Advantage of inducing polyploidy on enhancing the productivity of secondary metabolite in medicinal plant

Nouraddin Izadi Jeloudar1, Younes pourbeyrami Hir2, Esmaiel Chamani3

1,2,3 Ph.D. Candidate, Assistant and Full Professor of Horticultural Department of Agriculture and Natural Resources Faculty, Mohaghegh Ardabili University, I.R. Iran

ABSTRACT

Polyploidy is a kind of mutation which led to changes in the chromosome number and it is increasing a genetic diversity in plants kingdom. This event is important in the natural evolution and crop breeding. In most plants polyploidy generally enhance the cell size and increase the flower, inflorescence and leaves size consequently. It means that the production of the secondary metabolites in reproductive and productive organs of these plants is higher than diploids. Polyploidies are considered to exhibit increased gene activity and enzyme diversity, lower transpiration but higher photosynthetic rate, late flowering but over a longer period of time, lower growth rate but higher tolerance to mineral and nutrient stress, enhanced resistance to diseases, drought and cold. Autopolyploidy, multiplication of the same genome as such, probably increases the activity of some weak genes led to enhance the production of secondary substance. For instance, the essential oil in the auto-tetraploid Mentha arevensis was increased 30 percent and in Carum carvi it was 30-85 percent more than diploids. In some plants changing in the ploidy level is accompanied with the morphological and physiological changes. In general, induction of polyploidy by creating of variation in plant characters resulting in increasing the activity of the enzymes involved in the biosynthesis of the secondary metabolites such as: pharmaceuticals, aroma chemicals, total protein, and amino acid content, etc. and affect the quality and quantity of these substances.

Keywords: Diversity, Medicinal plant, Polyploidy, Secondary metabolites