that can be converted to reducing sugar. Cardamom husk was hydrolyzed using sulphuric acid (0.2N) at a temperature of 70-75°C. It was observed that the degradation has significant effect with respect to amount of husk taken and in turn sugar yield is around 45-50%, each of which is estimated by Bertrand's, Benedict's and Lane-Eyon methods.

Keywords: Degradation, Hydrolysis, Cardamom husk, Sugar, Estimation.

INTRODUCTION

Cardamom belongs to the family zingiberaceace. Cardamom are the dried fruits of perennial herbs. They are one of the highest priced and most expensive spices after saffron and vanilla. There are two kinds of cardamoms found in the spice world. True cardamom (or small) cardamom belongs to the genus elettaria. Large cardamom, Nepal cardamom or the black cardamom belongs to the genus amomum.

Cardamom is widely used in Asian cooking. It is an essential ingredient in garammasala and also used as a breath freshener. It is common to chew a seed or two after a spicy meal. It is also believed to aid digestion. Recent studies suggest that cardamom may prevent teeth cavities.
There is no domestic consumption of cardamom in Guatemala and therefore the entire production is exported. Currently, Guatemala produces about 20,000-30,000 tons annually [1]. India stands next in production with about 11000-12000 tons annually, but as the internal consumption is very high in India only 600-800 tons are exported [2].
Cardamoms are shade loving plants; in India cardamom is cultivated at altitudes between 700m and 1500m along the westran Ghats with an annual rainfall 1500-3000mm. the cardamom husk gives good protection and prevents the loss of oil from seeds [3].

MATERIALS AND METHODS

The hydrolysis of cardamom 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) cardamom 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 70-75°C. The reaction was expected to be at constant temperature (isothermal) but before that temperature was achieved, reaction has occurred. The hydrolyzes 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 Bertrand's Benedict's and Lane-eynon standard procedures [4,5]

(i) Bertrand's method [6] is based on the reducing action of sugar on the alkaline solution of tartarate complex with cupric

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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 70-75°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]

(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.[9]

RESULTS AND DISCUSSION

By varying the amount of cardamom husk 1,2,3,4 and 5g respectively at constant temperature (70-75°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 figures **1, 2, and 3** respectively.

CONCLUSION

Generally, Cardamom husk was considered a waste product, and therefore 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 45-50% which is authentically reported by analytical standard procedures in an economical way.

ACKNOWLEDGEMENT

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Table 1: Amount of Reducing Sugar Estimated by different methods

Weight of cardamom husk (g)	Benedict's method (g)	Bertrand's method (g)	Lane-Eynon method (g)
1.041	0.156	0.158	0.157
2.008	0.321	0.312	0.324
3.008	0.450	0.465	0.465
4.008	0.605	0.623	0.618
5.002	0.750	0.790	0.758

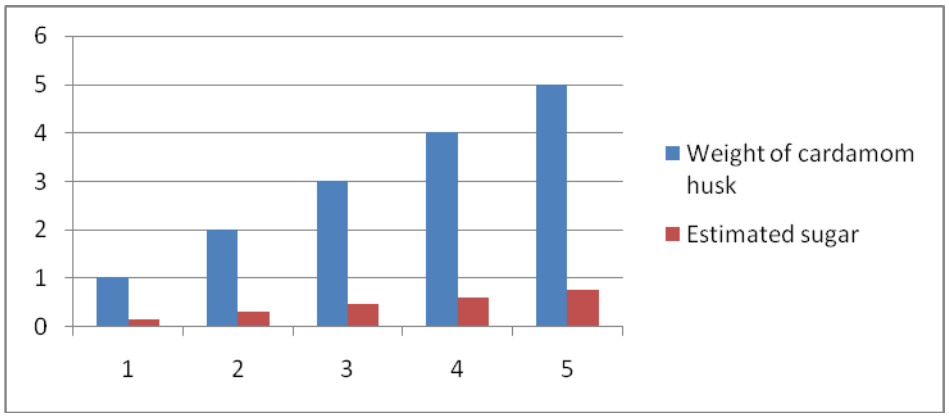

Figure 1: Estimation of reducing sugar by Benedict's method (g)

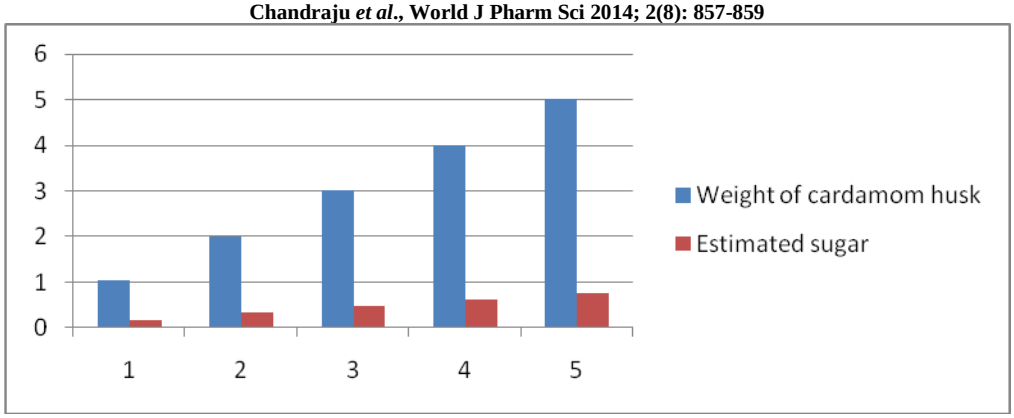

Figure 2: Estimation of reducing sugar by Bertrand's method (g)

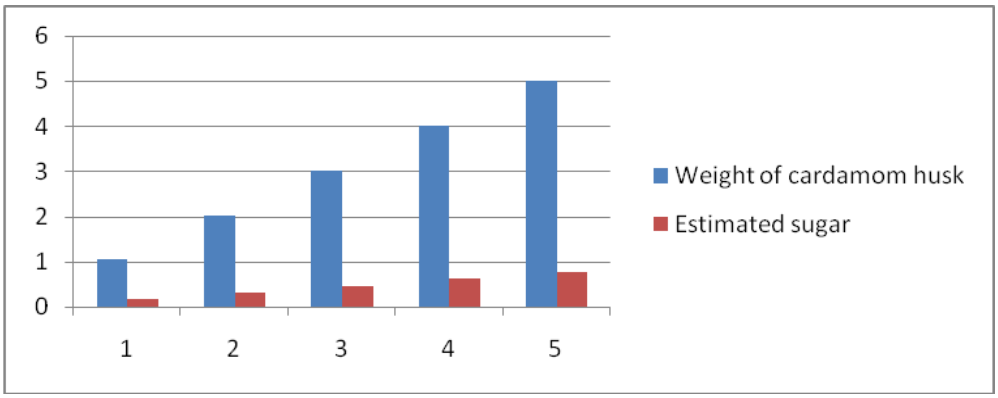

Figure 3: Estimation of reducing sugar by Lane-eynon method (g)

Amount of Cardamom husk, **Estimated Reducing sugar**

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