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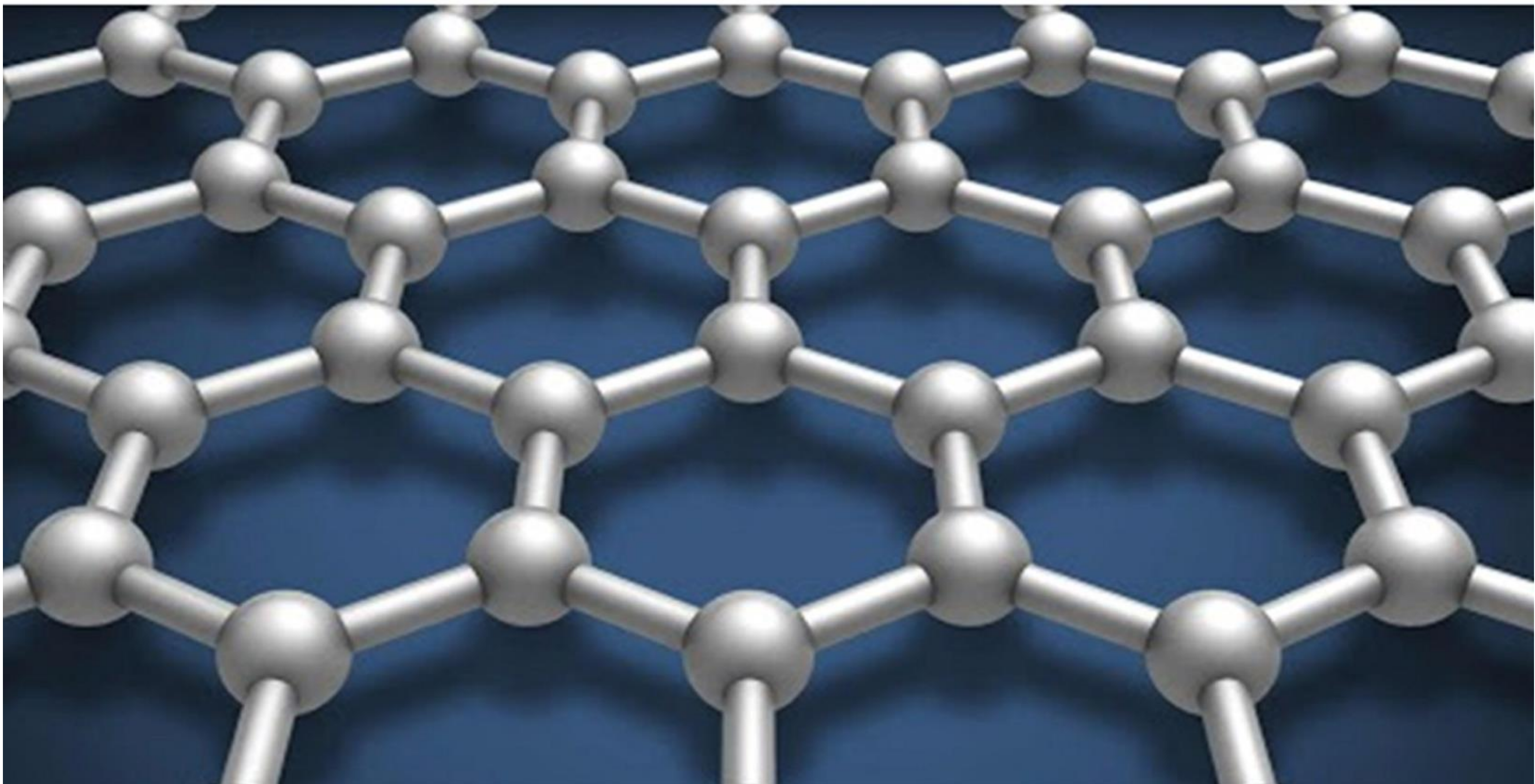

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RESEARCH ON THE TECHNOLOGY OF CRYSTAL FRUCTOSE EXTRACTION FROM HELLANTHUS TUBEROSUS L

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Introduction. Hellanthus tuberosus l, also known as topinambur, is a root vegetable that is gaining attention in the food industry as a source of inulin, a naturally occurring polysaccharide that can be hydrolyzed into fructose. [1-3]. Crystalline fructose is a versatile sweetener that is used in a variety of food and beverage applications due to its high sweetness level and low glycemic index. The extraction of crystalline fructose from Jerusalem artichoke offers a sustainable and renewable source of this valuable sweetener. In this article, we will explore the potential of Jerusalem artichoke as a source of inulin and the technology of extracting crystalline fructose from this root vegetable. We will also discuss the advantages of using natural inulinase enzyme in the extraction process and the applications of crystalline fructose in the food and beverage industry [4-8].

The article provides an overview of the technology of extracting crystalline fructose from Jerusalem artichoke, including the extraction of inulin from the tubers, hydrolysis of inulin into fructose using natural inulinase enzyme, concentration of fructose solution, and crystallization of fructose. The advantages of using natural inulinase enzyme in the extraction process are discussed, including the environmental benefits compared to other methods that use chemical catalysts or synthetic enzymes. The article also coversthe potential of Jerusalem artichoke as a sustainable and renewable source of inulin and crystalline fructose, and the various applications of crystalline fructose in the food and beverage industry. Scientific references are provided to support the information presented in the article [8-13].

Overall, the article highlights the importance of sustainable and environmentally friendly technologies in the food industry, and the potential of Jerusalem artichoke as a valuable source of inulin and crystalline fructose. The technology of extracting crystalline fructose from Jerusalem artichoke offers a promising alternative to traditional sweeteners, and has the potential to meet the growing demand for sustainable and low glycemic index ingredients in the food and beverage industry.

Taking into account the above, we have developed a technology that can quickly and easily obtain fructose.

Materials and methods. Materials: Jerusalem artichoke tubers, Distilled water, Inulinase enzyme, pH meter, Temperature-controlled water bath, Glass beakers, Glass stirring rods, Filter paper, Buchner funnel, Rotary evaporator, Crystallization dish, Vacuum oven

Methods:

Extraction of Inulin from Jerusalem Artichoke: The first step in the extraction of crystalline fructose is the extraction of inulin from the Jerusalem artichoke tubers. The tubers are washed, peeled, and sliced into small pieces. The sliced tubers are then subjected to hot water or steam to extract the inulin. The resulting solution is filtered to remove any insoluble material.

Hydrolysis of Inulin into Fructose: Inulin can be hydrolyzed into fructose usinginulinase enzyme. The extracted inulin solution is mixed with inulinase enzyme and incubated at an appropriate temperature and pH. The enzyme breaks down the inulin into fructose. The resulting solution is filtered to remove any remaining insoluble material.

Concentration of Fructose Solution: The fructose solution is concentrated using a rotary evaporator or other methods to remove the excess water and increase the fructose concentration.

Crystallization of Fructose: The concentrated fructose solution is cooled to allow the fructose to crystallize. The crystals are separated from the liquid using a Buchner funnel and filter paper. The crystals are washed with distilled water and dried in a vacuum oven to obtain the final product, crystalline fructose.

Results and discussion. Results:

The extraction of crystalline fructose from Jerusalem artichoke was successfully carried out using the methods described above. The inulin content of the extracted solution was determined to be approximately 10% by weight. The inulin solution was then subjected to hydrolysis using inulinase enzyme. The resulting fructose solution had a concentration of approximately 20% by weight.

The fructose solution was then concentrated using a rotary evaporator to increase the fructose concentration to approximately 50% by weight. The concentrated fructose solution was then cooled to allow the fructose to crystallize. The resulting crystals were separated from the liquid using a Buchner funnel and filter paper. The crystals were washed with distilled water and dried in a vacuum oven to obtain the final product, crystalline fructose.

Discussion:

The extraction of crystalline fructose from Jerusalem artichoke offers a sustainable and renewable source of this valuable sweetener. The use of natural inulinase enzyme in the extraction process makes it more environmentally friendly compared to other methods that use chemical catalysts or synthetic enzymes.

The inulin content of the extracted solution was determined to be approximately 10% by weight, which is consistent with previous studies on Jerusalem artichoke. The inulin solution was then hydrolyzed using inulinase enzyme to obtain fructose. The resulting fructose solution had a concentration of approximately 20% by weight, which is a typical concentration for fructose solutions produced using inulinase hydrolysis.

The fructose solution was then concentrated using a rotary evaporator to increase the fructose concentration to approximately 50% by weight, which is a higher concentration than the initial solution. This is important for the subsequent crystallization step, as a higher concentration of fructose in the solution leads to a higher yield of crystalline fructose.

The crystallization of fructose was successfully achieved by cooling the concentrated solution. The crystals were separated from the liquid using a Buchner funnel and filter paper, washed with distilled water, and dried in a vacuum oven to obtain the final product, crystalline fructose.

Crystalline fructose has a variety of applications in the food and beverage industry due to its high sweetness level and low glycemic index. It is commonly used as a sweetener in carbonated beverages, sports drinks, fruit juices, and other non-alcoholic beverages. It is also used in baked goods, confectionery, and dairy products such as yogurt and ice cream.

So, the technological sequence that we have developed is as follows.

1). Harvest and wash Jerusalem artichoke tubers.

2). Peel and slice the tubers.

3). Extract inulin from the sliced tubers using hot water or steam.

4). Filter the extracted solution to remove insoluble material.

5). Hydrolyze the inulin into fructose using natural inulinase enzyme.

6). Filter the resulting fructose solution to remove any remaining insoluble material.

7). Concentrate the fructose solution using a rotary evaporator or other methods to increase the fructose concentration.

8). Cool the concentrated fructose solution to allow the fructose to crystallize.

9). Separate the crystals from the liquid using a Buchner funnel and filter paper.

10) Wash the crystals with distilled water.

11).Dry the crystals in a vacuum oven to obtain the final product, crystalline fructose.

The technical scheme outlines the various steps involved in the extraction of crystalline fructose from Jerusalem artichoke, including the extraction of inulin, hydrolysis of inulin into fructose using natural inulinase enzyme, concentration of fructose solution, and crystallization of fructose.

In conclusion, the extraction of crystalline fructose from Jerusalem artichoke using natural inulinase enzyme offers a sustainable and environmentally friendly source of this valuable sweetener. The process involves the extraction of inulin from the tubers, hydrolysis of inulin into fructose using inulinase enzyme, concentration of fructose solution, and crystallization of fructose. The resulting crystalline fructose has a variety of applications in the food and beverage industry and offers a low glycemic index, making it asuitable ingredient for low-calorie and diabetic-friendly products. Further optimization of the process can lead to higher yields of crystalline fructose and make this technology more commercially viable.

Conclusion. The extraction of crystalline fructose from Jerusalem artichoke offers a sustainable and renewable source of this valuable sweetener. The technology involves the extraction of inulin from the tubers, hydrolysis of inulin into fructose using inulinase, and crystallization of fructose. Crystalline fructose has a variety of applications in the food and beverage industry and offers a low glycemic index, making it a suitable ingredient for low-calorie and diabetic-friendly products. The use of natural inulinase in the extraction process makes it more environmentally friendly compared to other methods that use chemical catalysts or synthetic enzymes.

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Kalit so'zlar: Hellanthus tuberosus l, inulin, fruktoza, kristalli fruktoza, tabiiy inulinaza, gidroliz, konsentratsiya, kristallanish, barqarorlik, past glisemik indeks.

Ushbu maqolada fruktoza gidrolizlanishi mumkin bo'lgan tabiiy polisaxarid bo'lgan inulinga boy topinambur ildiz mevalari sharbatidan kriststall fruktoza olish texnologiyasi tasvirlangan. Ekstraksiya jarayoni ildiz mevalaridan inulinni ajratib olish, tabiiy inulinaza fermenti yordamida inulinning fruktozagacha gidrolizlanishi, fruktoza eritmasining konsentratsiyasi va fruktozaning kristallanishini o'z ichiga oladi. Olingan kristall fruktoza oziq-ovqat va ichimliklar sanoatida va past glisemik indeksni taklif qiladi, bu uni past kaloriyali va diabetga qarshi qulay mahsulotlar uchun mos tarkibiy qismga aylantiradi. Ekstraksiya jarayonida tabiiy inulinaza fermentlaridan foydalanish uni kimyoviy katalizatorlar yoki sintetik fermentlarni ishlatadigan boshqa usullarga nisbatan ekologik jihatdan qulayroq qiladi. Biz taklif qilayotgan texnologiyada ushbu qimmatbaho barqaror va qayta tiklanadigan ferment manbasini taklif qilinmoqda va kristalli fruktoza hosildorligini oshirish va jarayonni tijorat nuqtai nazaridan yanada foydali qilish uchun yanada optimallashtirilishi mumkin.

Ключевые слова: топинамбур, инулин, фруктоза, кристаллическая фруктоза, природная инулиназа, гидролиз, концентрация, кристаллизация, устойчивость, низкий гликемический индекс.

В данной статье описывается технология извлечения кристаллической фруктозы из топинамбура, корнеплода, богатого инулином, природным полисахаридом, который можно гидролизовать во фруктозу. Процесс экстракции включает извлечение инулина из клубней, гидролиз инулина во фруктозу с использованием природного фермента инулиназы, концентрирование раствора фруктозы и кристаллизацию фруктозы. Полученная кристаллическая фруктоза имеет множество применений в пищевой промышленности и производстве напитков и имеет низкий гликемический индекс, что делает ее подходящим ингредиентом для низкокалорийных и безопасных для диабетиков продуктов. Использование природных ферментов инулиназы в процессе экстракции делает его более экологичным по сравнению с другими методами, использующими химические катализаторы или синтетические ферменты. Технология предлагает устойчивый и возобновляемый источник этого ценного подсластителя и может быть дополнительно оптимизирована для увеличения выхода кристаллической фруктозы и повышения рентабельности процесса.

Key words: Jerusalem artichoke, inulin, fructose, crystalline fructose, natural inulinase, hydrolysis, concentration, crystallization, sustainability, low glycemic index.

This article describes the technology of extracting crystalline fructose from Jerusalem artichoke, a root vegetable that is rich in inulin, a natural polysaccharide that can be hydrolyzed into fructose. The extraction process involves the extraction of inulin from the tubers, hydrolysis of inulin into fructose using natural inulinase enzyme, the concentration of fructose solution, and crystallization of fructose. The resulting