ARTEMISININ PRODUCTION USING GENETIC AND METABOLOMIC ENGINEERING

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Artemisia annua L. also known as sweet wormwood is one of the most popular herbaceous medicinal plant with its therapeutic benefits and application in medicine, from which the substance artemisinin as a valuable for medicine is obtained, but artemisinin is found in a very small amount in A. annua. Its low amount in Artemisia annua makes artemisinin valuable and unique in the world pharmaceutical industry. Many factors influence the amount of artemisinin in a plant, including growing conditions, environment, climate, temperature, soil salinity, water supply, light, and harvest season.

Artemisia annua has become a profitable crop in the countries where artemisinin is considered to be the most sought-after substance and is grown on large areas along with other agricultural crops. Specially optimized agrotechnical measures for the cultivation of this plant have been developed, published as a manual, and widely implemented in practice. Lines and other varieties of the plant A. annua, which produces the most amount of artemisinin, were developed and research was carried out using marker-assisted breeding technology.

Currently, artemisinin extract from Artemisia remains the main source for medicine, and its concentration in this plant is 0.01–1.2% in dry weight, but its content is relatively higher in cultivated varieties. Artemisinin is the most effective agent used in the fight against malaria in the world, as well as its promising properties are reported to combat against several types of cancer, viral diseases like hepatitis, influenza, human immunodeficiency virus (HIV), and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that causes COVID-19 (coronavirus disease 2019).

Today, with the increase in the number of people affected by the diseases, the demand for this substance is also increasing sharply. Because of the low amount in A. annua plant researchers are trying to obtain artemisinin in more amounts in other organisms and plant species using genetic and metabolomic engineering. Several plants and agricultural crops, as well as by analyzing biosynthetic pathways of artemisinin and their responsible genes in our study we have successfully started initial steps of our project. Specific genetic vectors were developed and they were transformed into plant explants, and now we are studying their development in somatic embryogenesis in in vitro conditions in order to obtain whole transgenic plants carrying new vectors/genes.