

eXtra Botany

Obituary

A tribute to Claudio Moser (1968–2024)

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Claudio Moser, a renowned researcher and Head of the Plant Biology and Physiology Unit at Edmund Mach Foundation in San Michele all'Adige (Trento-Italy), passed away on 17 February 2024 at the age of 55.

Claudio was a dedicated and passionate plant scientist with extensive knowledge of plant biochemistry and biology. He was a pioneer in molecular physiology and biotechnology,

particularly as they applied to grapevine (*Vitis* spp.). His enthusiasm for his work, combined with his exceptional ability to maintain an overview and balance within his research group, allowed him to connect people at the right time, fostering a supportive and collaborative environment. This talent was instrumental in establishing numerous partnerships within the grapevine research community, which has been deeply affected by his untimely death due to an uncontrollable illness. The many heartfelt condolences received are a testament to the impact of his loss.

Throughout his career, Claudio demonstrated not only his brilliance as a scientist but also his warmth and reliability as a colleague and friend. His gentle demeanour, patience, and unwavering support made every interaction with him a pleasure. His extensive body of work includes numerous scientific papers (ISI-WEB Researcher ID: B-4686-2010) and presentations at national and international conferences. He supervised or co-supervised approximately 20 theses, mentoring the next generation of scientists.

Born in Trento, Italy, Claudio graduated from the University of Pavia with a degree in Biological Sciences. He then joined the European Molecular Biology Laboratory (EMBL) in Heidelberg, Germany, where he spent 4 years conducting functional studies on the receptor of the signal recognition particle under the supervision of Professor Irmi Sinning (Moser *et al.*, 1997). He earned his PhD in Natural Sciences in 1998. Claudio subsequently undertook a short-term EMBO fellowship at the 'Centro di Fisica degli Stati Aggregati (CNR-CeFSA)' in Trento where he characterized the biochemical interaction between the FstY receptor (*Escherichia coli*) and lipid membranes. He then spent 2 years as a post-doctoral researcher at the GlaxoWellcome R&D Centre in Verona, supported by a European grant, working on expressing the *E. coli* helicase recombinant protein and testing its potential inhibitors.

Early in his career, Claudio focused on biochemical and cell biological studies to understand essential cell activities, such

as the targeting and translocation of secretory and membrane proteins.

In 2001, he joined the Fondazione Edmund Mach (FEM), becoming Head of Research Unit in 2005. From 2017 to 2021 he served as Department Coordinator. His main research interest was functional genomics of grapevine, with particular emphasis on understanding the molecular mechanisms behind fruit development (Pilati *et al.*, 2007, 2014), berry metabolism (Gatto *et al.*, 2008), and plant defence. He was involved in the Pinot Noir genome sequencing project (Velasco *et al.*, 2007) and contributed to uncover the origin of Pinots (Vezzulli *et al.*, 2012). Claudio's research aimed to understand the molecular function of the genes related to grapevine biology and physiology in response to biotic (fungal diseases) and abiotic (drought and heat) stresses (Giacomelli *et al.*, 2012; Faralli *et al.*, 2022). This knowledge supports crop improvement through conventional breeding, novel genomic approaches, and precision agriculture. Over the last decade, he focused on applying new genomic techniques (NGTs) to functional gene studies in grapevine and developed pioneering protocols to regenerate grapevine plants from edited protoplasts, producing DNA-free improved grapevines (Scintilla *et al.*, 2022).

One of the primary goals of the research projects led by Claudio was to increase knowledge about the processes occurring in cultivated grapevine (*Vitis vinifera* L.) during the interaction with pathogens, particularly the agents responsible for significant grapevine diseases, such as downy and powdery mildew as well as grey mould.

Claudio's group extensively studied the genetic mechanisms of resistance of grapevine to downy mildew, focusing on the role of stilbenoid synthesis. This research, which includes quantitative genetics analyses combined with transcriptomics and metabolomics approaches, led to numerous publications (Malacarne *et al.*, 2011; Vezzulli *et al.*, 2019). In collaboration with colleagues from the metabolomics platform at FEM, he isolated new stilbenoid compounds (Mattivi *et al.*, 2011). The importance of having clarified the molecular basis of resistance to downy mildew, not only scientifically, but above all for the potential application to the genetic improvement of the vine, earned the recognition of the research award from the Association of Italian Oenologists in 2013. Claudio's team also explored the biosynthetic pathways of stilbenoids and lignins, using the OneGeneE gene network tool to identify enzymes involved in the final oxidative oligomerization steps (Pilati *et al.*, 2021).

Claudio and his collaborators employed various approaches, including the use of grapevine cell cultures as a model system for studying the basic mechanisms of plant response to biotic and abiotic elicitors. This model helped mimic the time-dependent profile of accumulation of secondary metabolites (Zamboni *et al.*, 2009; Saw *et al.*, 2017).

Their pioneering work provided molecular insights into the dormancy phase of *Botrytis cinerea* during primary infection at

full bloom, only to be reactivated in a second phase of development when the mature berry is favourable for its spread (Haile *et al.*, 2017, 2020). This research led to further investigations on the role of the cell wall in the grapevine response to the fungus (Malacarne *et al.*, 2024).

Claudio also focused on the molecular mechanisms regulating berry ripening. He was among the first to use transcriptomics to identify key genes modulated at véraison, he uncovered the accumulation of reactive oxygen species (Pilati *et al.*, 2007), and described the accumulation of ethylene and abscisic acid (Leida *et al.*, 2016; Pilati *et al.*, 2017). At the molecular level, he investigated the oxylipin and the cuticle biosynthetic pathways (Pilati *et al.*, 2014; Jolliffe *et al.*, 2023), and the accumulation of anthocyanin and flavonol compounds (Costantini *et al.*, 2015; Malacarne *et al.*, 2015).

Over the past decade, Claudio's research aimed to elucidate the function of new genes involved in grapevine susceptibility to target them with NGTs to improve resistance and promote sustainable viticulture. Notable projects included efforts to improve tolerance to downy mildew in important and relevant grapevine cultivars by targeting *DMR6* genes, with evidence provided by Pirrello *et al.* (2021, 2022) and Giacomelli *et al.* (2023). Claudio was especially devoted to 'Chardonnay +', a collaborative project between FEM, the Dutch seed company Enza Zaden BH, and a consortium of local nurseries and wineries. This project aimed to create grapevine clones with enhanced resistance to fungal diseases via DNA-free gene editing. Dutch collaborators in the project noted: 'Claudio was instrumental in creating this team. He brought us together, he kept the spirit positive with his gentle, soft touch, and always with a smile. Claudio kept the overview and connected people at the right time'.

As a dedicated scientist and a caring group leader, Claudio possessed the unique ability to motivate, inspire, and uplift students and postdocs. He guided them through moments of frustration and encouraged them to focus on even the most preliminary findings. His open-mindedness and sensitivity fostered an environment of inclusivity and warmth, making students from various countries feel welcome in his laboratory. Claudio cultivated their curiosity and imparted the rigour necessary for scientific research. From 2021 he also joined the academic staff of the C3A at the University of Trento as adjunct professor teaching the course of Agricultural Chemistry and Biochemistry.

His group will always remember the trays of homemade cakes and pastries that he would bring to lab meetings to celebrate a milestone, or simply start a week with energy. Claudio cherished being part of his research group, enjoying trips and holiday gatherings together.

We had the honour of working with Claudio as mentors, colleagues, and collaborators. His sharp mind, his wisdom, sense of humour, and friendship will be deeply missed. Claudio's legacy will endure through his significant contributions to

plant science and the many lives he touched with his kindness and expertise.

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Conflict of interest

The author declare no conflicts of interest.

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