GSC Biological and Pharmaceutical Sciences
eISSN: 2581-3250 CODEN (USA): GBPSC2
Cross Ref DOI: 10.30574/gscbps
Journal homepage: https://gsconlinepress.com/journals/gscbps/

(RESEARCH ARTICLE)

Check for updates

Evaluation of artificial sweeteners in selected sugar-free marketed products

Kalyani S. Mahalle *, Swati P. Deshmukh and Shivshankar G. Devkunbi

Department of Pharmacology, Shraddha Institute of Pharmacy, Kondala (Zambre), Tq. Dist. Washim-444505, Maharashtra, India.

GSC Biological and Pharmaceutical Sciences, 2026, 35(02), 045-055

Publication history: Received on 25 March 2026; revised on 04 May 2026; accepted on 07 May 2026

Article DOI: https://doi.org/10.30574/gscbps.2026.35.2.0164

Abstract

The growing demand for low-calorie and diabetic-friendly food products has significantly increased the use of artificial sweeteners in commercially available sugar-free formulations. This study investigates the occurrence, types, and functional roles of artificial sweeteners in selected marketed sugar-free products. Emphasis is placed on evaluating labeling practices, combinations of sweeteners, and potential health implications associated with their consumption. The findings indicate that manufacturers frequently employ blends of sweeteners such as aspartame, sucralose, saccharin, and acesulfame potassium to enhance palatability and stability. While regulatory authorities have established safety thresholds for these compounds, concerns regarding excessive intake and long-term metabolic effects persist. This study highlights the importance of informed consumption and transparent labeling practices.(1)

Keywords: Artificial Sweeteners; Sugar Free Products; Qualitative Analysis; Ninhydrin Test

1 Introduction

The replacement of conventional sugars with artificial sweeteners has become increasingly prevalent in modern food systems. These synthetic compounds provide intense sweetness with minimal or no caloric contribution, making them suitable for individuals managing conditions such as diabetes mellitus and obesity.

Unlike natural sugars, artificial sweeteners exert negligible effects on blood glucose levels, which has contributed to their widespread incorporation into beverages, confectionery, pharmaceutical preparations, and dietary supplements. Despite their benefits, ongoing scientific discussions question their long-term physiological effects, necessitating systematic evaluation.

People with diabetes often find artificial sweeteners helpful because they allow them to enjoy food and drinks without causing spikes in blood sugar levels. These sweeteners also help reduce overall calorie intake, which is important for managing weight. In recent years, sugar-free options like low-calorie pastries, sugar-free tablets, and diet sodas have become increasingly popular, especially in urban areas. Consumers are turning to healthier alternatives such as sugar-free vanilla ice cream, Sprite Zero Sugar, and gold tablets as substitutes for regular sugary products.

To evaluate artificial sweeteners in food, both qualitative and quantitative methods are used.This process involves determining which sweeteners are present, how much of them there is, and whether they meet food safety standards. The main purpose of this study is to examine artificial sweeteners in several advertised sugar-free products, like sugar-free vanilla ice cream, Sprite Zero Sugar, and sugar-free gold tablets. These products come from different categories, including drinks, dairy-based sweets, and medicinal sweeteners. The study aims to give a complete understanding of the types and features of artificial sweeteners found in commonly consumed items by looking at these various products.This study also seeks to assess the quality, safety, and health impacts of consuming these products. It also aims

* Corresponding author: Kalyani S. Mahalle

to inform consumers about the correct usage of artificial sweeteners and the potential risks of exceeding recommended consumption levels.

Figure 1 Artificial Sweeteners

2 Classification of Artificial Sweeteners

Artificial sweeteners can be categorized based on their chemical composition and sweetness intensity.

2.1 Saccharin

Saccharin is an artificial sweetener that has no calories or energy content. For nearly a hundred years, it has been used in processed foods and drinks, making it one of the oldest artificial sweeteners. It is about 300 times sweeter than regular sugar.

2.2 Acesulfame potassium (Ace-k)

Acesulfame potassium is a commonly used sweetener. This white, crystalline substance stays stable up to 250 degrees Celsius. It is used in many types of bread products because of its ability to remain stable at high temperatures.

2.3 Aspartame

Aspartame is the most talked-about sugar substitute because it tastes like sugar. It remains stable at high temperatures and partially dissolves in water. The temperature determines how well it dissolves.

2.4 Sucralose

Sucralose is one of the most commonly used sugar substitutes. It works well even at high temperatures, making it suitable for use in baked goods. It is very safe and doesn't break down easily. Sucralose is twice as sweet as saccharin, three times as sweet as aspartame and acesulfame potassium, and can be up to 1000 times sweeter than regular sugar.(2)

3 Aim And Objectives

Aim

To systematically evaluate artificial sweeteners present in selected sugar-free commercial products.

Objectives

- To identify the types of artificial sweeteners used in marketed products
- To assess labeling accuracy and transparency
- To examine the use of single versus combined sweetener systems
- To evaluate potential health implications based on existing evidence
- To analyze general consumer awareness regarding artificial sweeteners.(3)

4 Materials and Methods

4.1 Sugar-Free Gold Tablet

Figure 2 Sugar Free Gold Tablet

Product Name: Sugar-Free Gold Tablet (with Chromium)

4.1.1 Category

- Artificial sweetener
- Sugar substitute (low-calorie).

4.1.2 Description

Sugar-Free Gold tablets are used as a substitute for sugar in beverages like tea, coffee, and other drinks. These tablets provide sweetness without adding significant calories, making them suitable for diabetic and weight-conscious individuals.

4.1.3 Excipients (Inactive Ingredients)

- Lactose / Dextrose – Bulking agent
- Microcrystalline cellulose – Binder
- Magnesium stearate – Lubricant
- Starch – Disintegrant
- Flavouring agents – Improve taste

4.1.4 Mechanism of Action

- Artificial sweeteners bind to taste receptors on the tongue
- Provide sweetness similar to sugar
- Do not significantly increase blood glucose levels

4.1.5 Uses

- Used in tea, coffee, milk, and beverages
- Suitable for –Diabetic patients, Weight management

4.2 Sprite Zero Sugar

Figure 3 Sprite Zero Sugar

4.2.1 Product Name

Sprite Zero Sugar (Lemon-Lime Flavoured Soft Drink)

4.2.2 Category

- Carbonated soft drink
- Sugar-free beverage

4.2.3 Description

Sprite Zero Sugar is a carbonated, sugar-free soft drink that provides a refreshing lemon-lime taste without added sugar. It is formulated using artificial sweeteners instead of sucrose, making it suitable for individuals who want to reduce calorie intake or manage blood sugar levels.

4.2.4 Excipients (Inactive Ingredients)

- Carbonated Water – Base
- Citric Acid – Acidulant (gives sour taste)
- Sodium Citrate – Buffering agent
- Potassium Sorbate – Preservative
- Natural Lemon-Lime Flavours – Taste enhancer

4.2.5 Mechanism of Action

Artificial sweeteners stimulate taste receptors on the tongue, producing a sweet taste similar to sugar but without increasing blood glucose levels.

4.2.6 Uses

- Refreshing beverage
- Alternative to sugary drink
- Suitable for: Diabetic individual, Weight management

4.3 Sugar-Free Vanilla Ice Cream

Figure 4 Sugar Free Vanilla Ice- Cream

Product Name: Amul Sugar-Free Vanilla Ice Cream

4.3.1 Category

- Dairy product
- Frozen dessert
- Sugar-free / low-calorie ice cream

4.3.2 Description

Amul Sugar-Free Vanilla Ice Cream is a low-calorie frozen dairy product designed for people who want to reduce sugar intake. It provides a sweet taste using artificial sweeteners instead of sugar, while maintaining the creamy texture and flavor of regular ice cream.

4.3.3 Excipients (Inactive Ingredients)

- Milk solids – Base material
- Stabilizers (Guar gum, Carrageenan) – Prevent ice crystal formation
- Emulsifiers (Mono- and Diglycerides) – Improve texture
- Polydextrose / Maltodextrin – Bulking agents
- Vanilla flavour – Taste enhancer

4.3.4 Mechanism of Action

Artificial sweeteners activate sweet taste receptors on the tongue, producing sweetness similar to sugar without adding calories or increasing blood glucose levels.

4.3.5 Uses

- Dessert option for:
- Diabetic patients
- Weight-conscious individuals
- Substitute for regular high-sugar ice cream (4)

4.4 Methods And Evaluation

4.4.1 Sample Preparation

Sugar Free Gold Tablet

- Crush tablet into fine powder using mortar and pestle
- Dissolve in 10 mL distilled water
- Filter using Whatman filter paper

Figure 5 Tablet Test Sample

Sprite Zero Sugar

- Degas (remove CO_2 by shaking/sonication)
- Dilute with distilled water
- Filter

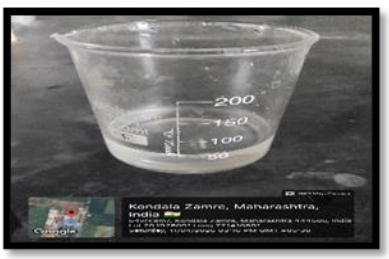

Figure 6 Sprite Test Sample

Sugar-Free Vanilla Ice Cream

- Melt sample at room temperature
- Take 10 g melted ice cream
- Add 20 ml warm distilled water
- Stir well to dissolve
- Filter to remove solids

- Use clear filtrate for testing (5)

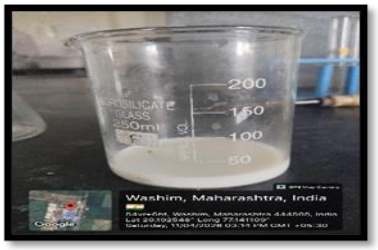

Figure 7 Ice Cream Test Sample

Detection of Artificial Sweeteners in Selected Sugar-free Marketed Products

Qualitative Tests for Sugar Free Gold Tablet

I.Ninhydrin Test (For Aspartame)

Aim: To identify the presence of aspartame in the tablet.

Observation

Blue color appears → Aspartame present

Figure 8 Ninhydrin Test

4.4.2 II.Hydrolysis Test (For Aspartame)

Aim: To confirm aspartame by detecting amino acids formed after hydrolysis.

Observation

Deep purple / Blue color → Confirms aspartame

Figure 9 Hydrolysis Test

4.4.3 III. Silver Nitrate Test (For Acesulfame K)

Aim : To detect presence of acesulfame potassium.

Observation

White Precipitate → Acesulfame K present

Figure 10 Silver Nitrate Test

Qualitative Tests for Zero Sugar Sprite

I. Ninhydrin Test (For Aspartame)

Aim : To detect the presence of aspartame in the sample .

Observation

Blue color appears → Aspartame present.

Figure 11 Ninhydrin Test

4.4.4 II. Barium Chloride Test (For Acesulfame K)

Aim : To detect acesulfame potassium.

Observation : Formation of White Precipitate → Confirms acesulfame K

Figure 12 Barium Chloride Test

4.4.5 III. Ferric Chloride Test (General Sweetener Test)

Aim : To detect the phenolic or complex-forming Sweeteners.

Observation

Yellow color → suggests the presence of artificial Sweeteners

Figure 13 Ferric Chloride Test

4.4.6 Qualitative Tests for Sugar Free Vanilla Ice Cream

I. Ninhydrin Test (For Aspartame)

Aim : To detect the presence of aspartame in the sample.

Observation

Blue color → Aspartame present

Figure 14 Ninhydrin Test

4.4.7 II. Ferric Chloride Test (General artificial Sweeteners)

Aim : To detect the presence of artificial Sweeteners (6)

Observation

Light yellowish color Indicates the presence of artificial Sweeteners.

Figure 15 Ferric Chloride Test

4.5 Evaluation

Organoleptic Evaluation of Selected Products

4.5.1 Sugar Free Gold Tablet

- Color: White

- Appearance: Small, round tablets
- Odor: Odorless
- Taste: Very sweet, slightly bitter aftertaste
- Texture: Smooth, dissolves quickly in mouth

4.5.2 Sprite Zero Sugar

- Color: Colorless, clear liquid
- Appearance: Effervescent (bubbles present)
- Odor: Citrus aroma
- Taste: Sweet with mild artificial aftertaste
- Texture/Mouthfeel: Fizzy and refreshing

4.5.3 Sugar-Free Vanilla Ice Cream

- Color: Creamy white
- Appearance: Smooth and uniform
- Odor: Pleasant vanilla aroma
- Taste: Sweet, slightly less intense than sugar-based ice cream
- Texture: Soft, creamy, smooth
- Mouthfeel: Slight difference due to absence of sugar (7)

5 Result and discussion

The analysis of selected sugar-free marketed products such as sugar-free tablets, zero-sugar beverages, and sugar-free ice cream revealed the presence of commonly used artificial sweeteners. The results obtained from qualitative methods are interpreted to understand the presence and concentration of artificial sweeteners in selected products. Results are compared with regulatory standards to assess product safety.

Table 1 Result and Discussion of Sugar Free Gold Tablet

Sr. No	Tests	Sweeteners detected	Observation	Result
1	Ninhydrin Test	Aspartame	Blue colour	Positive
2	Hydrolysis Test	Aspartame	Blue colour	Positive
3	Silver Nitrate	Acesulfame K	White Precipitate	Negative

Table 2 Result and Discussion of Zero Sugar Sprite

Sr. No	Tests	Sweeteners detected	Observation	Result
1	Ninhydrin Test	Aspartame	Blue colour	Positive
2	Barium Chloride Test	Acesulfame Potassium	White Precipitate	Positive
3	Ferric Chloride Test	General Sweeteners present	Yellow Colour	Positive

Table 3 Result and Discussion of Sugar Free Vanilla Ice Cream (8)

Sr. No	Tests	Sweeteners detected	Observation	Result
1	Ninhydrin Test	Aspartame	Blue colour	Negative
2	Ferric Chloride Test	General Artificial Sweeteners	Light yellowish colour	Positive

5.1 Safety Assessment

Regulatory authorities worldwide have established acceptable daily intake (ADI) values for artificial sweeteners based on extensive toxicological data. When consumed within these limits, these compounds are considered safe for human use.

Nevertheless, excessive consumption may contribute to mild adverse effects such as gastrointestinal discomfort or altered metabolic responses in susceptible individuals.

5.2 Advantages

- Provides sweetness without significant caloric intake
- Suitable for diabetic and weight-conscious individuals
- Does not contribute to dental cpreferen

5.3 Disadvantages

- Potential for overconsumption due to perceived safety
- Possible aftertaste affecting consumer preference
- Limited clarity regarding long-term metabolic effect (9)

5.4 Regulatory Considerations

International and national regulatory bodies monitor the use of artificial sweeteners and enforce labeling standards to ensure consumer safety. Compliance with established ADI values is essential for minimizing health risks.

5.5 Consumer Awareness

The study indicates that while consumers actively choose sugar-free products, awareness regarding the specific types and effects of artificial sweeteners remains limited. Improved educational initiatives and labeling clarity are necessary.

5.6 Future Scope

- Future research should focus on:
- Long-term clinical studies
- Development of safer alternative sweeteners
- Enhanced regulatory policies for labeling transparency (10)

6 Conclusion

Artificial sweeteners play a significant role in the formulation of sugar-free products and offer clear benefits in dietary management. However, their consumption should be moderated, and consumers should be educated about their appropriate use. Continued research and regulatory oversight are essential to ensure long-term safety.The investigation found that artificial sweeteners were clearly identified and measured in the selected sugar-free products. The results indicated that these items are safe to eat when used in reasonable amounts and contain approved artificial sweeteners within safe limits. Using different testing methods helped create an accurate and reliable evaluation, which helped ensure customer safety and better quality control. This study highlights the importance of monitoring artificial sweeteners in food to follow the law and protect people's health.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Rother KI, Conway EM, Sylvetsky AC. How non-nutritive sweeteners influence glucose metabolism and appetite. Curr Opin Clin Nutr Metab Care. 2012;15(4):413–419.

[2] Pepino MY, Tiemann CD, Patterson BW, Wice BM, Klein S. Sucralose affects glycemic and hormonal responses to an oral glucose load. Diabetes Care. 2013;36(9):2530–2535. Doi:10.2337/dc12-2221

[3] Puttegowda SKB, Shivaramu M, Manjunath BS, Venkataraman R, Nagarajappa RB. Understanding artificial sweeteners and food colorants—their impact on human health: a review. Indian J Pharm Pract. 2025;18(1):8–15. Doi:10.5530/ijopp.20250089

[4] Paul S, Bandyopadhyay A. Artificial sweeteners: safety, metabolic effects, and regulatory status. Nutr Metab. 2020;17(1):1–12. Doi:10.1186/s12986-020-00463-6

[5] Kossiva L, et al. Long-term health effects of artificial sweeteners: benefits and risks. Nutrients. 2024;16(3):567. Doi:10.3390/nu16030567

[6] Poshala R, et al. Toxicological evaluation of commonly used artificial sweeteners. Food Chem Toxicol. 2020;136:111000. Doi:10.1016/j.fct.2019.111000

[7] More S, et al. Health impacts of artificial sweeteners: a review. J Clin Nutr Diet. 2021;7(2):89–98.

[8] Naik P, et al. Detection of artificial sweeteners in commercial products using HPLC and TLC methods. Int J Food Anal. 2024;12(1):34–42.

[9] Jurcevic Zidar N, et al. Consumer awareness and usage patterns of artificial sweeteners and association with BMI. Public Health Nutr. 2025;28(1):78–87.

[10] Thakur R, Vatika S. Health impacts of artificial sweeteners in India: a review with focus on elderly populations. Indian J Nutr. 2025;13(1):22–30.