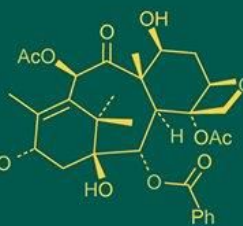


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Stevia uncovered: Health benefits, usage tips & safety considerations

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Abstract

Rising concerns over excessive sugar intake and its link to diabetes, obesity, and other lifestyle disorders have renewed interest in safer alternatives to conventional sweeteners. Stevia, derived from *Stevia rebaudiana Bertonii*, has gained global attention as a high-intensity natural sweetener that provides sweetness without contributing calories or elevating blood glucose levels. This article presents a balanced, evidence-based overview of stevia, explaining its origin, metabolic fate, and scientifically supported health benefits in language accessible to the general reader. Particular emphasis is placed on usage guidance and safety considerations, including acceptable daily intake, regulatory approvals, and population-specific cautions. By bridging scientific understanding with everyday dietary practice, the article aims to help consumers and professionals make informed, responsible choices about incorporating stevia into modern diets.

Keywords: *Stevia rebaudiana*, Steviol glycosides and natural calorie-free sweetener

Introduction

Stevia rebaudiana, a perennial herb of the family Asteraceae, has gained global attention as a natural, non-caloric sweetener due to the presence of steviol glycosides such as stevioside and rebaudioside A, which are approximately 200-300 times sweeter than sucrose (Jadhav *et al.*, 2023; Momtazi-Borojeni *et al.*, 2016) [5, 9]. Unlike conventional sugars, these compounds are not metabolized as carbohydrates and therefore do not contribute to caloric intake or glycaemic load. The increasing prevalence of non-communicable diseases such as diabetes, obesity, and cardiovascular disorders has accelerated the demand for natural sugar alternatives, positioning stevia as a promising functional ingredient in modern diets.

Traditionally used by indigenous communities of Paraguay and Brazil, stevia has now expanded globally due to its health-promoting properties and safety profile. Scientific evidence indicates that steviol glycosides exhibit antihyperglycaemic, antihypertensive, anti-inflammatory, and antimicrobial activities, thereby contributing not only to sweetness but also to therapeutic potential (Verma *et al.*, 2019; Momtazi-Borojeni *et al.*, 2016) [13, 9]

What Exactly Is Stevia?

Stevia rebaudiana Bertonii is a herbaceous perennial plant native to South America, particularly Paraguay and Brazil. Its leaves contain a diverse group of diterpenoid compounds known as steviol glycosides, including stevioside, rebaudioside A, C, D, and M, which are responsible for its intense sweetness (Galankis, 2021; Jadhav *et al.*, 2023) [3, 5]. Among these, stevioside and rebaudioside A are the most abundant and widely used, with rebaudioside A preferred due to its better sensory profile and reduced bitterness.

Chemically, these glycosides are derived from the ent-kaurene diterpenoid pathway and are present in varying concentrations depending on genotype, environmental conditions, and processing methods. Stevia leaves also contain proteins, carbohydrates, amino acids, and trace minerals, further contributing to its nutritional value (Marcinek and Krejpcio, 2015) [8]

How Stevia Works Inside the Body

Steviol glycosides are not hydrolysed by digestive enzymes in the upper gastrointestinal

tract; instead, they reach the colon where gut microbiota convert them into steviol, which is subsequently absorbed, conjugated to steviol glucuronide in the liver, and excreted via urine (EFSA, 2020) ^[2]. This unique metabolic pathway explains why stevia does not elevate blood glucose or insulin levels, making it suitable for individuals with diabetes and metabolic disorders.

Health Benefits: What Science Actually Supports

1. Blood sugar control

Steviol glycosides have been shown to improve glucose metabolism and insulin sensitivity without causing glycaemic spikes, making them suitable for diabetic and prediabetic individuals (Jadhav *et al.*, 2023; Momtazi-Borojeni *et al.*, 2016) ^[5, 9]

2. Weight management

Because stevia provides sweetness without calories, it can help reduce overall energy intake when used mindfully. Unlike sugar alcohols, it does not cause bloating or laxative effects at normal intake levels.

3. Cardiovascular support

Stevioside has been reported to exert antihypertensive effects by promoting vasodilation and enhancing sodium excretion, thereby contributing to cardiovascular health (Verma *et al.*, 2019) ^[13]

4. Oral health friendly

Stevia does not support the growth of cariogenic bacteria, reducing the risk of dental caries compared to sucrose-based sweeteners (Jadhav *et al.*, 2023) ^[5]

5. Antioxidant and anti-inflammatory properties

Stevia extracts exhibit antioxidant, anti-inflammatory, antimicrobial, and anticancer properties, though these effects are more pronounced in whole-leaf extracts than purified glycosides (Momtazi-Borojeni *et al.*, 2016) ^[9].

Beyond Human Diets: Agricultural and Food Industry Value

Stevia's relevance extends beyond the kitchen table.

- In food technology, it enables sugar reduction in beverages, dairy products, bakery items, and nutraceuticals.
- In animal nutrition, research suggests potential prebiotic and gut-health supporting roles when stevia biomass or extracts are used judiciously (Gut-health modulation as a phytobiotic).
- From an agricultural perspective, stevia offers farmers a high-value crop option, especially in subtropical and tropical regions, provided proper agronomic practices are followed. Also used in poultry and aquaculture feeds.

Different food regulatory authorities' response to Stevia as a natural NNS

Globally, the rising burden of non-communicable diseases such as diabetes, obesity, and cardiovascular disorders has been closely linked to the excessive intake of natural nutritive sweeteners, prompting a growing shift toward non-nutritive sweeteners (NNS) across all age groups. These sweeteners, approved by the Food Safety and Standards Authority of India (FSSAI), possess significantly higher

sweetness intensity than conventional sugars and contribute negligible or zero calories when incorporated into food systems. As a result, they are increasingly recognized as healthier alternatives for dietary management and sugar reduction strategies. Currently, FSSAI has approved six major artificial NNS for human consumption, namely saccharin, aspartame, sucralose, isomaltulose, neotame, and acesulfame potassium whereas the steviol glycoside is the only natural NNS that has been approved by FSSAI till now. However, despite their widespread use, concerns have emerged regarding the potential health implications of their metabolic by-products, particularly based on evidence from animal studies, leading to ongoing scientific debate. Consequently, global research efforts have intensified toward identifying safer, plant-derived, organic, and non-carcinogenic alternatives that can provide sweetness without caloric contribution or adverse health risks. In this context, natural NNS have gained considerable attention due to their favorable sensory properties, structural diversity, and applicability in food systems, as highlighted by Ambawat *et al.* (2021) ^[11]. Among these, steviol glycosides derived from *Stevia rebaudiana* represent the only natural non-nutritive sweetener currently approved by FSSAI, making them a particularly important focus for both research and commercial applications. The safety of steviol glycosides has been extensively evaluated by international regulatory bodies such as EFSA and JECFA. An acceptable daily intake (ADI) of 4 mg/kg body weight/day (as steviol equivalents) has been established (EFSA, 2020; Tanaviyutpakdee *et al.*, 2025) ^[2, 12]. Recent population-based exposure studies indicate that actual intake levels remain well below the ADI across different age groups, suggesting no significant health risk under normal consumption patterns.

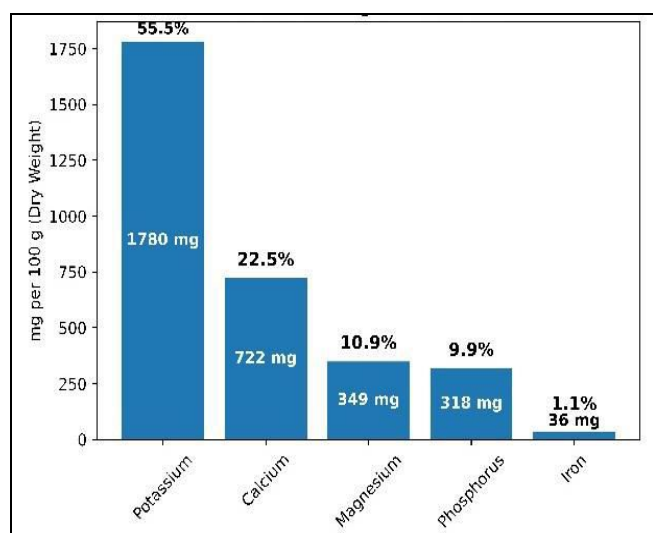
Additionally, toxicological evaluations confirm that steviol glycosides are non-carcinogenic, non-mutagenic, and non-teratogenic, reinforcing their safety as food additives (Momtazi-Borojeni *et al.*, 2016) ^[9]. However, excessive consumption through multiple food sources may approach ADI limits, particularly in children, highlighting the need for regulated use and monitoring. The increasing incorporation of steviol glycosides into processed foods aligns with global efforts to reduce sugar consumption. Regulatory frameworks such as those established by the Food Safety and Standards Authority of India (FSSAI) mandate clear labelling and controlled use of non-nutritive sweeteners to ensure consumer safety and informed choices (Pande *et al.*, 2025) ^[10]. Stevia is now widely used in beverages, dairy products, bakery items, and nutraceutical formulations due to its stability and high sweetening potency.

Best performing stevia genotypes recommended for grower on the basis contribution towards human health

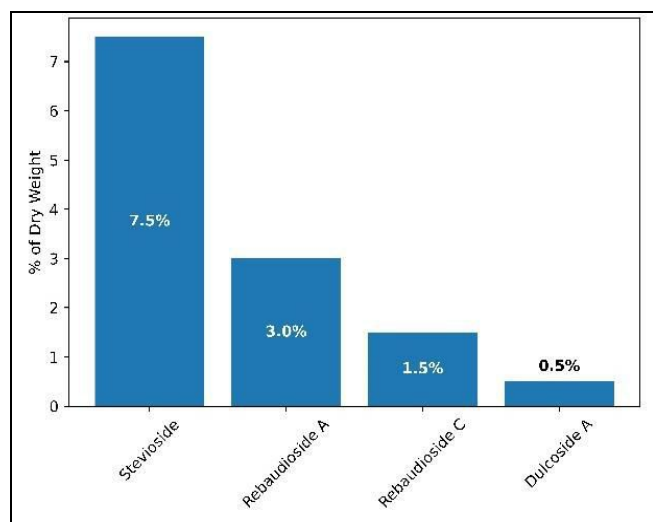
Several stevia genotypes have been identified as superior not only in agronomic performance but also in their contribution to human health through enhanced steviol glycoside composition and biomass yield. Reddy *et al.* (2019) ^[11], while evaluating nine genotypes under the Northern Dry Zone of Karnataka, reported that GKVK Stevia-1 exhibited superior vegetative growth and chlorophyll accumulation, which are directly associated with higher leaf biomass and consequently greater accumulation of bioactive steviol glycosides. Similarly,

varietal improvement efforts have led to the development of high-quality cultivars such as CIMAP Madhu, which recorded significantly higher dry leaf yield (43.05 q ha^{-1}) along with elevated stevioside (12.57%) and rebaudioside (5.80%) content and low dulcoside-A, making it highly suitable for pharmaceutical and nutraceutical applications (Lal *et al.*, 2011) [7]. In terms of quality enhancement, the cultivar Him Stevia (CSIR-IHBT-ST-01) has been specifically bred for a higher rebaudioside-A to stevioside ratio (≈ 1.25), which improves taste profile and reduces bitterness, thereby increasing its acceptability as a natural, non-caloric sweetener beneficial for diabetic and health-conscious consumers. Furthermore, multi-environment evaluation studies indicated that genotypes such as CSIR-IHBT-ST-1801 and CSIR-IHBT-ST-G12 demonstrated high dry leaf biomass and stability across environments, ensuring consistent production of steviol glycosides, which are known for their antihyperglycaemic and cardioprotective properties (Yadav *et al.*, 2024) [14]. Collectively, these findings highlight that genotypes combining high biomass yield with enhanced rebaudioside-A content and favorable glycoside profiles are most suitable for growers targeting both economic returns and health-oriented markets.

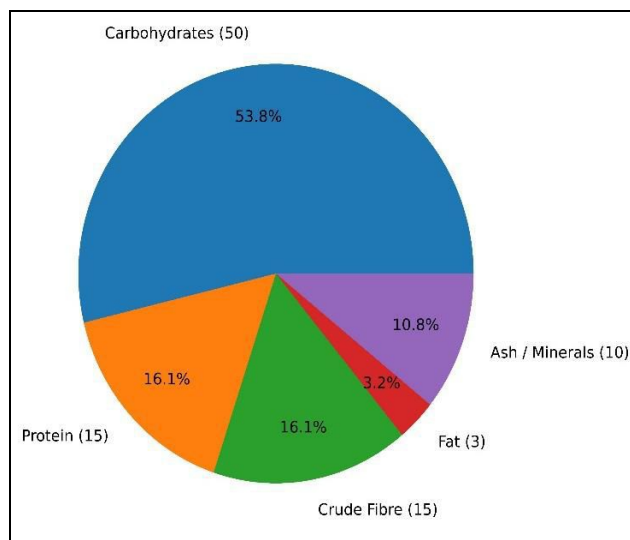
Quality contents in stevia (Gupta and Ena, 2013)



Major Mineral Composition of *Stevia rebaudiana* Leaves (with Percentage Contribution)



Major Steviol Glycosides in *Stevia rebaudiana* Leaves



Prominent Nutrient Composition of *Stevia rebaudiana* (Grams per 100 g Dry Weight Basis, DW)

Safety First: What Regulators Say

Safety is where confusion often begins—mostly due to misinformation. International regulatory bodies have conducted extensive toxicological evaluations of steviol glycosides. The Food Safety and Standards Authority of India permits the use of steviol glycosides in specified food categories within defined limits (Infant foods and certain special categories are excluded). They must comply with purity, labelling and GMP norms of the regulated bodies. The European Food Safety Authority and the World Health Organization have established an Acceptable Daily Intake (ADI) of 4 mg/kg body weight/day (expressed as steviol equivalents). This means a 60 kg adult can safely consume stevia-sweetened foods well within normal dietary patterns without risk.

Importantly, stevia is non-carcinogenic, non-mutagenic, and non-reproductive toxic when used within approved limits.

Myths around Stevia

- “Stevia is artificial”. No. Stevia is plant-derived. However, commercial products may contain purified extracts or blends.
- “It damages kidneys or fertility”. This claim comes from outdated or misinterpreted animal studies using unrealistically high doses. Regulatory conclusions clearly refute this at approved intake levels.
- “Natural means unlimited or Stevia is 100% safe in any amount”. False. Like any bioactive compound, moderation matters.
- “Stevia cures diabetes”. False. It supports sugar reduction, nothing more.
- “Natural means no side effects”. False. Safety depends on purification, dose, and regulation.
- “Stevia leaf powder = approved stevia”. False. Only purified steviol glycosides are approved.
- “Stevia is not a sugar, not an artificial sweetener, and not an herbal medicine. It is a high intensity natural sweetener regulated as a food additive.”

Smart Usage Tips for Everyday Life

- Prefer purified steviol glycosides (Reb-A, Reb-M) for clean taste.

- Start with small quantity of stevia as it is intensely sweet.
- Combine with bulk sweeteners (like erythritol) in baking for better texture.
- Avoid crude leaf powders unless you understand dosage and taste variability.
- Always check food labels for blends and total sweetener composition.

Who Should Be Slightly Cautious?

- Individuals with known hypersensitivity (rare)
- Those consuming large quantities of multiple sweeteners simultaneously
- People assuming stevia can “cancel out” poor dietary habits

Stevia supports health-it does not replace balanced nutrition.

Special Populations: A Note of Caution

- **Children:** Safe within regulated foods, but avoid over-sweet habituation
- **Pregnant & lactating women:** No proven harm, but moderation advised
- **People with autoimmune or gut inflammatory disorders:** Preliminary immunomodulatory signals exist-clinical relevance still unclear

This is why regulators avoid exaggerated health claims.

Conclusion

Stevia is not a miracle, nor a marketing trick. It is a scientifically validated product that need to be used wisely helping the society to reduce excess sugar intake without sacrificing pleasure. Its true value does not lay in sweetness alone but in choice: the choice to enjoy food while respecting long-term health.

In a world struggling with diet-related diseases, stevia reminds us that sometimes, nature already holds the answers and we just need to use them correctly. In a country where sugar reduction is a public health priority, stevia fits best not as a shortcut, but as a supporting actor in healthier dietary patterns.

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References

1. Ambawat S, Tiwari M, Sharma A, Chauhan NS. Natural non-nutritive but healthier sweeteners. *Med Plants-Int J Phytomed Relat Ind*. 2021;13(3):378-87.
2. EFSA Panel on Food Additives and Flavourings (FAF), Younes M, Aquilina G, Engel KH, Fowler P, Frutos Fernandez MJ, *et al*. Safety of a proposed amendment of the specifications for steviol glycosides (E 960) as a food additive: to expand the list of steviol glycosides to all those identified in the leaves of *Stevia rebaudiana* Bertoni. *EFSA Journal*. 2020 Apr;18(4):e06106.
3. Galanakis CM. *Steviol Glycosides: Production, Properties, and Applications*. Academic Press; 2021.
4. Gupta E, Purwar S, Singh A, Sundaram S, Rai GK, Sundaram S. Evaluation of nutritional, anti-nutritional and bioactive compounds in juice and powder of *Stevia rebaudiana*. *Indian Journal of Natural Sciences*. 2015;5(28):3308-17.
5. Jadhav V, Joshi AA, Kshirsagar RB. Stevia (steviol glycosides): A thorough exploration of a natural food additive. *Indian Food Industry Mag*. 2023;5(3):55-72.
6. Jadhav V. Stevia (Steviol glycosides): A thorough exploration of a natural food additive.
7. Lal RK, Chandra R, Gupta MM, Singh AK, Panday R. Registration of a high yielding variety CIMAP Madhu of Stevia (*Stevia rebaudiana*). *Journal of Medicinal and Aromatic Plant Sciences*. 2011 Jun 29;33(1):77-80.
8. Marcinek K, Krejpcio Z. *Stevia rebaudiana* Bertoni-chemical composition and functional properties. *Acta Sci Pol Technol Aliment*. 2015;14(2):145-152.
9. Momtazi-Borojeni AA, Esmaeili SA, Abdollahi E, Sahebkar A. A review on the pharmacology and toxicology of steviol glycosides extracted from *Stevia rebaudiana*. *J Cell Physiol*. 2016;231(1):25-39.
10. Pande B, Chandorkar S, Singh M. A decadal transition in food labelling compliance with the Food Safety and Standards Authority of India regulations and the nutritional composition of processed packaged foods: Implications for public health. *World Nutrition*. 2025 Sep 30;16(3):120-31.
11. Reddy PS, Farooq M, Singh VP, Vijaymahantesh, Vishwanath YC, Kerutagi MG. Evaluation of stevia (*Stevia rebaudiana* Bertoni) genotypes performance on growth and chlorophyll accumulation. *International Journal of Chemical Studies*. 2019;7(5):1383-1387.
12. Tanaviyutpakdee P, Phitwongtaewan P, Phungsiangdee Y, Karnpanit W, Phattanakulanun P, Yomvachirasin T, *et al*. Risk of exposure to steviol glycosides through consumption of foods and beverages: A survey of the Thai population. *Food Science & Nutrition*. 2025 Feb;13(2):4681.
13. Verma MK, Kumar N, Rishikant. A review on the pharmacological properties and medicinal use of *Stevia rebaudiana*. *Pharma Innov J*. 2019;8(1):371-374.
14. Yadav N, Singh S, Chauhan R, Kumar A, Pal PK, Singh S. Dry leaf biomass stability of stevia (*Stevia rebaudiana*) clones over different environments. *International Journal of Plant & Soil Science*. 2024;36(8):80-89.