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# BIOSYNTHESIS OF SESQUITERPENE LACTONES IN *CYNARA CARDUNCULUS* L.

ELJOUNAIDI K.*, COMINO C.*, MOGLIA A.*, HEHN A.**,***, BOURGAUD F.**,***, CANKAR K.****,*****, MENIN B.******, LANTERI S.*, BEEKWILDER J.****

*) Dipartimento di Scienze Agrarie, Forestali e Alimentari, University of Torino, Via L. da Vinci 44, 10095 Grugliasco (Italy)
**) Université de Lorraine, UMR 1121 Agronomie et Environnement, 2 avenue de la forêt de Haye, 54505 Vandœuvre-lès-Nancy (France)
***) INRA, UMR 1121 Agronomie et Environnement, 2 avenue de la forêt de Haye, 54505 Vandœuvre-lès-Nancy (France)
****) Plant Research International, P.O. Box 16, 6700 AA Wageningen (The Netherlands)
*****) Laboratory of Plant Physiology, Wageningen University, P.O. Box 658, 6700AR Wageningen (The Netherlands)
******) PTP/Rice Genomics Unit, Via Einstein, 26900 Lodi (Italy)

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Globe artichoke (*Cynara cardunculus* var. *scolymus* L., *Asteraceae*) is a cross pollinated perennial crop rich in phenolic and terpenoid compounds. Its bitter taste is due to its high content in sesquiterpene lactones (STLs), a large and diverse group of biologically active plant chemicals characterized by anti-cancer, anti-inflammatory, anti-malarian and antimicrobial proprieties.

The STLs major representatives are cynaropicrin and, to a lesser extent, grosheimin and its derivatives. Cynaropicrin belongs to the guaianolide STL subclass, which derives from the common precursor costunolide. Three enzymes are involved in the costunolide biosynthetic pathway: the Germacrene A Synthase (GAS), which we previously isolated in globe artichoke, the Germacrene A Oxidase (GAO) and the Costunolide Synthase (COS).

In a set of ~19,000 globe artichoke unigenes the partial sequences of putative GAO (CYP71AV5) and COS were identified and the complete sequences obtained through RACE PCR. A BlastP search in GenBank revealed that both the globe artichoke GAO and COS have high homology with the ones of other members of the *Asteraceae* family. In particular GAO showed 95% and 85% identity with the ones of *Saussurea costus* and *Cichorium intybus*, respectively, while COS displayed 86% of identity with the ones of both *Cichorium intybus* and *Lactuca sativa.*

To assess the functional activity of globe artichoke GAO and COS, their full length CDS were cloned in the yeast expression vector pYEDP60 and expressed into *S. cerevisiae* WAT11 strain. The metabolite analysis revealed that the co-expression of globe artichoke GAO and chicory GAS resulted in the biosynthesis of elematrien-12-oic acid (cope rearrangement of germacrene A acid by heat), while the co-expression of feverfew (*Tanacetum parthenium*) GAS, chicory GAO and globe artichoke COS led to biosynthesis of the costunolide. The STL accumulation in different globe artichoke tissues at different developmental stage has been also investigated by LC-MS analyses.