



A REVIEW ON *STEVIA REBAUDIANA BERTONI*: A MAGIC SWEETENER

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ABSTRACT

In the world full of lifestyle diseases, there is a great need to improve one's eating habits and achieve a healthy living. One of the most common of such diseases is diabetes. At least one member in each family is prone to it, and obviously one may crave for sweetness in life. Hence, *Stevia Rebaudiana* is one such substitute as it not only act as a sweetening agent but also act as an anti-diabetic and therefore we are considering it as a magic drug. Also apart from being an anti-diabetic, it also has numerous other pharmacological actions and wide commercial uses that are being discussed in this review article.

Keywords: *Stevia Rebaudiana Bertoni*, Diabetes, Pharmacological Actions, Natural Sweetener, Commercial uses, Composition.

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INTRODUCTION

Stevia Rebaudiana Bertoni is a plant herb and a natural sweetener that belong to the family Asteraceae that is 100-300 times sweeter than sucrose⁽¹⁾ and also has an anti-diabetic activity.⁽²⁾ It is mostly found in Paraguay, and primarily produced in Argentina, Brazil, Columbia, Paraguay, China, Japan, Malaysia, South Korea, Vietnam, Israel, Australia, Kenya, and the US.⁽¹⁾ In India, it has been successfully cultivated in the states of Rajasthan, Maharashtra, Kerala & Orissa. The soil should be in pH range of 6.5-7.5, well drained red soil and sandy loam soil. Saline soils should be avoided to cultivate this plant. ⁽²⁾ The major property that makes it a magic sweetener is its anti-diabetic property. Consumption of Stevia in diabetes and obesity is very safe considering the low-calorie levels.⁽²⁾ The study highlighted that Stevia, in the tested environment, represents a promising semi-perennial crop

which offers new solutions in terms of cropping system diversification and marketing opportunities.⁽³⁾ This herb is an emerging and trending research in the field of pharmaceuticals, as a functional food product and in the making of various foods and beverages to decrease the caloric intake and make it acceptable for consumer satisfaction.⁽¹⁾ Various studies have highlighted promising health benefits of stevia against diabetes, obesity, hypertension, cancer, dental caries, oxidative stress, and microbial infections. Besides its health benefits, it is also having wide industrial applications like a food ingredient, as sucrose replacer, as fertilizers, as an animal feed and as solubilizing and foaming agents.⁽⁴⁾ Stevia can also work against microorganisms and can show a preservative effect in a formulation.⁽⁵⁻⁷⁾

Although there are above 200 species of genus stevia, but only *stevia rebaudiana* gives the sweetest essence. Leaves

of stevia produce diterpene glycosides (Stevioside and rebaudiosides), non-toxic, high potency sweeteners and may replace sucrose as well as artificial sweeteners. (8) The leaves of *stevia rebaudiana* contain non-carcinogenic and non-caloric sweeteners (Steviol-glycosides) whose consumption could exert beneficial effect on human health.(9-14)

The objective of this article is to understand the importance of stevia as a sweetening agent along with its anti-diabetic activity which makes it a magic drug.

COMPOSITION

Stevia Rebaudiana Bertoni consist of numerous constituents and therefore has wide pharmacological activities also. The average protein (crude) was found to be 86.33 g/kg dry matter. Arginine, Lysine, Histidine, Phenylalanine, Leucine, Valine, Threonine and Isoleucine were found in the amounts of 0.81 g/100g, 0.15 g/100g, 0.34 g/100g, 0.88 g/100g, 1.30 g/100g, 0.94 g/100g, 0.75 g/100g and 0.72 g/100g respectively. Crude fat, crude fiber and ash was found to be 11.79g/kg, 284.68 g/kg, 96.56 g/kg DM respectively. Energy emitted by stevia is 9.77 MJ/kg on average. These amounts vary in stems and leaves. The Moisture, Ash, Crude fat, Crude Protein and Crude fiber were found in amounts of 7.72%, 7.89%, 3.81%, 14.57%, 10.00%, 63.73% respectively. (1)

The plant leaves are also rich in certain minerals. Sodium (0.7mg/100g), Iron (366mg/100g), Manganese (2.4mg/100g), zinc (20mg/100g), Potassium (17.3mg/100g), Calcium (8.2mg/100g), Phosphorus (2.6mg/100g). Some of the studies also show that they also contain some levels of magnesium (1.86 g/kg DM), copper (10.2mg/kg) and nitrogen (13.81g/kg DM) (1).

Stevia leaves are also rich in iminosugar steviamine, lipids, essential oils, sterbins, thiamine, niacin, beta carotene, Vitamin C, Vitamin B2, austroinulin, rebaudiosides, quercetin, isoquercitrin, xanthophyllus and trace elements. Vitamin C, B2, Folic Acid are found to be 14.98mg/100g, 0.43mg/100g, 52.18mg/100g respectively(1).

The principal elements which give stevia their taste are the glycosides, compounds made by a simple sugar and some other compound by replacing a hydroxyl molecule in the sugar group making a glycosidic bond. Steviosides, steviols, Steviolbioside, Rebaudioside A, B, C, D, and dulcoside A are found in 2.0%, 0.70%, 1.2%, 5.0%, 0.50%, 2.0%, 3.3% and 1.0% DW respectively and are responsible for the various benefits of stevia (1)

Due to its rich nutritional and phytochemical profile, Stevia also provides beneficial effects against plethora of health conditions.(4) The nutritional composition of Stevia per 100g in dry weight basis is given in table 1.

Table1: Nutritional composition of Stevia per 100g in dry weight basis. (5)

Nutrient Composition	Per 1000 gram
PROXIMATE	
Moisture (g)	7
Energy (kcal)	270
Protein (g)	10
Fat (g)	3
Total carbohydrate (g)	52
Ash (g)	11
Crude fiber (g)	18
MINERALS	
Calcium (mg)	464.4
Phosphorus (mg)	11.4
Iron (mg)	55.3
Sodium (mg)	190.0
Potassium (mg)	1800.0
ANTI-NUTRITIONAL FACTORS	
Oxalic acid (mg)	2295.0
Tannins (mg)	0.010

STEVIA AS AN ANTI-DIABETIC

The major property that makes stevia a magic drug is its anti-diabetic activity. It is a rare drug that controls the production of insulin despite of being sweet itself. The incentive of production of insulin is directly dependent on the quantity of steviosides and calcium ions. Steviosides affect insulin sensitivity by enhancing the acceptance of glucose and improving pretein expression and thereby resulting in depolarization of Beta cells of pancreas by closing Potassium channels and opening of calcium channels.(1) As given in figure 1.

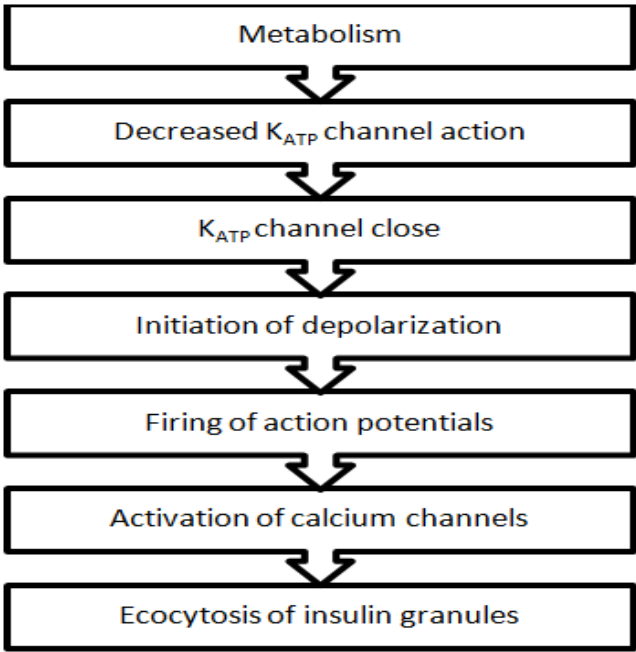


Figure1:Anti-diabetic activity of stevia (14)

Stevia leaves have been used because of their antioxidant properties and proven through phenol analysis extracted from the stevia plant, namely the proportion of total phenol of 91 mg/g. The studies comparing stevia with aspartame and sucrose have shown that giving stevia reduced significantly postprandial glucose levels and did not find after-effect. (2) Jeppesen *et al.* discovered that stevioside and steviol directly influence insulin release, which is due to the increase in insulin secretion in both pathways, namely the INS-1 pancreatic beta cell line and normal mice islet. In type-II diabetes, insulin depletion occurs and is followed by an increase in glucagon levels. This is closely related to the dysfunctioning of alpha-pancreatic cells, thus, contributing to disease's development. (2)

OTHER PHARMACOLOGICAL ACTIONS OF STEVIA

Despite of being an anti-diabetic drug, stevia has numerous other pharmacological actions as listed below:-

- **Anti-oxidant activity**

It has a high anti-oxidant activity because it contains high percentage of phenols and flavanoids. Also acts as a sugar substitute owing to the presence of various compounds with medicinal significance such as phenolic compounds, flavanoids, diterpene glycosides (i.e.) stevioside and rebaudioside-A, condensed tannins, anthocyanins, and phenolic acids. (15-16)

- **Endocrine disorders**

It works for endocrine disruption as steviol glycosides can interfere with hormones controlled by endocrine system. (16)

- **Gastrointestinal functioning**

The studies have reported potential gastrointestinal benefits of steviol glycosides. It improves overall gastrointestinal function and also relief upset stomach. It also prevents ulceration in Gastro-intestinal tract. (17,18)

- **Anti-hypertensive**

Stevia shows dual positive effect by acting as an antihyperglycemic and a blood pressure-lowering substance. It shows effects that have therapeutic potential in treatment of type-II diabetes and metabolic syndrome. (19) Based on studies performed on rats of same or different strains, dogs and humans, pure stevioside is effective for the treatment of mild essential hypertension, while crude stevioside was ineffective upto dose of 15 mg Kg⁻¹ Day⁻¹. And therefore it also effects the renal function. (20-30)

- It is used as a tonic to treat depression and also useful in chronic yeast infections. (20)

- Raw stuff of stevia is utilized as a synthesizer for contraceptive pills and medicines for cholesterol suppressing. (22)

- It also promote weight loss to satisfy sugar cravings. (23)
- Dry stevia leaf powder is used for the rejuvenation, nourishment, stimulation and restoration of the normal function of the pancreas.
- It plays a beneficial role in preventing dental caries. (28)
- It also showed potential antimicrobial activities against pathogenic bacteria. (29-31)

COMMERCIAL USES OF STEVIA

Stevia is commonly used as a food additive in sweets and carbonated beverages in Brazilian and Paraguayan natives and Japan. (24,25) It is also used to prepare sauces and used in cookies, pickles, chewing gums and tea. It can be used in baking as the sweet glycosides do not break down when heated. (26) It also has great use in food and beverage industries and are mostly used in herbal teas. (27)

CONCLUSION

There is a great need to improve our eating and living habits, due to increased risk of lifestyle diseases like diabetes, blood pressure, etc.. This article is related to one such approach as it comprise of detailed review on *Stevia Rebaudiana Bertoni* which is used as an artificial sweetener that is obtained naturally. The overall study reviewed that the use of stevia as a substitute to sugar is safe, non-carcinogenic, non-hypertensive with no major side effects. When it is used as a substitute of carbohydrate and sugar in diet, then it has been reported that those with diabetes support a reduction in postprandial blood glucose as well as reduced sugar and energy intake. It promises as a tool to help lower energy intakes, which may even lead to reduction and prevention of obesity along with numerous other beneficial pharmacological functions and wide commercial uses in market.

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