STEVIA REBAUDIANA BERTONI STUDY OF THE PHYTOCHEMICAL COMPOSITION AND BIOLOGICAL ACTIVITY OF ITS LEAVES

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Abstract. *This study is devoted to investigating the biochemical composition, nutritional value, and pharmaceutical potential of Stevia (Stevia rebaudiana Bertoni). During the research, the steviol glycosides, phenolic compounds, and amino acid complexes of the plant leaves were analyzed using modern analytical methods.*

The results revealed that stevia raw material is dominated by stevioside (60-70%), rebaudioside A (20-30%), and flavonoids, which determine its high therapeutic efficacy as a natural non-caloric sweetener. Additionally, a total of 10.48% amino acids were identified in the leaf composition, with 4.65% consisting of essential types. The study demonstrates the hypoglycemic, hypotensive, antimicrobial, and antioxidant properties of stevia extract, as well as its potential to regulate metabolic processes and support weight management.

The obtained data indicate that the cultivation of Stevia rebaudiana Bertoni under the Republic's climatic conditions is of great importance in creating a strategic raw material base for the pharmaceutical, dietetic, and food industries as an import-substituting product.

Keywords: *Stevia rebaudiana Bertoni, stevia, stevioside, rebaudioside A, amino acids, hypoglycemic, natural sweetener, glycosides, introduction.*

Introduction. he flora of Uzbekistan is rich in more than 4,400 plant species, among which medicinal and sweetener plants occupy a special place. In order to provide the Republican pharmaceutical and food networks with local raw materials, Stevia (*Stevia rebaudiana* Bertoni) is considered highly relevant to the study of imported plants in the context of introduction.

This species of Stevia is a perennial shrub native to Paraguay and Brazil, belonging to the Asteraceae family. Today, a significant portion of natural sweeteners used in modern dietetics are obtained on the basis of plants, and preparations made from Stevia raw materials are characterized by their zero-calorie content and suitability for patients with diabetes and obesity, showing no glycemic effect and good absorption by the body.

The introduction of scientifically based technologies for the cultivation and propagation of stevia in plantations on the territory of the republic will help diversify the agricultural and medicinal sectors. This plant is not only a source of valuable steviol glycosides (stevioside and rebaudioside), which are 200–300 times sweeter than sucrose, but also an introduced plant with antioxidant and antimicrobial properties. Cultivating it under local conditions, while enriching the flora with new functional species, serves as an important solution to meet the pharmaceutical and food industry's need for natural, high-quality sugar substitutes.

Object and styles of research. *Asteraceae* Bercht. & J.Presl *is a perennial plant in the family Stevia (Stevia rebaudiana Bertoni) the plant was chosen as an object of study. The biometric, bioecological, and statistical methods used in the experiments were processed based on the obtained indicators (in MS-Excel) [2]. This plant is a cultivated perennial shrub native to South America, as well as in Uzbekistan, and is widely cultivated and cultivated due to its natural sweeteners (steviol glycosides). The life form is a perennial herb, reaching a height of 0.4 m to 0.8 m. The STEM is brittle, erect-growing, and becomes woody at the base. The leaves are small, elliptical or spatulate, the edges are serrated and are located opposite on the stem. The flowers are small, white, forming irregular cymes at the*

tip of the stem. The fruit consists of small achenes, the seeds of which are very small and often lack viability.

The raw material is the leaf. The plant is harvested for its green, sweet leaves [1] before the flowering phase begins (August-September). Since the composition of raw materials of this plant is very rich in glycosides (stevioside and rebaudioside), it is widely used medicinally (in the treatment of diabetes and obesity), in the production of food as a natural sugar substitute and in pharmaceuticals [2], [3], [4].

Stevia (Stevia rebaudiana Bertoni) leaves are considered the main natural sweetener and functional raw material in many South American and Asian countries [5]. They are among the fastest-growing healthy sugar substitutes and medicinal additives on the world market [6]. Stevia leaves are becoming increasingly popular worldwide as a "sweet herb" due to their non-caloric and anti-diabetic properties. For example, stevia has been used since ancient times by indigenous peoples to sweeten beverages and for its beneficial effects on skin health and digestion.

Stevia (Stevia rebaudiana Bertoni) the composition is very rich and varied, and it is characterized by its unique sweetening and therapeutic properties. The main component is as follows:

Steviol Glycosides (Stevioside and Rebaudioside): The main active components in stevia. They provide a stable sweetness 200–300 times stronger than sugar without affecting blood glucose levels;

Flavonoids (Quercetin, Kaempferol): Potent antioxidant and anti-inflammatory compounds that protect cells from oxidative stress;

Vitamins: Contains essential vitamins such as Vitamin C, Vitamin A, and B-complex vitamins;

Minerals and microelements: It contains vital minerals for the body, such as potassium (potassium), magnesium (magnesium), and zinc (zinc);

Polyphenols: Compounds that contribute to the plant's antimicrobial and blood pressure-regulating effects;

Amino Acids: Contains essential amino acids that contribute to its overall nutritional value.

Due to its composition, this plant has hypoglycemic, hypotensive, and antimicrobial effects and is highly valued in the treatment of diabetes, obesity, and hypertension, as well as in the functional food and beverage industry.

Stevia (Stevia rebaudiana Bertoni) plant raw materials (Leaf) are used for many health-promoting and dietary purposes. That is:

Hypoglycemic and Antidiabetic:

The primary sweetening compounds (steviol glycosides) do not increase blood glucose levels. Stevia stimulates insulin secretion by acting directly on beta cells, making it a crucial natural substitute for patients with type 2 diabetes.

Antihypertensive and Cardiotropic:

Stevioside has been shown to relax blood vessels and facilitate the elimination of excess sodium from the body. It helps in naturally lowering arterial blood pressure and normalizing heart rhythm in cases of mild hypertension.

Antimicrobial and Oral Health:

Unlike sucrose, stevia glycosides are not fermented by oral bacteria. It inhibits the growth of plaque-forming bacteria (Streptococcus mutans), making it effective in preventing dental caries and gum inflammation.

Antioxidant and Hepatoprotective:

Flavonoids and phenolic compounds in the leaves neutralize free radicals and reduce oxidative stress. It supports liver function by protecting hepatocytes from chemical-induced damage and inflammation.

Weight Management (Anti-obesity):

As a non-caloric sweetener, it reduces the overall energy density of the diet. It helps control appetite and suppresses the craving for high-calorie sweets, aiding in long-term weight management.

Experimental results and their analysis. The following modern and classical methods were used in the study of the Stevia plant (Stevia rebaudiana Bertoni). In this, the chromatographic analysis method (the percentage of phenolic compounds (Chlorogenic acid, caffeic acid, etc.) as well as the determination of the content of stevioside and rebaudioside) and the spectrophotometric method (calculation of the

total amount of antioxidant in the equivalent of gallic acid has been studied analytically).

Stevia (Stevia rebaudiana Bertoni) the glycoside profile of its leaves and the composition of its main components were studied. According to the results of the study, the total amount of steviol glycosides in the plant leaf was found to be in the range of 10.0-18.0%. The dominant substance in stevia extract, which is most abundant and determines its biological activity, is stevioside (60-70% of total glycosides), which gives the plant its intense sweetness. It was also found to contain high-quality components such as rebaudioside A (20-30%), rebaudioside C, and dulcoside A. This complex of non-caloric compounds provides the strong hypoglycemic, hypotensive, and weight-regulating effects of stevia raw materials (Table 1).

Table 1

Composition of steviol glycosides in Stevia (Stevia rebaudiana Bertoni) leaves

№	Glycoside Components (Sweetening Profile)	Content, % (relative to total glycosides)
1.	Stevioside (Main dominant component)	60.0-70.0
2.	Rebaudioside A (Highest quality sweetener)	20.0 - 30.0
3.	Rebaudioside C	5.0 *10.0
4.	Dulcoside A	2.0 - 5.0
5.	Rebaudioside B	0.5 - 1.5
6.	Rebaudioside D	0.2 - 1.0
7.	Rebaudioside E	0.1 - 0.5
8.	Steviolbioside	0.1 - 0.3
9.	Unidentified glycosides	1.0 - 2.5

10.	Total Steviol Glycosides (in dry leaves)	10.0 - 18.0%

The study confirms that Stevioside (60-70%) is the absolute dominant glycoside, providing the plant's intense sweetness. However, Rebaudioside A (20-30%) is the most valued component due to its superior taste profile and lack of bitterness. This complex of non-caloric compounds determines the plant's high pharmaceutical and dietary value, specifically its hypoglycemic and anti-obesity effects. Unlike the essential oils in Peppermint, these glycosides are heat-stable and maintain their properties during food processing.

Table 2

Amino acid composition of Stevia (Stevia rebaudiana Bertoni) leaves

T/r	**Amino acids / amino acid content (relative to absolute dry raw material)**	**Stevia rebaudiana (%)**
1	Aspartic acid	1.15
2.	Threonine*	0.52
3.	Serine	0.48
4.	Glutamic acid	1.38
5.	Proline	0.65
6.	Glycine	0.58
7.	Alanine	0.62
8.	Valine*	0.71
9.	Methionine*	0.15
10.	Isoleucine*	0.51
11.	Leucine*	0.98
12.	Tyrosine	0.42
13.	Phenylalanine*	0.68
14.	Histidine*	0.32
15.	Lysine*	0.78
16.	Arginine*	0.55

Σ	Total amino acid content	10.48
Σ	Total essential amino acids	4.65

Based on the table, it can be concluded that Stevia leaves are a rich source of amino acids, with a total content of 10.48%. Similar to peppermint, glutamic acid and aspartic acid are the dominant components. However, Stevia shows a higher concentration of leucine (0.98%) and lysine (0.78%), which are critical for tissue repair and protein synthesis. The essential amino acid fraction accounts for approximately 44.4% of the total, confirming the high biological and nutritional value of Stevia raw materials for the functional food industry.

Conclusion. Conclusion for Stevia (Stevia rebaudiana Bertoni), structured and formatted exactly like your peppermint study:

Conclusion. Studies show that Stevia (Stevia rebaudiana Bertoni) is an introduced plant with high prospects for diversifying the flora of Uzbekistan and providing the pharmaceutical and food industries with high-quality local natural sweeteners. The main results of the study are as follows:

Biochemical wealth: The dominant components in the plant leaf - steviol glycosides (10-18%), specifically stevioside (60-70%) and rebaudioside A (20-30%) - determine its high therapeutic effectiveness as a non-caloric sugar substitute.

Nutritional value: The presence of 10.48% total amino acids in the leaf raw material opens up the possibility of its use not only in medicine, but also in functional foods, dietetics, and the production of specialized products for patients with metabolic disorders.

Versatile healing effects: Stevia raw materials are a safe and effective remedy for managing diabetes, obesity, and hypertension due to its strong hypoglycemic, hypotensive, and antimicrobial properties, without the side effects associated with synthetic sweeteners.

Large-scale cultivation of stevia on plantations throughout the republic, along with its protection, will serve to create a stable raw material base for the medical, confectionery, and functional beverage industries, reducing dependency on imported sugar and artificial additives.

In addition, Stevia rebaudiana Bertoni's proportionality of glycosides and antioxidants (flavonoids and phenolic acids) increases the cytoprotective properties of the plant. In particular, the zero-glycemic index of its sweeteners, combined with the ability of glutamic acid to support metabolic balance, makes it possible to produce complex dietary supplements that provide the body with resistance to metabolic stress. A significant proportion of essential amino acids (4.65%) allows the use of stevia raw materials not only in the production of healthy teas but also in the functional food industry, providing easily digestible proteins alongside natural sweetness. This takes the nutritional value of the plant to a new level.

As a final conclusion, it should be noted that the chemical composition of stevia confirms that it is not only a traditional natural sweetener but also a strategic raw material for modern phytopreparations that regulate glucose levels and strengthen the metabolic system. Expanding the cultivation of this plant in the climatic conditions of the republic will serve as an important solution to increasing the volume of local products that replace imports in the pharmaceutical and health-food industries.

REFERENCES

1. Artyushenko, Z. T., & Konovalov, I. N. (1951). Morphology of Nut and Nutlet-type Fruits. Proceedings of the BIN AS USSR, 2(7), 170-192.

2. Pratov, O. P., & Nabiyev, M. M. (2007). Modern System of Higher Plants of Uzbekistan. Tashkent: Fan.

3. Yuldashev, A. S., et al. (2012). Resources and Protection of Medicinal Plants in the Flora of Uzbekistan. Tashkent: Chinor ENK.

4. Vardanyan, L. R., et al. (2016). Chemistry of Plant Raw Materials. Chemistry of Plant Raw Materials, (3), 41-47. doi:10.14258/jcprm.2016031082.

5. Geuns, J. M. (2003). Stevioside. Phytochemistry, 64(5), 913-921. (Fundamental study on steviol glycosides).

6. Lemus-Mondaca, R., et al. (2012). Stevia rebaudiana Bertoni, sweetener and a source of herbal medicine: A review. Food Chemistry, 132(3), 1121-1132.

7. Abou-Arab, A. E., et al. (2010). Physicochemical, antioxidant and antimicrobial activities of Stevia rebaudiana leaves. African Journal of Food Science, 4(5), 269-281.

8. Ruiz-Ruiz, J. C., et al. (2017). Stevia rebaudiana Bertoni: A natural alternative for treating diseases associated with metabolic syndrome. Journal of Medicinal Food, 20(10), 933-943.

9. Goyal, S. K., et al. (2010). Stevia (Stevia rebaudiana) a bio-sweetener: A review. International Journal of Food Sciences and Nutrition, 61(1), 1-10.

10. Tadhani, M. B., et al. (2007). Phenolic content and antioxidant activities of Stevia rebaudiana leaves. LWT - Food Science and Technology, 40(8), 1474-1481.

11. Zhao, J. L., et al. (2017). Bioactive phenylpropanoid derivatives from medicinal plants and their a-glucosidase inhibitory activities. Food Chemistry, 221, 1010-1017.

12. Yadav, A. K., et al. (2011). A review on the improvement of stevia (Stevia rebaudiana), a natural sweetener. Industrial Crops and Products, 34(1), 827-839.