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Review article

Genetically Modified Potatoes: A Novel Approach to Combat Hyperlipidemia

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Abstract

Today, genetically modified organisms (GMOs) are widely used in our daily life and are even used in some regions to produce animal and human feed. Plants are the species most frequently employed in gene therapy. The potato is among the best examples of this type of plant. These days, there are many different genetic varieties of potato plants, including ones with high levels of tolerance to biological and environmental challenges and greater nutritional value. Protein plants are essential for human and veterinary health because they include substances that may be utilized as vaccines, as well as components that support the immune systems of animals and humans. The production of industrial biomaterials requires the use of genetically engineered potato plants.

Key words: genetically modified organism; anti-hyperlipidemic; potato; transgenic plants

Introduction

GMO genes have been deeply embedded in our society and have recently been incorporated into the lives of people and animals in several nations. (Snow et al.,2005) Growing potatoes in spring and selling them in the fall is now permitted under JR Simplot, which was approved by the US EPA and the US Department of Nutrition and Drugs last week. Simplots claims that potatoes don't carry DNA from unrelated organisms; they just contain potato chips. It's not always a genetically altered gene that makes up the DNA molecule. (Turnbull, et al.,2021) Transgenic potato plants containing high levels of the immunosuppressive protein AmA1 were used to save Respondent A. As suggested, the cool potato tubers were unaffected by the spread of all generations of corrosive amino bekee. The production of similar amino acids, like

as tyrosine, cysteine, methionine, and lysine are essential. You have to get to a particular level in order to access potato crops. When it comes to improving a person's diet, these changes can be very beneficial. its use in India to treat the deadliest illnesses and conditions that affect children (Chakraborty et al., 2000).

Increases in 24-ethylsterol, isofcosterol, and sitosterol were shown to improve all sterol levels in both leaves and tubers in transgenic plants. High sterol levels are caused by increases in stable sterols and low and low sterols. In both cases, cholesterol levels—which are non-alkylated sterols—fall. Cloned cDNA-based solanidineglucosyltransferase (SGT) induction is one of the final processes of glycoalkaloid mixtures. Although cholesterol accounts for 15% to 20% of total sterols, it is especially high in eggplants such as potatoes and tobacco (Nicotianarusticam). Cholesterol is low in sterols in many plant species. It has been tried and proven that excessive production of SMT1 or SMT2 in transgenic potato plants promotes lower cholesterol levels, presumably due to increases in cychloratinol and alkylating sterols. This is more common in transgenic potato plants, as SMT2 has a negative impact on plant growth, which is why SMT1 was selected. (Chen et al.,2018) We observe changes in sterol biosynthesis as well as lower TG

levels in potato plants that produce SMT1 at high levels. Lower cholesterol levels in transgenic plants led to the finding of TGA content in light cholesterol, which has been identified as a key pathway in the synthesis of glycoalkaloid. (Arnqvist et al.,2003) Wild tree leaves had higher TGA levels than tubers, covering around 3.3 or 7.1 on the surface in both fresh and dried form. For tubers, the greatest ratios of solanine to chaconine are 1: 3 and 1: 2. Transgenic plants showed a 41% to 63% reduction in TGA levels in their leaves and tubers as compared to normal species. (Dhalsamant et al.,2022) Both -solanine and -chaconine levels decreased, but the ratio of -solanine to -chaconine did not change. It was demonstrated that lower tubers from different sources were linked to lower TGA levels.

Clone 217, for instance, had the lowest TGA in leaves but the highest amount in tubers, while clone 126 had unrelated TGA in these two clones. We recently found that overexpression of GmSMT1 in transgenic tobacco plants lowers cholesterol levels, and similar decreases were seen in this investigation. In any case, when all sterols are evaluated, the cholesterol level of genetically edited clones is not always corrected. In transgenic leaves and tubers, free cholesterol levels decreased, just as empty sterols in stearyl esters were freely dispersed. Lisa Arnqvist and colleagues, 2003 Our results suggest that the increase in cycloartenol and alkylating sterol metabolic transport brought on by GmSMT1 expression may be because alkylating and non-alkylated biosynthetic sterol studies for

compounds. It is recommended that cycloartenol be used to reduce non-alkylated sterols, such as cholesterol. (Sitbon et al.,2001). Since they lack the same SMT1 characteristics, Arabidopsis and SMT1 have similar oxidative effects that result in the propagation of different strains and five strata of total cholesterol levels (Zhou, et al.,1999) (Diner et al., 2000). These results imply that SMT1 is essential for the synthesis of plant sterols.

With the ultimate objective of creating plants that don't produce these deadly chemicals, experts led by Kazuki Saito of the RIKEN Center for Sustainable Resource Science have finally identified the SGA combo component in potatoes. In order to deconstruct the processes involved in SGA merger, Saito's group teamed together with a multidisciplinary consortium of experts from all around Japan. (Goncalves et al.,2021) They began by looking for traits in the potato genome that an achievable role in the cholesterol mix, which is recognized as a fundamental compromise during the production of SGA. (Moreau et al.,2018). Their search turned up two rival traits, sterol side chain reductase 1 and 2 (SSR1 and SSR2), which encode enzymes similar to those involved in the production of cholesterol in organisms. According to a cautiously helpful study by Sawai et al. (2014), SSR2 is primarily responsible for converting antecedent mixtures into cholesterol, which in turn provides access to SGA. Undoubtedly, using a technique known as RNA hushing to precisely inhibit SSR2 resulted in significantly reduced SGA levels without obstructing plant growth. Inspired by these results, Saito and his colleagues extract the SSR2 selectively using modified chemicals called translation activator-like effector nucleases (TALENs).

SMT normalizes plant cholesterol levels in this manner; low cholesterol levels in SMT, which transgenerate an excessive amount of transgenic plants, and high cholesterol levels in plants that destroy SMT support this notion (Diener et al., 2000). The following plants showed weakened cholesterol generation and contained 90% lower levels of SGA compared to unmodified and modified potatoes. (Liou et al.,2024) SSR2 is the primary protein containing the SGA biosynthetic cholesterol toxin in potatoes. Expansion of C-24 cycloarthenol methylation is a significant breakthrough in the production of C-24 alkyl in plants.

For example, both potato plants exhibited considerable suppression of SGA decreases and cholesterol levels in biosynthesis. The conversion of biofuels from the SGA-cholesterol route to the C-induced alkyl pathway 24 may enhance particular C-24 alkyl packing and associated StSSR2 disruption, in addition to the potato StSSR2 issue. Another option is to cancel the trip. SSR2. The transfer levels of campesterol, b-sitosterol, and isofucosterol were observed to be affected differently by St SSR2 and St SSR2 abnormalities. (Kumar, et al.,2020) Many plants, including rhubarb (Rheum spp.), bark (Arachishypogaea), and pine (Pinus spp.), collect stilbens, which are phenolic chemicals. Tropf and associates (1994). Clinical studies show that resveratrol reduces blood cholesterol levels by preventing platelet aggregation in ecosanoid chemicals, which increases heart rate. (Wang et al.,2002)

Conclusion

It's crucial to comprehend how to maximize complex carbohydrates like starch as we move toward a bio-based economy. A deeper comprehension of the starch biosynthesis process, the production of storage starch granules, and the ways in which their size, shape, and content may be altered and optimized for a variety of bio-products is essential for both food and non-food applications. Despite the benefits of biotechnological methods, regulatory obstacles are preventing the production and marketing of crops with altered starch properties. The creation of new plant breeding techniques that would avoid these regulatory problems would significantly benefit in the production of novel starches. Other strategies that have a great deal of promise for identifying key genes influencing starch features include the discovery of genetic markers associated with starch characteristics and the use of new mutations in tilling populations.

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