

Abstract

Polyploidy induction is a suitable approach to modify custom traits and also is an effective breeding approach for biodiversity creation. Polyploidy can be an operative method to be utilized to increase biomass and improve medicinal and decorative traits. Leaf, stem and root are considered useful organs among the medicinal herbs. A species in the tetraploid herbs is bigger in compare with neploid. Ajowan is a medicinal herb which has many healing properties such as being Anti-flatulence, Anti-nausea, and Rheumatic pain relief. This research investigates the effect of colchicine on polyploidy induction and also its effect on cytogenetic, morphologic, and physiological characteristics of three ajowoan medicinal herb population (Pakistan, Sistan, and Shiraz). In this research, apical meristem of root is used for caryotype studies. Therefore a factorial experiment is performed on the root of ajowoan based on completely stochastic scheme with 3 iterations using treatments including concentration of colchicine in 4 levels (0, 0.2, 0.5, 0.75, and 1 g/l) and the treatment time in 3 levels (6, 12, 18 hours). Cytogenetic characteristics are utilized by projective analysis. The number of base chromosomes in the examined species was $2n = 2x = 18$. For three populations under study, the highest percentage of polyploidy induction obtained following the immersion of seedlings in the concentration of 0.5 g/l within 6 hours. The treatments affected the number of chromosomes, so that the number of chromosomes of most of the cells was doubled ($2n = 4x = 36$). Then in order to study morphologic and physiologic characteristics of the plant under the effect of colchicine, the treatment of 0.5 g/l within 6 hours was applied on seed and planted in pot, which caused the highest tetraploidy induction percentage. In the investigation of colchicine treatment effect, it was found that tetraploid plants were superior for the traits of “b-chlorophyll, carotenoid, ascorbate peroxidase, catalase and flavonoid, the number of lateral branches, plant height, the number of leaves, main stem diameter, leaf width, and wet and dry weight” and diploid plants were superior for the traits of “a- chlorophyll, anthocyanin, total phenol and protein, the number of flowers, root diameter, and secondary stem diameter”. Among the three populations under study, Pakistan population was superior to the two populations of Sistan and Shiraz.

Keywords: Polyploidy, Ajowan, Chromosomal index, colchicine.



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