

CYNARA CARDUNCULUS L.: FROM VEGETABLE TO ENERGY CROP

ACQUADRO A.*, PORTIS E.*, SCAGLIONE D.*, MAURO R.P.****, CAMPION B.**,
FALAVIGNA A.**, ZACCARDELLI R.***, RONGA D.*****, PERRONE D.***,
MAUROMICALE G.****, LANTERI S.*

*) DIVAPRA, Plant Genetics and Breeding, University of Torino, Grugliasco (Italy)

**) CRA-ORL, Research Unit for Vegetable Crops, Montanaso Lombardo (Italy)

***) CRA-ORT, Research Center for Vegetable Crops, Pontecagnano (Italy)

****) DACPA Scienze Agronomiche, University of Catania (Italy)

*****) Department of Agricultural and Food Sciences, University of Modena and Reggio Emilia (Italy)

Cultivated cardoon, biomass, energy crop, QTLs

Cynara cardunculus (Asteraceae) is native to the Mediterranean basin and includes: the globe artichoke (var. *scolymus*) and the cultivated cardoon (var. *altilis*), grown respectively for the production of immature inflorescences and fleshy stalks consumed as vegetables, as well as their progenitor wild cardoon (var. *sylvestris*).

The species is perennial and has great potential as a source of renewable energy, thanks to its productivity of lignocellulosic biomass. The calorific value of the three *C. cardunculus* taxa is analogous, however cultivated cardoon has the highest biomass yield, which can reach up to ~19t/ha (energy value ~ 17 MJ/kg).

Within the Project 'CYNERGIA' (funded by the MIPAAF), 9 commercial varieties and local ecotypes of cultivated cardoon are being evaluated for biomass yield (10,000 pt/ha) in three environments located in North and South Italy. During the first year the biomass production reached values up to 8.3 t/ha (dry matter), which is expected to high increase during the second and following years. The estimated Net Energy Balance (NEB) reached values in excess of 100 GJ/ha, with an energy input of 29 GJ/ha. The first year estimated energetic efficiency (NER) was 3.9, it will increase starting from the second year due to both higher biomass production and not need for crop establishment (~ 50% of the energy costs).

A double pseudo-testcross mapping strategy has been previously applied to developed molecular linkage maps based on the F₁ progeny from the cross between a genotype of globe artichoke 'Romanesco C3' (female parent) and one of cultivated cardoon (Altilis 41), contrasting in biomass yield. About one thousand markers were attributed to 17 major linkage groups and 384 SNP markers will be soon mapped by the GoldenGate Assay platform (Illumina). The segregating progeny has been already characterized in autumn 2010 for traits associated to biomass production, and a second round of characterization in year 2011 is in progress. This will make it possible to identify Quantitative Trait Loci related to bio-energy traits, with the goal of future implementation of marker assisted breeding programs.