



QUANTITATIVE ESTIMATION OF REDUCING SUGAR BY ACID HYDROLYSIS OF SAPOTA (*MANILKARA ACHRAS*) PEELS BY STANDARD METHODS

¹Venkatesh, R., ²Krushna Yadav, D.K. & ¹Chandrabu, S.

¹Department of Studies in Sugar Technology, Sir M. Vishweshwaraya Post-graduate Center, University of Mysore, Tubinakere, Mandya-571402, Karnataka, India

²Department of Food science and Nutrition, University of Agricultural Sciences, GKVK, Bengaluru-560065

ABSTRACT

Sapota is a wonderful gift by the nature commonly called as chickoo, it having a combined flavour of brown and beat sugar. It has a short shelf life fruit but having several medicinal properties due to the presence of polyphenols, ascorbic acid, etc. sapota has been part of human diet but while consumption of these fruit some of them are through outer skin it may leads to environmental pollution. Sapota (*Manilkara achras*) is polysaccharide source that can be converted in to reducing sugar. In a temperature of 75°C it can be hydrolyzed using sulphuric acid. It was observed that the degradation has significant effect with respect by varying time (60, 90 minutes) and concentration of (Sulphuric acid and Hydrochloric acid). In turn sugar yield is around 40-50%, each which is estimated by Bertrand's, Benedict's, and Lane-Eynon methods.

KEY WORDS: Degradation, polysaccharides, reducing sugar.

INTRODUCTION

Sapota, it is native of Mexico and Central America and scientifically called as *Manilkera zapota* is one of the plants belongs to the family sapotaceae. It includes about 800 species of evergreen trees and shrubs in around 65 genera (Parle milind *et al.*, 2015). Sapota is highly productive and generally free from major pests (Gopi *et al.*, 2015). Maharashtra and south Gujarat was major sapota cultivated and marketed to different parts of the country. It is highly perishable can be spoiled within five days due to degradative metabolism. The shelf life can be increased by stored at low temperature (Patel *et al.*, 2010).

MATERIALS & METHODS

The hydrolysis of Sapota (*Manilkera zapota*) peels was carried out at constant stirring using 2M sulphuric acid in a hot plate equipped with a temperature controller, and continuously shaken during the operation. Initially measured volume of water, sulphuric acid or hydrochloric acid with 1gm Sapota peel were put into the beaker and kept under hot plate as well as the temperature controller was adjusted such that the temperature (Isothermal), but before that temperature was achieved, reaction has occurred. The hydrolyzed was neutralized to bring the pH 7, the addition of calcium carbonate to neutralize the excess chlorides and precipitated as lead chlorides and activated carbon, followed by filtration. The concentration of reducing sugar was analysed by Bertrand's Benedict's and Lane-eynon standard procedures (Chandrabu *et al.*, 2013, 2014). By varying the concentration of 2M sulphuric acid and 2M hydrochloric acid, where time 60 minutes and temperature 75°C are kept constant.

By varying the time 60, 90 minutes respectively keeping temperature 75°C and concentration at the ratio of 2M sulphuric acid and 2M hydrochloric acid (15ml)/100mL

distilled water as constant, the quantitative values are tabulated (Tables 2-5) and their values are plotted in the following (Figures 1-4), beyond the mentioned concentration and heating time limit charring occurs (Chandrabu *et al.*, 2014)

From all the above values it is clear that the value does not differ much. After all the analysis the maximum reducing sugar value runs to 40-50% on the whole. There is no absurd difference in the yield to sugars when there is a change of acid weather it is either sulphuric acid or hydrochloric acid.

- (i) Bertrand's method 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 FeSO₄ which is titrated against standardized KMnO₄; Cu equivalence is correlated with the table to get the amount of reducing sugar. This is based on the alkaline solution of tartarate complex of cupric ion.
- (ii) In Lane-Eynon method, 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. At this stage 3 drops of methylene blue indicator is added. The dye is reduced to a colorless compound immediately and the end point is changing of color from blue to red. In this method it is susceptible for interference from other type of molecules that act as reducing agent.
- (iii) In Benedict's method pipette out Benedict's quantitative reagent in to a clean conical flask. The contents were heated to a temperature of 65-70°C. Then it is titrated against unknown sample solution till the appearance of chalky white precipitate. 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 (Sausen Silmi *et al.*, 1997)

RESULTS & DISCUSSION

At constant temperature (75°C), by varying the concentration of H₂SO₄ (0.1M, 0.3M and 0.5M) The reducing sugar estimated by different method, Bertrand's method (0.2162, 0.4132, and 0.5049 g) Benedict's method (0.2642, 0.4653 and 0.5239 g) and Lane-Eynon method (0.2971, 0.4897 and 0.5643g). At various time intervals

(60min, and 90min).from Bertrand's method (0.4123, 0.4431g), Benedict's method (0.4146, 0.4268 g) and Lane-Eynon method (0.4139, 0.4536 g) and in the same way by varying concentration of HCL from Bertrand's method (0.4321, 0.4631, and 0.4982 g), Benedict's method (0.4421, 0.4712, and 0.5082 g), and Lane-Eynon method (0.4362, 0.4566 and 0.5163 g) At various time intervals (60min, and 90min). From Bertrand's method (0.4102, 0.4142 g), Benedict's method (0.3998, 0.4232 g), and Lane-Eynon method (0.3987, 0.4132 g) respectively.

Amount of 2M H ₂ SO ₄ /100mL Distilled water	Amount of 2M HCl/100mL Distilled water
5mL(0.1M)	5mL(0.1M)
15mL(0.3M)	15mL(0.3M)
25mL(0.5M)	25mL(0.5M)

TABLE 1: Sapota sample: concentration of strong acids chosen and monitored

Sl.No	Amount of 2M H ₂ SO ₄ /100mL Distilled water	Bertrand's method(g)	Benedict's method(g)	Lane-Eynon method(g)
1	5mL(0.1M)	0.2162	0.2642	0.2971
2	15mL(0.3M)	0.4132	0.4653	0.4897
3	25mL(0.5M)	0.5049	0.5239	0.5643

TABLE 2: Heating time is kept constant [1h] while concentration of sulphuric acid is varied

Sl.No	Heating time(Hr.)	Bertrand's method(g)	Benedict's method(g)	Lane-Eynon Method(g)
1	1	0.4123	0.4146	0.4139
2	1:30	0.4431	0.4268	0.4536

TABLE 3: Concentration is kept constant (15ml of 2M sulphuric acid taken per 100ml distilled water) while time period of heating is varied.

Sl.No	Amount of 2M HCl/100mL Distilled water	Bertrand's method(g)	Benedict's method(g)	Lane-eynon method(g)
1	5mL(0.1M)	0.4321	0.4421	0.4362
2	15mL(0.3M)	0.4631	0.4712	0.4566
3	25mL(0.5M)	0.4982	0.5082	0.5163

TABLE 4: Heating time is kept constant (1hr) while concentration of hydrochloric acid is varied

Sl. No	Heating time (Hr.)	Bertrand's method (g)	Benedict's method (g)	Lane-Eynon method (g)
1	1	0.4102	0.3998	0.3987
2	1:30	0.4142	0.4232	0.4132

TABLE 5. Concentration is kept constant (15ml of 2m hydrochloric acid taken/100ml distilled water) while time period of heating is varied

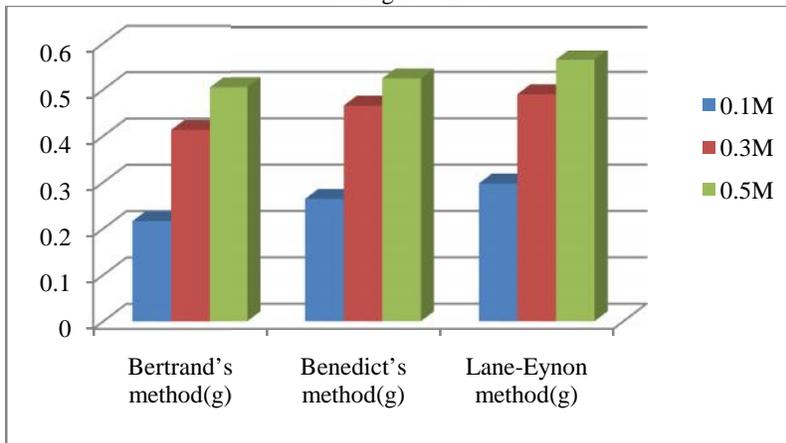


FIGURE 1: Estimation of reducing sugar by varying H₂SO₄

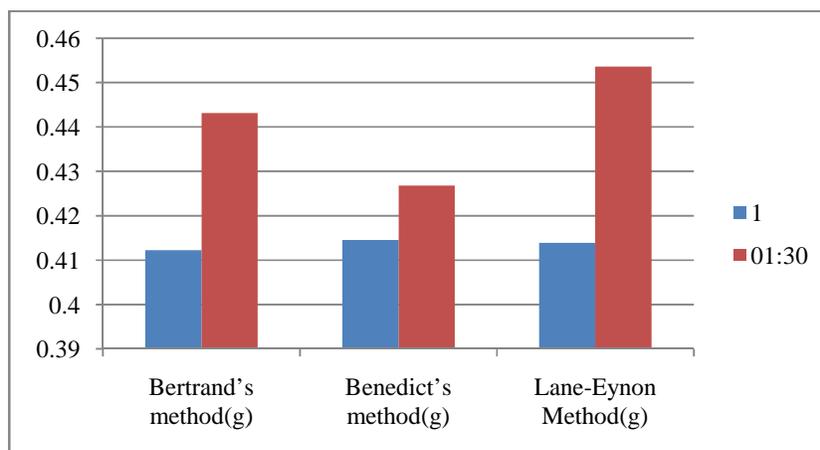


FIGURE 2. Estimation of reducing sugar by variation of heating time H_2SO_4 Constant

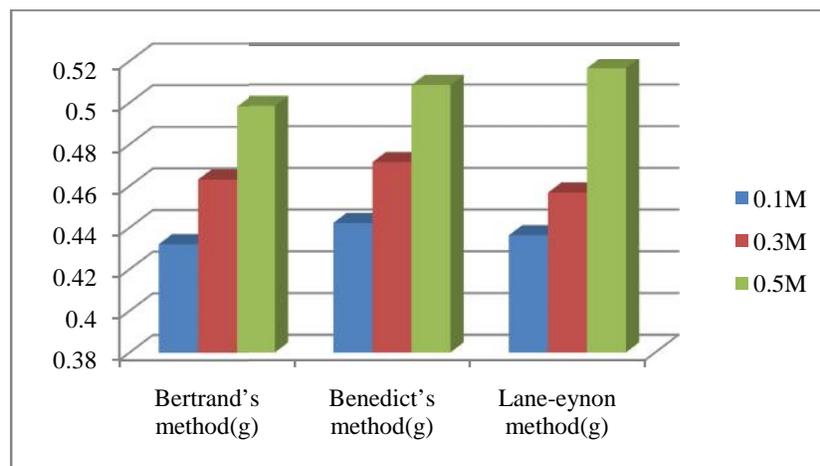


FIGURE 3. Estimation of Reducing sugar by varying HCL

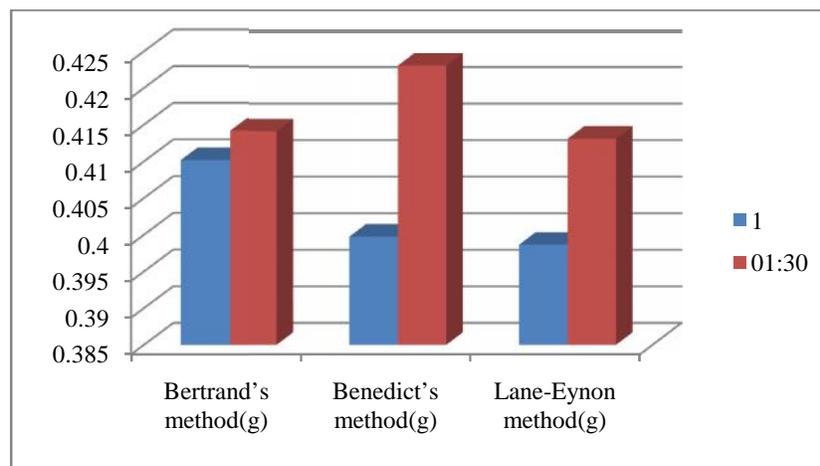


FIGURE 4. Estimation of Reducing sugar by variation of heating time HCL Constant

CONCLUSION

Sapota peels are polysaccharide is hydrolyzed enzymatically. In the present work, the mimicking conversion is exhibited through a simple acid hydrolysis process by the application of various acids like 2M H_2SO_4 and HCl under two conditions one is by varying the concentration of acid at constant temperature and time of heating. Another one is by varying the time of heating at constant concentration and temperature the amount of reducing sugars are monitored and the yield percent also

runs up to 40-50% which is authentically reported by analytical standard procedure in a cost effective manner.

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