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Ph.D Plants genetics And breeding

Identification,relative expression some unknown genes involved in the biosynthesis of L.) and the study of the rosmarinic acid in rosemary plants (*Rosmarinus officinalis* immunological properties its essential oil contents

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February 2022

Abstract

Rosemary is one of the useful medicinal plants among different categories of plants due to its many medicinal properties. Many genes are involved in the production of rosmarinic acid that the expression of these genes can be influenced by external (environmental) and internal factors. One of the methods of producing phenolic compounds (especially rosmarinic acid) in plants and increasing them is exposing them to biological and non-biological stresses. Nanoparticles, as one of the non-bioleaders, use their electrochemical properties to interfere with the biosynthetic pathway of compounds in plants. The human innate immune system is controlled and activated by many genes encoding soluble and insoluble molecules. One of the most important of these are PRRs. Due to the importance of rosmarinic acid and its special medicinal properties, this study aimed to identify, express the relative expression of some unknown genes involved in the biosynthetic pathway of rosemary acid (*Rosmarinus officinalis* L.) and study the immunological properties of its extract in Biology and technology research site of Zanjan University was conducted. At first, gold nanoparticles with dimensions of 13-56 nm were extracted and the existence of gold nanoparticles was confirmed by various studies. Then, the genes of rosmarinic acid production pathway were designed through NGS studies. After establishment in two time intervals of 24 hours and 48 hours and the control group (without any treatment) were sprayed with gold nanoparticles at a rate of 30 ppm. The active ingredient was extracted by a double distillation device (Clevenger) and then some of them were used for GC-mass studies as well as immunological studies. The results of this study showed that the genes used in this study identified their genome sequences for the first time in rosemary and also GC-mas studies showed that gold nanoparticles could cause significant changes in many compounds in rosemary and also caused extinction. Expression of some compounds in 24 hour and 48 hour groups or expression of some compounds that were seen with gold nanoparticle treatment but were not present in the control group. In the discussion of immunology, the results obtained by ELISA and qPCR test as well as real timePCR showed that rosemary, especially those samples that were treated with gold nanoparticles for 48 hours and received higher doses of gold nanoparticles, Showed severe anti-inflammatory effects. These effects are seen in two key inflammatory molecules, NFK-B and TLR4. Also, the results of flow cytometry showed that cell samples treated with nanoparticle-impregnated rosemary extract had the highest percentage of apoptosis within 48 hours and reduced the number of living cells in the area where the percentage of necrosis was low. Gold nanoparticles also intensified and changed the production of compounds in rosmarinic acid extract, which could open a new window of research for researchers in the production and purification of these compounds in the future. In parallel research, we showed that gold nanoparticles have the ability to affect the active ingredient of rosemary to improve anti-inflammatory properties in human peripheral blood cells.

Keywords: Immunomodulation, Gene expression, Chemical decomposition, Gold nanoparticles, Gene design