Transnational Access Report

1. General Information

Project Acronym (ID):	MOMEVIP
Project Title	Molecular and metabolic bases of volatile isoprenoid-induced resistance to stresses
Name of Group Leader	Francesco Loreto (CNR)
Name of organization	*Consiglio Nazionale delle Ricerche-Istituto per la Protezione delle Piante (CNR)*

2. Project summary (max. 250 words)

In keeping with the MOMEVIP scientific questions, this experiment focused on the integrated effect of climate change on isoprenoid metabolism, and the consequent response of transgenic isoprene emitting tobacco plants to cumulative stress events.
Using different biophysical approaches (Velikova et al. 2011, Velikova et al. 2012) previous experiments on tobacco have demonstrated that isoprene contributes to maintaining the intactness of cellular structures, and to cell death signaling, through interaction with reactive nitrogen and oxygen species in stressed plants.
Tobacco (*Nicotiana tabacum* cv. Samson) wild type plant, and its azygous lines (A) (which do not emit isoprene), and plants of isoprene-emitting tobacco plants in which a *Populus alba* isoprene synthase gene has been inserted (Vickers et al. 2009), have been used for this study. Two different lines (fourth generation, in which the trait has been stabilized) of transgenic plants (labelled as lines H6 and H12) were used, as these lines have showed the highest rates of isoprene emission.
The experiment aimed to provide new information on isoprene emission and its biological role in plant protection in forecasted climate scenarios.

3. Main achievements (max. 250 words)

Isoprene protection of photosynthetic membranes against thermal stresses has been postulated theoretically (Siwko *et al*., 2007) and recently demonstrated by three biophysical measurements (Velikova *et al*., 2011).
The large joint simulation experiment carried out in the outstanding central facility available at Helmholtz Zentrum in Munich, to reproduce future climate conditions and associated environmental stress intensification, was a unique opportunity to understand how plants (isoprene emitting/non-emitting) can cope with climate change scenarios.
The main idea was to monitor and analyze how primary and secondary metabolism, growth, and development of plants were influenced by higher temperature and increased CO_2, associated with reduced water availability.
Gas exchange and chlorophyll fluorescence have been measured to determine the components of photosynthetic carbon fixation, and volatile secondary metabolites have been measured. From the results of these measurements we have already seen some differences between the lines in the different scenarios.
Also the biomass and the time of flowering gave different results between the lines and scenarios.
Vegetative samples for secondary metabolites, transcriptome and proteome analysis have been collected, but we are still waiting for the results.
The aim of the experiment was to provide new biological insights on how isoprene emission can help plants to cope with a new climate change scenario. We are expecting more interesting results from the destructive analysis.