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BIOTECHNOLOGY FOR INCREASING INULIN CONTENT IN PLANTS

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Abstract
Information is provided on plant species containing inulin, their morpho-physiological characteristics, distribution, composition, and plant cultivation technology.

Keywords: Jerusalem artichoke, Jerusalem artichoke (Helianthus tuberosus L.), Onion (lat. Állium cépa), Watermelon (Citrullus lanatus), Banana (especially green banana), Artichoke (cynara scolymus l.) Ginger (Zingiber officinale).

Introduction

Inulin is a polysaccharide produced by plants, mainly in the roots and rhizomes of plants. It has a probiotic effect, improves the intestinal microbial flora, and is also used in the treatment of diabetes mellitus and the prevention of obesity. Inulin is also valuable for industry, and is widely used in the food, pharmaceutical and cosmetic industries. Increasing the amount of inulin, as well as ensuring its higher production in plants, is an important issue that advances plant biology and biotechnology.[1]

Inulin is mainly a polysaccharide, and performs the functions of energy storage and moisture retention for plants. Inulin also increases the economic value of plants due to its health benefits. Inulin is used in the food industry (e.g. as an alternative to sugar) and the pharmaceutical industry (e.g. as a probiotic) due to its high satiety properties. Genetic modification of these plants and increasing the amount of inulin production using biotechnological methods play an important role.

Results and their Analysis:

There are several biotechnological methods for increasing inulin content. These methods include genetic modification, methods under the influence of microorganisms, with the participation of enzymes, methods of implementing agrotechnical processes and methods of increasing metabolic control under the influence of biostimulators. Each method is based on its own methods and technologies.[2]

The most effective biotechnological method for increasing inulin content in plants is genetic modification. Many enzymes, such as inulinase and inulinose, are involved in the process of inulin production. The activity of these enzymes can be enhanced or changed by genetic modification.

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Introduction of genes related to inulin biosynthesis: Inulin production can be increased by introducing genes that control inulin biosynthesis into plants. Such genes can be associated, for example, with enzymes that catalyze inulin biosynthesis.[3]

Transgenic plants: Introducing new genes that help produce inulin into the genetic makeup of plants increases their inulin production potential. Such plants are often called transgenic plants, and their inulin production process is improved.[4]

In addition, the amount of inulin can be increased by manipulating agrobiotechnological conditions. For example, Jerusalem artichoke (Helianthus tuberosus) contains inulin, and Jerusalem artichoke (Helianthus tuberosus) is mainly used as a feed for livestock.

Inulin is used in medicine in its roots. It is cold-resistant, and since it is a short-day plant, it can also be grown in the northern regions. Its above-ground part can withstand a frost of 6 degrees. Jerusalem artichoke is more adaptable than other cultivated plants to all soil and climatic conditions of Uzbekistan (except for saline lands).

If Jerusalem artichoke is not placed in a crop rotation system very carefully and the number of years it has grown in the ground is not taken into account, it can cause great harm to the plants planted after it, like weeds.[7]

There is information that Jerusalem artichoke has been grown in one place for 10 years, even up to 40 years. However, it is recommended to grow it in one place for 3-4 years. If alfalfa is planted in the land freed from Jerusalem artichoke, it is mowed 5-6 times during the year, as a result of which the sprouts that have grown from the Jerusalem artichoke are lost and the land is cleared of it. The agrotechnical measures used for Jerusalem artichoke are very close to those used for potato cultivation. [5]

Before plowing the land where Jerusalem artichoke is planted in the fall, 30-40 tons of manure and 40 kg of phosphorus fertilizer per hectare are plowed to a depth of 27-30 cm. 25-50 grams of Jerusalem artichoke tubers are planted. If it is cut, its yield may decrease by 25-30 percent. If the tuber is very large (70-100 g), it is advisable to cut it before planting. It is recommended to plant cut tubers only in spring. If planted in autumn, it will not be possible to get the planned harvest from it. 50-60 thousand tubers or 0.6-2.0 tons of seeds are sown per hectare. Jerusalem artichoke is sown in two periods, depending on the climatic conditions in which it is grown, in late February-early March and late October-early November.

The planting depth depends on the size of the tuber being planted, it is planted 5-12 cm deep in a 70 x 35 x 40 cm pattern. After planting, the soil is harrowed once or twice until the seedlings emerge. After the seedlings have fully sprouted, the rows are cultivated after each watering. If weeds have grown, the rows are cut. Jerusalem artichoke is more demanding on the nutrients contained in the soil.

One ton of its crop removes 3 kg of nitrogen, 3.5 kg of phosphorus and 4.5 kg of potassium from the soil. Fertilizing Jerusalem artichoke is one of the most important agrotechnical factors. The plant is quite demanding on nitrogen and phosphorus fertilizers. When planting Jerusalem artichoke, 1.5-20 percent of nitrogen fertilizers and the remaining 20-25 percent of phosphorus fertilizers are applied, after the plant sprouts, 30 percent of nitrogen fertilizers are applied, and during the tillering period - 50 percent. A mixture of potassium fertilizers is applied before

plowing. In general, during the season, it is recommended to feed the land planted with Jerusalem artichoke with 120-150 kg of nitrogen, 70-80 kg of phosphorus and 60 kg of potassium fertilizer per hectare. Plant nutrition is carried out by watering. Jerusalem artichoke is watered 8-10 times during the growing season. The growing season is 120-200 days. The second and third years of Jerusalem artichoke life begin with 2-3 harrowing in early spring.
In the second and third years, the Jerusalem artichoke plant grows, so the rows are cultivated, fertilized and excess growth is removed. Jerusalem artichoke can be propagated not only from rhizomes, but also from stem cuttings. Jerusalem artichoke stems are ready for planting in Uzbekistan at the end of October, and rhizomes - in November**.**

Conclusion

Plants containing inulin are very beneficial for health, as they help improve intestinal microflora, control blood sugar levels, and lower cholesterol levels.
The rich composition of Jerusalem artichoke (Jerusalem artichoke) with inulin, vitamins, and minerals provides it with important benefits in managing diabetes. The inulin in the plant helps to control blood glucose levels without increasing them. At the same time, the antioxidant properties of Jerusalem artichoke and its effect on improving intestinal microflora serve as an effective tool in the fight against diabetes. Therefore, it is recommended to include Jerusalem artichoke in the diet of patients with diabetes, helping to improve overall health.

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