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STEVIA REBAUDIANA BERTONI – HEALTH BENEFITS AND TECHNOLOGY APPLICATIONS IN FOOD PRODUCTION. A REVIEW®

Stevia rebaudiana Bertoni – przegląd korzyści zdrowotnych oraz technologicznych zastosowań w produkcji żywności®

Stevia (Stevia rebaudiana Bertoni), a shrub of the Compositae family, is cultivated in many regions of the world for its sweet taste. The sweetness of this plant is a result of steviol glycosides containment, which are 100-300 times sweeter than sucrose. Steviol glycosides have been used as a sweetener and sugar substitute in the food industry. Scientific studies indicate that the regular consumption of steviol glycosides can have a positive effect on health and the human body. Among others they lower blood glucose levels, lower blood pressure and cholesterol, as well as have a protective effect on the pancreas and kidneys. Due to their technological properties, they are used, among others, in the production of beverages and confectionery. Steviol glycosides have the potential to become an important sweetener in the natural food market due to their functional and sensory properties. In combination with other ingredients, they are used to create functional food products with beneficial health properties. ***The aim of the article was is to present the properties of stevia and the steviol glycosides isolated therefrom, highlighting the health and technological benefits and possible applications in the food industry.***

Key words: *Stevia Rebaudiana Bertoni*, steviol glycosides, health benefits, technological process.

Stewia (Stevia rebaudiana Bertoni), krzew z rodziny Compositae, uprawiany jest w wielu regionach świata ze względu na swój słodki smak. Słodycz, roślina ta zawdzięcza obecności glikozydów stewiolowych, 100–300 razy bardziej słodkich niż sacharoza. Glikozydy stewiolowe znalazły zastosowanie jako substancja słodząca, substytut cukru w przemyśle spożywczym. Ze względu na swój bogaty profil odżywczy glikozydy stewiolowe wykazują właściwości biologiczne. Badania naukowe wskazują, że regularne ich spożycie może mieć pozytywny wpływ na zdrowie i organizm człowieka poprzez m.in. obniżenie poziomu glukozy we krwi, obniżenie ciśnienia i cholesterolu, ochronne działanie na trzustkę i nerki. Ze względu na właściwości technologiczne stosowane są między innymi w produkcji napojów i wyrobów cukierniczych. Glikozydy stewiolowe mają potencjał aby stać się ważną substancją słodzącą na rynku żywności naturalnej ze względu na właściwości funkcjonalne i sensoryczne. W połączeniu z innymi składnikami wykorzystywane są do wytworzenia funkcjonalnych produktów spożywczych o korzystnych właściwościach zdrowotnych. ***Celem artykułu jest przedstawienie właściwości stewii i izolowanych z niej glikozydów stewiolowych, z podkreśleniem korzyści zdrowotnych i technologicznych oraz możliwego zastosowania w przemyśle spożywczym.***

Słowa kluczowe: *Stevia Rebaudiana Bertoni,* Glikozydy stewiolowe, korzyści zdrowotne, proces technologiczny.

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INTRODUCTION

Sugar is a commonly used sweetener. It plays an important role in food technology. It is used not only to add a sweet taste, and to reduce a bitter and sour taste, but also to emphasize the intensity of the aroma, to obtain the right texture of different products, the structure, and brown colors of baking products. Sugar also plays a preservative role in jams, marmalades, preserves, and candied fruit. In a temperate climate, it is obtained from sugar beets, while in subtropical countries it is obtained from sugar cane. The composition of beet sugar does not differ from that of a cane sugar. It contains over 99.5% of sucrose and is a source of readily available energy [83].

Taking into account pure and processed sugar, the consumption in Poland in the 1950s was 21–27.9 kg per capita per year. In the 1960s it has increased to 30.6–38.9 kg and subsequently gradually increased to 44.4 kg per capita in 1990. In the last two decades (2000–2019), the total sugar consumption ranged between 38.4–44.5 kg per capita per year. In 2019, a slight decrease in sugar consumption was stated, which amounted to 42.1 kg per capita per year [75].

High average annual sugar consumption is recorded worldwide. In 2017–2019, it was 22.5 kg per capita per year and varied between continents. In Europe, it amounted to nearly 40 kg; in North America about 50 kg; in Latin America 45 kg; in Asia, less than 20 kg; and in Africa about 18 kg per capita per year [64].

The excessive consumption of sugar with various processed products has led the consumers to reduce the amount of sugar in their diets by giving up sweetening their drinks and choosing low-sugar foods. People with higher education more often decide to substitute sugar with sweeteners, including steviol glycosides [68].

Many countries, including Poland (from January 2021) have introducing the so-called sugar tax. In order to meet the expectations of consumers, producers are trying to transform traditional recipes while maintaining the original sensory features. The main criterion for choosing the use of a sweetener is, first of all, the lack of negative impact on human health, the intensity of the sensation of sweet taste, physicochemical properties, such as solubility, stability, availability, and low production costs [44, 82]. Currently, the goal is to replace sucrose in food products with non-nutritive sweeteners from natural sources [53, 56, 70].

Steviol glycosides, due to their functional and sensory properties as well as their beneficial effect on human health, are considered a new, natural sweetener. They have found use, alone or in combination with other sweeteners, in the manufacturing of food products with functional properties. The aim of this review is to present the properties of stevia and the steviol glycosides isolated therefrom, taking into account the health and technological benefits and applicability in the food industry.

DATA COLLECTION

All data presented in this review were summarized from the references, including scientific journals and book chapters. These references were systematically searched against databases: PubMed, Web of Science, Scopus and Google Scholar with a keywords: *Stevia Rebaudiana Bertoni*, steviol glycosides, health benefits, technological process. To search for maximum relative references, the keyword was set as "steviol glycosides and technological process", and restricted to 2000–2020 years.

CHARACTERISTICS OF STEVIA REBAUDIANA BERTONI

Table 1. Comparison of the properties of steviol glycosides and sucrose

Tabela 1. Porównanie cech sacharozy i glikozydów stewiolowych

Sucrose	Steviol glycosides
It gives a sweet taste	They give products a sweet taste but leave a bitter aftertaste
It shapes the color, e.g. in confectionery products	The color does not change during baking
It creates structure, create texture and consistency	No structure-forming properties
It disrupts the hormonal balance	They reduce the symptoms of liver and kidney diseases
Leads to obesity by providing "empty calories"	Calorie-free sweeteners
It contributes to the development of fungi and yeasts	They have antibacterial properties
It promotes the formation of caries	They have anti-caries properties
Extends durability and has a preservative role	They inhibit the growth of mold
It has a low price	High prices of highly purified stevia preparations

Source: Own elaboration based on literature [33, 48]

Źródło: Opracowanie własne na podstawie [33, 48]

Among natural sweeteners, steviol glycosides seem to be a good choice, meeting basically all criteria of a good sugar substitute (Table 1). They are obtained by extraction from the *Stevia rebaudiana Bertoni* plant, which is one of the 154 herbs of the genus Stevia. This one of the two genus of Stevia that produces sweet glycosides, which have much greater sweetening properties than sucrose. On average, they are about 300 times sweeter than sucrose. In terms of sweetening properties and exhibited biochemical properties, *Stevia rebaudiana Bertoni* was considered the most valuable [91]. This plant belongs to the Compositae species, which grows wild in South America and is now cultivated in many regions of the world, including Asia, Europe, and North America [48].

In many countries, stevia is widely used as a sugar substitute in food, drinks, and medicine [1]. Stevia leaves extracts to have better functional and sensory properties than other high-potency sweeteners and have the potential to become the main sweetener in the natural food market [34]. In addition to technological applications, many research results have indicated that regular consumption of steviol glycosides can have beneficial effects on health [1, 77].

Safety of use of steviol glycosides

Due to the sweet taste of the *Stevia rebaudiana Bertoni* plant, its leaves have been used for centuries by the Guarani Indians to sweeten herbal infusions. In countries with traditions of its use, including Paraguay and Japan, no negative effects of its consumption have been documented [10, 86]. The safety of using steviol glycosides has been discussed in the literature, analyzed and considered by numerous regulatory agencies and research organizations. Based on the results of scientific research, in 2008 the European Food Safety Authority established the Acceptable Daily Intake (ADI) of steviol glycosides at the level of 0–4 mg/ kg body weight expressed as steviol equivalent. In 2011 year, steviol glycosides were approved for use in food with the designation E 960 [25].

High-purity stevia leaf extracts have been approved for use in food and beverages in over 150 countries and regions, including the European Union, United States, Middle East, New Zealand, Australia, China, Canada, Japan, Korea, India, Malaysia, Mexico, Brazil, Paraguay, Egypt, Chile, Argentina, Ghana, Kenya, South Africa and many other countries in Asia, Africa, Europe and Latin America [78]. National and international food safety agencies have concluded that steviol glycosides, including the commonly used stevioside and rebaudioside A, are not genotoxic. In recent years, it has been suspected that steviol glycosides may be mutagenic. However, this opinion was based on a limited number of studies [58, 66]. It has been suggested that further in vivo genotoxicity studies are needed to complete the safety profiles of steviol glycosides. Current knowledge regarding *in vivo* and *in vitro* testing of steviol glycosides does not indicate genotoxicity of stevioside or rebaudioside A. In connection with the lack of evidence of cancer development in rat bioassays, the safety of all steviol glycosides with respect to their genotoxicity and carcinogenicity has been established [90]. Abbas Momtazi-Borojeni et al. [1] conducted an extensive meta-analysis of the collected studies, confirming that steviol glycosides are not mutagenic, teratogenic or carcinogenic and do not cause toxicity. The safety of stevia is also largely due to the fact that steviol glycosides are poorly absorbed by both humans and rats in the stomach and the upper intestine [57].

Health properties of steviol glycosides

Steviol glycosides exhibit biological properties. It has been proven that their regular consumption can have a positive effect on health and the human body, as indicated by many authors (Table 2).

Table 2. Health-promoting properties of steviol glycosides

Tabela 2. Właściwości prozdrowotne glikozydów stewiolowych

Effect on health	Source
Lowering blood pressure	[39]
Can be consumed by people suffering from phenylketonuria	[12]
No adverse effects on fertility and reproduction	[1, 12]
Lowering blood glucose levels	[1, 55, 77]
Lowering blood cholesterol	[55]
Inhibition of the growth of cancer cells	[55]
Strengthening blood vessels	[55]
Choleretic action	[48]
Anti-inflammatory acction	[48]
Prevention of ulceration in the digestive tract	[48]
Alleviating damage to the pancreas, kidneys and liver in diabetes	[22, 81]
Anti-caries action	[81]
Most studies indicate positive aspects of steviol glycoside consumption in the diet.	[16, 76, 89, 90]
They show high antioxidant activity	[1, 40, 67, 77]
They limit the growth of many bacteria and infectious organisms, also demonstrating the effect on microorganisms: *Salmonella typhi*, *Aeromonas hydrophila*, *Vibrio cholerae*, *Bacillus subtilis*, *Staphylococcus aureus*	[1, 2, 40,77]
They exhibit antirrotaviral activity by inhibiting the replication of all HRV serotypes and blocking their attachment to the cell.	[54]

Source: Own elaboration based on literature

Źródło: Opracowanie własne na podstawie literatury

Steviol glycosides as a non-caloric sweetener may have an effect on weight loss and thus on obesity. In studies conducted on rats, it was shown a significant decrease in body weight, total cholesterol, triglycerides and low-density lipoproteins, and an increase in high-density lipoproteins in rats that consumed stevia in their diet compared to control rats exposed in diet to sucrose [24]. In a more recent study, diabetic rats given an aqueous extract of stevia leaves for 8 weeks reduced body weight because they reduced their feed and water consumption compared to a control group [3].

Scientists are still working to determine the effects and benefits of human consumption of stevia. Many randomized controlled studies have failed to describe the change in body weight between stevia users and a control group consuming sucrose [51]. However, some authors report a beneficial effect of steviol glycosides in this aspect. In people who consumed stevia and products with their contain, a reduction in the feeling of hunger and the desire to eat was observed compared to the control group [5, 26]. It seems that it is important for diabetics to lower blood glucose levels under the influence of steviol glycosides. This effect is possible due to the inhibition of the activity of α-amylase and α-glucosidase, important enzymes involved in the digestion of carbohydrates [16, 96]. The administration of 500 mg/ kg steviol glycoside extract with diet to diabetic rats resulted in a decrease in their body weight and blood glucose levels. Histopathological examinations also confirmed the protective effect on the pancreas, showing a slight regeneration of structural damage [22]. The meta-analysis also showed that steviol glycosides significantly decreased systolic blood pressure compared to the control group, but no significant effect on diastolic blood pressure [14]. It is also worth emphasizing that steviol, obtained from stevia, has a significant anti-cancer effect against human cancer cells of the digestive tract [20].

Sensory profile of steviol glycosides

The steviol glycosides are responsible for the flavor of the *Stevia Rebaudiana* plant. The main glycosides include stevioside, which constitutes about 65%, and rebiaudoside A constitutes about 25%. The sweetening potential of individual steviol glycosides in relation to sucrose is presented in Table 3.

Table 3. Sweetening potential of steviol glycosides relative to sucrose

Tabela 3. Potencjał słodzący glikozydów stewiolowych w stosunku do sacharozy

Relationship	Sweetening potential		
Stewiol	210–300	–	
Stewiolbiozyd	114	100–125	90
Stewiozyd	200–450	200–450	150–250
Rebaudiozyd A	150–350	150–450	200–300
Rebaudiozyd B	30–120	30–350	150
Rebaudiozyd C	221–450	50–450	30
Rebaudiozyd D	150–300	150–450	221
Rebaudiozyd E	200	150–300	-
Rebaudiozyd F	30–120	30–120	-
Dulkozyd A	90–125	50–125	30
Source	[82]	[19, 29, 37]	[62]

Source: Own elaboration based on literature

Źródło: Opracowanie własne na podstawie literatury

Stevioside is responsible for a bitter and licorice aftertaste that is weaker with rebaudioside A. Rebaudioside A is the most stable in the technological process. At the same time, it shows the best sensory values, has the least bitterness and sour taste than other steviol glycosides. It also has the most desirable sensory profile of all glycosides, as well as greater sweetening power with a lower level of undesirable off-flavors. It is also more thermally stable and more soluble in water compared to stevioside [18, 48, 71, 85]. Solutions of rebaudioside A, compared to solutions of aspartame and sugar (with the same sweetening power), are characterized by the most intense sweet aftertaste. An important feature of steviol glycosides is the persistence of a sweet aftertaste in the mouth for a long time after consumption, despite the feeling of bitterness. This sensation is much longer and is more intense than that of sucrose [48]. In practice, the lowest possible levels of addition of steviol glycosides are used because of the possible potential for undesirable off-flavors. The use of substances such as rice maltodextrin, vegetable glycerin, erythritol, fructo-oligosaccharin, the addition of citric acid and pectin allows to mask the bitter aftertaste and increases the possibilities addition of steviol glycosides [30, 69]. Chranioti et al. [21] found that the bitterness of steviol glycosides also decreased after encapsulation with maltodextrin and inulin if using the spray drying technique. One of the commonly used flavor improvement strategies for stevioside due to enhance the sweetness power is glycosylation which can be carried out using α-amylase from *Aspergillus oryzae* or *Bacillus amyloliquefaciens*, in the presence of soluble starch [92, 93], glucosyltransferase cyclodextrification [94], dextransucrase [43] and alternansachraza [61]. The enzymatic transglycosylation of rebaudioside A by the enzyme glucansachrase from *Lactobacillus reuteri* 180 was also successfully performed, using sucrose as a glucosyl donor [23, 31, 60, 87]. The third most common steviol glycoside found in stevia leaves is Rebaudioside C. It has limited use in the food industry due to its persistent bitterness and low sweetness compared to other glycosides.

The taste profile of steviol glycosides is influenced by the degree of purification and the quantitative proportions between individual glycosides. The undesirable aftertaste of steviol glycosides is related to the impurities left over from the extraction and purification process. Therefore, thanks to the use of the latest traditional and non-genetically modified breeding techniques, new varieties of stevia are created that contain the desired steviol glycosides, such as Rebaudioside M and D, at a level 20 times higher than in the well-known varieties of stevia [72, 73, 78].

Selected technological properties of steviol glycosides

In Japan, stevia has been used by food producers for over 40 years. Salty snacks are the main group of food products in which steviol glycosides have been used. Due to the fact that the combination of stevioside and sodium chloride gives the dish softness, steviol glycosides are used in the production of pickled vegetables, dried seafood, soy sauces and miso [19, 34, 84, 88], and jams [11, 17, 45, 69].

The use of steviol glycosides in beverages

Steviol glycosides are used in the production of beverages due to their sweetening properties and storage stability (Table 4). It was found that in highly acidic products, at elevated temperatures, gradual hydrolysis of steviol glycosides to steviol may take place. However, this does not affect the loss of sweetness, because the resulting steviol is also characterized by strong sweetening properties. It was also found that 160 mg/ l of stevioside successfully replaces 34 g/ l of sucrose in peach juice without negative affecting the sensory properties of the product, while reducing the energy value by 25% [4, 65]. Stevia can be used as a replacement for sucrose in apple and cherry drinks, as it does not affect the sensory experience [9]. The use of steviol glycosides in peach juice sweetened with a combination of sucrose (56 g/ l) and stevia (160 mg/ l) to replace sucrose (34 g/ l), reduced the energy value by 25% without affecting the sensory aspects of the product compared to the sample containing 90 g/ l sucrose. Fruit juices sweetened with steviol glycosides showed a bitter taste as well as a metallic aftertaste [74]. However, it has been shown that the addition of lime flavor effectively masks negative sensory taste [59]. In mango nectar with no added sugar, the use of 3% stevia and 6% inulin allowed to obtain the best mango nectar with the desired value, without undesirable changes in organoleptic and physicochemical properties [8].

Table 4. Application of steviol glycosides in various food groups

Tabela 4. Zastosowanie glikozydów stewiolowych w różnych grupach żywności

Food group	Source
Beverages: – peach juice – apple and cherry drinks – mango nectar – chokeberry juice – cola drinks – ice tea	[4, 8, 9, 38, 65, 72, 79]
Bakery and confectionery products: – muffins – oatmeal cookies – sweet bread – breakfast cereals – cereal bars	[6, 13, 28, 35, 95]
Functional food: – whipped cream with no added sugar – functional fruit juices – high-protein functional cookies – functional wheat bread	[7, 15, 42, 47, 77]
Nutraceuticals: – chlorophylls – phytosterols – polyphenols – carotenoids – tannins	[46, 63]
Dairy: – yoghurts – chocolate milk – frozen milk dessert (kulfi) – rice pudding (kheer) – milk desserts	[32, 36, 41, 49, 50]

Source: Own elaboration based on literature

Źródło: Opracowanie własne na podstawie literatury

Stevia leaves can also increase the nutritional value of beverages, as has been shown with chokeberry juice. Chokeberry juice with the addition of steviol glycosides had a better nutritional composition (high content of vitamin C, carotenoids, total content of chlorophylls and polyphenols) compared to the juice made with the addition of sucrose [79]. Among the carbonated soft drinks on the food market, Coca-Cola Co. and Pepsi Co Inc. have decided to introduce stevia-sweetened beverages, thus reducing the energy value of the drinks [38]. Fruit functional apple and carrot juices with stevia extract showed better sensory values and phenolic profile [42]. The addition of steviol glycosides to strawberry juice increased the content of phenolic compounds, including the total content of phenols, flavonoids and antioxidant capacity. In addition, the authors report [79] that the addition of stevia together with the use of ultrasonic treatment techniques can be an effective strategy for preserving strawberry juices, while increasing their sweetness and antioxidant properties of the resulting beverages. Study results encourage the use of stevia as a replacement for traditional sugar in fruit juices, which may not only lower the energy value and sugar content, but also provide better physicochemical properties and higher nutritional value, positively influencing the effects of fruit juices [15, 80].

The use of steviol glycosides in bakery products and cookies

Stevia can also be successfully introduced as a sucrose substitute in bakery products (Table 4). Replacing sucrose with stevioside on the level of 50 and 100% in bread did not affect the physicochemical and sensory characteristics of the product compared to the traditional composition (100% sucrose) [95]. In other studies, it was found that replacing more than 50% of sucrose with steviol glycosides negatively affected the sensory profile of bakery products, in particular the undesirable aftertaste [53].

Similarly, replacing up to 50% of sucrose in muffins did not affect the texture deterioration, but lowered the glycemic index. In order to improve the sensory features, the addition of cocoa and vanilla turned out to be necessary. However, muffins with 100% sucrose substitution with steviol glycosides showed high notes of bitter aftertaste, were characterized by a hard consistency and dryness, which resulted in the lack of consumer acceptance [28].

Similar relationships were found in oatmeal cookies. Substitution of sucrose with steviol glycosides on the level of 25, 33, 50 and 66% in cookies did not affect their sensory quality. While the addition of 100% stevia contributed to low sensory ratings in terms of taste, color, appearance, texture and overall acceptability [13, 35].

Stevia, as a sucrose replacement, is also used with other sweetening ingredients to produce functional foods (Table 4). A functional whipping cream with improved physical and sensory properties, with no added sugar, was produced. Isomalt and Rebaudioside A, as well as isomalt were used as a sucrose substitute, and maltodextrin is used for improving texture [7]. Low-calorie and high-protein functional cookies, prepared by replacing sucrose at the level of 20% with stevia leaf powder and wheat flour with soy flour, showed high sensory quality [47]. The innovative use of stevia due to its antioxidant properties was to functional wheat bread [77].

The use of steviol glycosides in dairy products

Stevia can be used to produce functional foods as well as nutraceuticals due to contain of extractable biologically active ingredients such as polyphenols, chlorophylls, carotenoids and tannins [46]. Polysaccharides, i.e. fructans, that have been isolated from stevia roots, have also found application in functional and prebiotic foods [52]. Due to the fact that the addition of stevia and food additives does not negative affect the yoghurt-making process, steviol glycosides have been used as sweeteners in the production of yoghurt [36]. The resulting consistency and creaminess are comparable to products with sugar. In yoghurt sample with the addition of only stevia, an unfavorable aftertaste was noticeable, which was masked by the addition of a thickener. According to Lisak et al. [50] natural and flavored yoghurts, sweetened with the addition of stevia, sucrose, and equal proportions of stevia and sucrose in three different concentrations, showed the same apparent viscosity. On the other hand, yoghurts with the addition of 4.5 g/ 100g of equal amounts of stevia and sucrose obtained the best sensory scores. Likewise, chocolate milk partially sweetened with monk fruit and stevia reduced the content of traditional sugar without affecting consumer acceptance [49]. Other authors report the possibility of using stevia in milk drinks and desserts, e.g. Indian kulfi (a frozen product resembling ice cream) or rice pudding (kheer). The sucrose content reduced by stevia in kulfi and kheer was 75 and 67%, which also reduced the energy value [32, 41].

CONCLUSIONS

1. Steviol glycosides have special biological properties, and their regular consumption may have a positive effect on human health and body, for example cause lowering blood glucose levels, lowering blood pressure and cholesterol, and have protective effect on the pancreas and kidneys.
2. Studies confirm that steviol glycosides are not mutagenic, teratogenic or carcinogenic and do not cause toxicity and can be consumed at the acceptable doses.
3. Stevia shows better functional and sensory properties than other high-potency sweeteners and has the potential to become the main sweetener on the natural food market.
4. The use of substances such as: rice maltodextrin, vegetable glycerin, erythritol, fructooligosaccharide, addition of citric acid and pectin allows masking the bitter aftertaste and give the possibility of increasing the addition of steviol glycosides in the designed bakery products, cakes and beverages.
5. Steviol glycosides, according to their sweetening properties and stability during storage, are used in the production of beverages, and also improving their health benefits.
6. Stevia can be a substitute for sucrose in bakery products in amounts not greater than 50% of sucrose, due to its unfavorable effect on the sensory profile of the products.
7. Stevia, as a sucrose replacement, is also used with other ingredients to obtain functional food products with beneficial health properties.

WNIOSKI

1. Glikozydy stewiolowe wykazują właściwości biologiczne, zaś regularne ich spożywanie może mieć pozytywny wpływ na zdrowie i organizm człowieka tj. obniżenie poziomu glukozy we krwi, obniżenie ciśnienia i cholesterolu, ochronne działanie na trzustkę czy nerki.
2. Badania potwierdzają, że glikozydy stewiolowe nie są mutagenne, teratogenne ani rakotwórcze i nie powodują toksyczności oraz mogą być spożywane w określonych dawkach.
3. Stewia wykazuje lepsze właściwości funkcjonalne i sensoryczne od innych substancji słodzących o dużej mocy oraz posiadaja potencjał aby stać się główną substancją słodzącą na rynku żywności naturalnej.
4. Stosowanie substancji, takich jak: maltodekstryna ryżowa, roślinna gliceryna, erytrol, fruktooligosacharyna, dodatek kwas cytrynowego oraz pektyny pozwala na zamaskowanie gorzkiego posmaku i możliwość zwiększenia dodatku glikozydami stewiolowymi w projektowanych wyrobach piekarniczych, ciastach, napojach.
5. Glikozydy stewiolowe dzięki swoim właściwościom słodzącym oraz stabilności podczas przechowywania, stosowane są w produkcji napojów, jednocześnie wpływając na poprawę korzyści zdrowotnych.
6. Stewia może być substytutem sacharozy w wyrobach piekarniczych w ilościach nie większych niż 50% sacharozy, ze względu na niekorzystny wpływ na profil sensoryczny produktów.
7. Stewia, jako zamiennik sacharozy, wykorzystywana jest również z innymi składnikami, aby uzyskać funkcjonalne produkty spożywcze o korzystnych właściwościach zdrowotnych.

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