# Quantitative and Qualitative analysis of Glucose and Fructose from Flower Nectaries

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**Abstract**

Nectar is important in pollination. Varied kinds of flowers show presence of different amount of nectars and sugars. The present study includes evaluation of sugar from the flowers collected from the campus of Navrachana University, Vadodara. The preliminary analysis revealed the presence of glucose and fructose in the samples. For quantitative assessments, spectrophotometric techniques were used. For glucose and fructose identification, anthrone and resorcinol methods were followed respectively. This study will thus help in understanding the basic chemical nature of nectar.

**Keywords**

Nectar, Glucose, Fructose, Spectrophotometer

## Introduction

Nectar is sweet substance, produced by some plants to attract pollinators such as bees, butterflies and hummingbirds. Bees collect nectar and turn it into honey. In the process of nectar collection, pollinators accidentally transfer pollen from male flowers to female flowers. The nectar is the reward for several pollinators. The nectar is produced from sap of phloem by active secretion that results in a solution of sugars like sucrose, fructose and glucose in varied proportions depending upon the vegetative state[1]. The plant may secrete a little bit of nectar with high sugar concentration, or secrete more quantities but with low sugar concentration. These differences in nectar may vary depending on pollinator visitation[2].There are reports of estimation of individual sugars present in different nectars but relatively large volumes were necessary for the analytical methods used by most of the researchers[3,4]. Mostly

flowers of most plants secrete nectar sparingly, hence there is a need for simpler methods to quantify sugars. Other factor considered is types of secreted sugars: sucrose, glucose and fructose[5].The quantities of sugars may vary with the species.

## Material and Methods

The following species were included in the present study. *Hibiscus rosa-sinensis* L. 'Yellow Wings' cultivar, *Hibiscus rosa-sinensis* L. , *Datura stramonium* L. , *Tecoma stans L.*, *Peltophorum pterocarpum* (DC.)Backer ex K. Heyne , *Heliconia psittacorum* Ruiz & Pay, *Ixora coccinea* L.

Herbarium specimens bearing collection number Bot/27819/aut are deposited in the herbarium of Botany Department, The M.S. University of Baroda. They were authenticated by Dr Padmanabhi Nagar, Associate Professor, Department of Botany, The M.S. University of Baroda. Nectar was collected from flowers in the morning by using glass capillaries. The collection was done carefully to prevent contamination with pollen grains [6]. The samples were collected in 1ml micro centrifuge vials, stored in refrigerator after dissolving in 75 % methanol[7].

### *Qualitative analysis of sugars*

For the experiment TLC silica gel 60 F254 plates were purchased from Merck. A light reference line 2 cm above the base was marked. Concentrated solutions of standard and the sample were loaded on TLC plate using capillary tubes about 7-8 times and simply air-dried. The TLC chamber was saturated with the solvent prior to the experiment. TLC plates with loaded samples were placed in the chamber in upright position and covered and the solvent is allowed to rise till desired distance is achieved. The plates were taken out, dried in stream of warm air and gently sprayed with the spraying reagent. They were observed for the appearance and the Rf values were calculated accordingly.

### *Preparation of solvent system*

Two solvent systems were used for identification of sugars [8]

- Chloroform:Acetic Acid:Water (3:3.5:0.5)
- Isopropanol: Distilled water (4:1)

The chamber was saturated half-an-hour prior to the experiment with the solvent.

***Spraying reagent***

1% aniline and 1% diphenylamine (both in acetone). Mixture of aniline, diphenylamine and 85% phosphoric acid were used as spraying reagent on the developed chromatogram. The plates were heated for few minutes for development of the band.

**Quantitative analysis of glucose** was done by Anthrone method [9].

**Quantitative analysis of fructose** was done by Resorcinol method [10].

**Results and Discussion**

***Qualitative analysis of sugars*** All the nectar samples were analyzed for the presence of glucose, fructose and sucrose by comparison with the standard solutions of each sugar (Figure1).


**Figure 1: Thin layer chromatography**

### *Quantitative analysis of sugars*

***Glucose estimation*** Glucose was found to be present in all the samples. However the highest concentration was seen in *Ixora* followed by *Tecoma. Heliconia* however, showed the lowest levels of glucose (Figure 2).

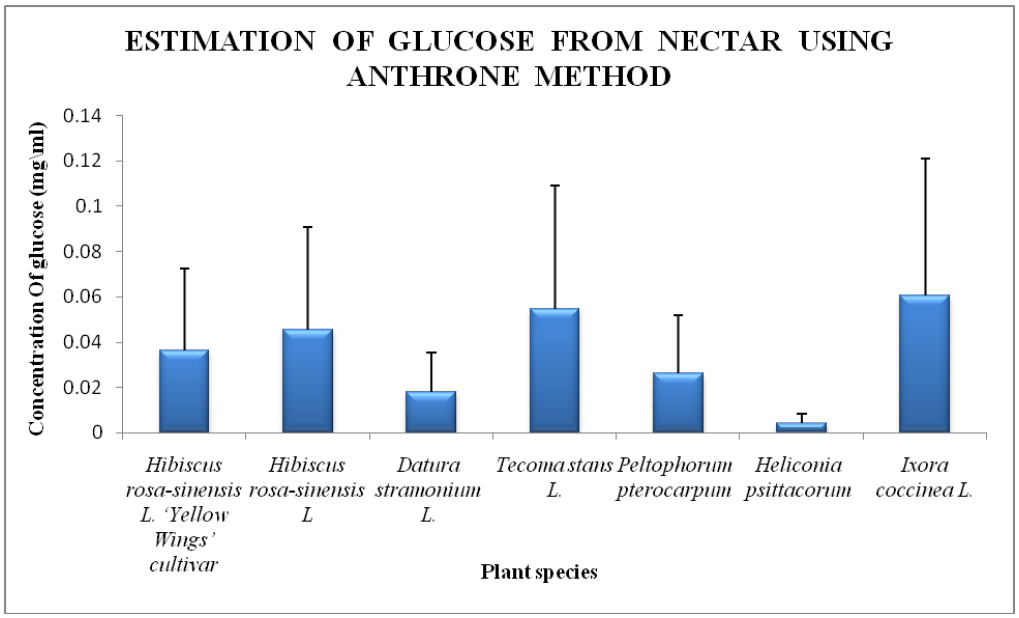


**Figure 2: Quantitative analysis of sugars- *Glucose estimation***

***Fructose estimation*** All nectar samples showed the presence of fructose. *Hibiscus rosa-sinensis* L. 'Yellow Wings' cultivar showed significant levels of fructose concentration while *Tecoma* had the lowest concentration (Figure 3).

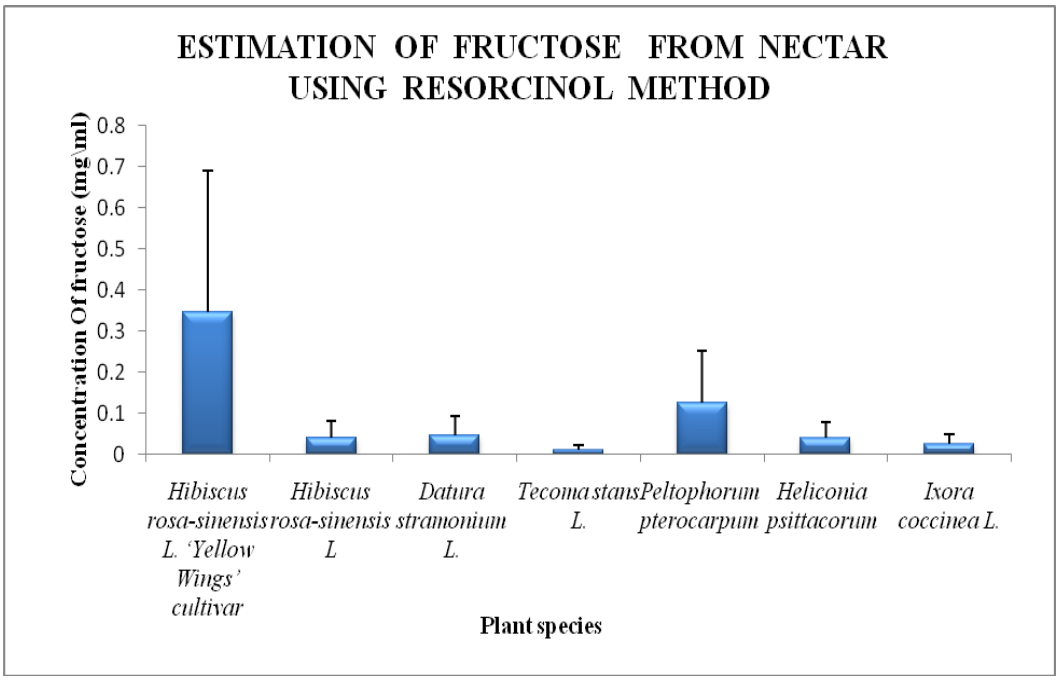


**Figure 3: Quantitative analysis of sugars- *Fructose estimation***

All plants showed the presence of glucose and fructose but the content varied depending upon the plant species. The nectar of *Ixora* and *Tecoma* were rich in glucose while that of *Hibiscus rosa-sinensis* L. 'Yellow Wings' cultivar was found to be rich in fructose. The results suggest that similar studies can be employed for studies on other components of nectar.

## Conclusion

The paper tries to understand nutritive value of nectar based on the quantitative assessment of the presence of glucose and fructose. All nectar samples are a good source of the sugars, glucose, fructose and sucrose in varying proportions, proving that nectar is a good source of nutrition after being converted into honey. The present study can be expanded further to detect the presence of other chemical constituents of nectar, thus establishing the importance of different chemical constituents of nectar and increasing its edible value.

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