Proceedings of the Joint Meeting AGI-SIBV-SIGA
Assisi, Italy – 19/22 September, 2011
ISBN **978-88-904570-2-9**

Poster Communication Abstract – 3A.12

MOLECULAR AND PHYSIOLOGICAL ADAPTATION OF *OLEA EUROPEAE* TO LOW TEMPERATURES

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Cold stress, Olea europeae, RNA-seq, chlorophyll fluorescence

Olea europeae is a thermophilic and eliophilic plant species perfectly adapted to warm/hot temperatures of the Mediterranean basin. Growing at colder environmental conditions provides olive oil with peculiar qualitative characteristics, thus cultivation of olive trees is becoming more and more common in Northern Italy, even away from the classically devoted lakesides. This new tendency exposes olive trees of Northern Italy to winter challenges which can affect olive production till plant survival. Even if olive trees have capacity of cold acclimation, winter warm spells can break the acclimation and expose olive plants to high risk of cold damages.

Genotype specific cold tolerance has been reported for olive trees based on empiric knowledge, thus an objective characterization of genotypes based on molecular and/or physiological strategies of cold tolerance would be more suitable. However, so far little is known about the molecular changes induced by exposition of olive trees to low temperatures and no physiological tests have been developed for an *in vivo* rapid screening of cold tolerance of olive plants.

This work aims to study the short and long term molecular changes induced in leaves of olive trees exposed to progressive lowering of temperatures, till light freezing conditions. Two *O. europeae* cultivars contrasting for cold tolerance, the tolerant Dolce Agogia and the sensitive Leccino, have been compared in order to identify gene determinants of cold tolerance. RNA-seq based on Illumina GAIIx platform is being applied for whole transcriptome analysis. Contigs are being *de novo* assembled, then annotated and counted to identify genes differentially expressed in response to cold and between the two genotypes. These analyses will be early improved through sequencing and annotation of the olive genome, cv Leccino (OLEA project). The data will indicate putative candidate genes responsible of the olive adaptation to low temperatures.

In a parallel experiment we assessed the physiological status of the plants through chlorophyll fluorescence. Indeed, cold stress causes photo-inhibition of the photosynthesis, above all impacting on the efficiency of the Photosystem II. The chlorophyll fluorescence of dark adapted leaves (Fv/Fm) measures the potential photochemical activity of PSII, thus allowing the assessment of eventual photo-damages. The two cultivars showed a significant different sensitivity to cold damages on PSII, with the cold sensitive Leccino showing lower Fv/Fm values, in particular at colder temperatures. This result suggests a possible exploitation of chlorophyll fluorescence as an objective tool for *in vivo* screening of olive cultivars for tolerance to low temperature and for phenotyping of the Leccino x Dolce Agogia mapping population with the final aim to identify the genetic bases of olive cold tolerance.