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Survey of five *Artemisia* species with different artemisinin contents in view of relative expression of 13 genes involved in artemisinin production, karyology, and nuclear DNA content

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Artemisinin, a sesquiterpene lactone, is an efficacious anti-malarial drug, effective against cancer, hepatitis, and schistosomiasis. Many *Artemisia* species produced lower artemisinin content than *A. annua*. Except for the latter, there are no published studies on the transcription factor and different sesquiterpene synthases competing for the same substrate, farnesyl diphosphate (FDP), which is a precursor of artemisinin. Leaves of five *Artemisia* species with different artemisinin contents were assessed in view of the relative expression of 13 genes involved in artemisinin production, karyology, and genome size. This study identified one novel plant sources of artemisinin (*A. deserti*, 6.40 mg g⁻¹ DW) that performed as well as *A. annua* of Iran (6.27 mg g⁻¹ DW), but inferior to *A. annua* cv. Anamed (14.50 mg g⁻¹ DW) at flowering stage. Four species (*A. annua*, *A. khorassanica*, *A. persica*, and *A. deserti*) were diploid ($2n = 2x = 18$ m), while *A. marschalliana* was tetraploid ($2n = 4x = 36$ m). Among four diploids species, a difference of 9.97 pg in 2C DNA contents [ranged 4.02 (*A. annua*)-13.99 (*A. deserti*)] was distinguished despite having the same chromosome number while, the mean of 2C-value of *A. marschalliana* was 11.50 pg. The high artemisinin content of *A. deserti* is related to the highest genes (mainly ALDH1, CYP, ORA) expression. Because these genes in studied species were found to have a similar expression pattern, enabling us to suggest that ORA is a transcription factor regulating the promoters of artemisinin biosynthetic genes. The superior high-genome *A. deserti* had the highest expression of CPS, GAS, ORA, ALDH1 (178 fold), and CYP (150 fold), verifying that this species may have the vast metabolic capacities. It is noteworthy that this species has 3.5-fold 2C DNA amount compared to *A. annua*.

Biography

Ghasem Karimzadeh received a PhD in Plant Cell Biology from Cardiff University, Cardiff, UK in 1996. He is an Associate Professor in the Department of Plant Breeding, Faculty of Agriculture, Tarbiat Modares University, Tehran, Iran. His research interest areas are cytogenetics, *in vivo*- & *in vitro*-polyploidy induction, ploidy level and secondary metabolites in medicinal plants, plant response to abiotic environmental stresses.

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