

Professor Emerita Marijana Krsnik Rasol – an appreciation on the occasion of her eightieth birthday

Professor Emerita Marijana Krsnik-Rasol is a distinguished Croatian biologist, known for her extensive research into plant molecular biology and proteomics. She was born on July 2, 1944, in Zagreb, Croatia. Prof. Krsnik-Rasol's academic journey began with her high school education in Zagreb, followed by her studies in experimental biology at the University of Zagreb's Faculty of Science, where she graduated in 1968. She obtained her master's degree in 1972, with a thesis entitled "Research on plant tumours induced by the bacterium *Agrobacterium tumefaciens*" under the supervision of Prof. Zvonimir Devidé. She earned her Ph.D. in 1983 with a thesis on "Proteins as indicators and regulators of plant cell differentiation" (supervisors Prof. Z. Devidé and Prof. D. Šerman).

After completing her studies, Prof. Krsnik-Rasol worked as a research assistant at the laboratory of electron microscopy of the Ruder Bošković Institute. In 1971, she joined the Division of Botany within the Department of Biology at the University of Zagreb's Faculty of Science as an instructor, to be promoted to assistant professor in 1987. Her professional trajectory continued on its upward path as she moved to the newly founded Division of Molecular Biology in 1989, where she made significant contributions to the field. In 1995, she was appointed associate professor. In 1999, she became a full professor, and in 2004 a tenured professor. She is particularly to be credited with the founding of the laboratory for electrophoretic research on plant proteins. From 1998 to 2000 she was Head of the Department of Biology and from 2002 to 2005 Head of the Division of Molecular Biology. In this role, she was responsible for setting up new laboratories and practicums and organized the relocation of the Department of Molecular Biology to the new building of the Faculty of Science in Horvatovac. She retired in 2011 and was appointed *professor emerita* in 2012.

Marijana Krsnik-Rasol furthered her academic development through advanced studies at prestigious universities throughout Europe. She honed her expertise at the University of Leipzig in 1979, in Heidelberg in 1980, in Hamburg in 1991 and 1995, in Brest in 1993 and in Munich in 1994. As a visiting professor, she contributed to teaching and scientific research at the University of Orleans in 1997, 1998, 1999 and 2004 and at the Karl-Franzens University in Graz

in 1998 and 1999. In 2009, she also spent time at the Ben-Gurion University of the Negev in Beer Sheva, Israel, as part of a bilateral research project.

Prof. Krsnik-Rasol's research focuses on cell biology, in particular the differentiation and tumour transformation of plant cells under controlled *in vitro* conditions. Through light and electron microscopic studies of cellular structures and ultrastructure, she discovered that differentiated plant cells undergoing tumour transformation with the Ti plasmid undergo a process of dedifferentiation that is clearly reflected in the conversion of the developed chloroplasts into a juvenile proplastid form (Acta Bot. Croat. 1974; Plant Physiol. Biochem. 1993; J. Plant. Physiol. 1994). One of her notable discoveries was the identification of changes in the activity and isoforms of the enzymes peroxidase and esterase as early biochemical markers of morphogenesis and tumour transformation in plant cells (J. Dev. Biol. 1991; Biologia Plantarum 1997; Chem. Biol. Interact. 1999). Her work also showed that horseradish tumour cells produce peroxidase in abundance, making them a potential source of this enzyme for biotechnological production (Period. Biol. 1992). In addition, transformed sugar beet cells were found to be a source of betalain pigments, which are used as natural, non-toxic colorants in the food industry (Food Technol. Biotechnol. 2011). Prof. Krsnik-Rasol has contributed to the further development of new laboratory techniques, especially in the field of plant proteomics (Proteomics, 2008). She was the principal investigator of scientific projects funded by the Ministry of Science and Sports, including "Differential protein expression in plant cells" (2006-2011), "Proteins and sugars in plant development" (2002-2005) and "Signaling molecules in plant development" (1996-2002). She also co-lead a bilateral project with Professor Dudy Bar-Zvi from Israel on "Life Under Stress: Molecular Components and Mechanisms of Plant Response to Osmotic Stress" (2010-2011). As a member of the "International Association for Plant Biotechnology" and president of the "Croatian Society for Plant Physiology" she has been actively involved in advancing the study and understanding of plant biology both in Croatia and internationally.

Throughout her career, Marijana Krsnik-Rasol has been devoted to teaching and supervising students. While still an

instructor she led practical courses in Cell Biology and Genetics, and after her advancement in science and teaching positions, she began lecturing in cell biology. She also introduced a new course "Methods for Plant Protein Research", which focused on hands-on work and introduced students to scientific research and the presentation of results. Under her guidance, numerous students completed their bachelor's and master's theses and she supervised several doctoral dissertations. As a guest lecturer, she gave seminars on electrophoretic analysis of plant proteins at the Institute of Plant Physiology at the University of Graz. At the University of Orléans she taught courses in Plant Physiology and Genetics and led practical sessions. She played an active role in the development of new curricula and their adaptation to the recommendations of the Bologna Declaration. Together with Professor Daniel Hagegé, she initiated a joint Master's programme in Molecular Biotechnology (Bioindustrial Techniques) with the University of Orléans and was involved in its implementation. Her teaching was highly rated in student surveys and she was awarded the title "Chevalier dans l'Ordre des Palmes Académiques" by the Ministry of Education of the French Republic. The author of the high school textbook "From Molecule to Organism" (Školska knjiga, 1995–2001) and co-author of subsequent editions of the same textbook (2003–2013), she also collaborated on the high school textbook "Life 1" (Školska knjiga, 2014). She also jointly wrote the university textbook "Electrophoretic Techniques for Protein Research" (Hrvatska sveučilišna naklada, 2011).

The papers cited are listed here according to the order in which they appear in the text:

1. Krsnik-Rasol, M., 1974: Crown-Gall tumors on bean leaves induced by *Agrobacterium tumefaciens*. *Acta Botanica Croatica* 33, 63–67.
2. Lorković, Z., Muraja-Fras, J., Krsnik-Rasol, M., Wrisher, M., 1993: Ultrastructural and biochemical changes in potato tuber cells related to tumorigenesis. *Plant Physiology and Biochemistry* 31, 633–638.
3. Muraja-Fras, J., Krsnik-Rasol, M., Wrisher, M., 1994: Plastid transformation in greening potato tuber tissue. *Journal of Plant Physiology*, 144 (1), 58–63.
4. Krsnik-Rasol, M., 1991: Peroxidase as a developmental marker in plant tissue culture. *The International Journal of Developmental Biology* 35(3), 259–623.
5. Peškan, T., Pedreno, M.A., Krsnik-Rasol, M., Munoz R., 1997: Subcellular localization and polymorphism of peroxidase in horse-radish tumour and teratoma tissue. *Biologia plantarum* 39 (4), 575–582.
6. Krsnik Rasol, M., Čipčić, H., Hagegé, D., 1999: Isoesterases related to cell differentiation in plant tissue culture. *Chemico-Biological Interactions* 119–120, 587–592.
7. Krsnik-Rasol, M., Jelaska, S., Derkos-Sojak, V., Delić, V., 1992: Regeneration and peroxidase activity in horse-radish transformants, *Periodicum biologorum* 94, 105–110.
8. Pavoković, D., Krsnik-Rasol, M., 2011: Complex biochemistry and biotechnological production of betalains. *Food Technology and Biotechnology* 49 (2), 145–155.
9. Supek, F., Peharec, P., Krsnik-Rasol, M., Šmuc, T., 2008: Enhanced analytical power of SDS-PAGE using machine learning algorithms. *Proteomics* 8(1), 28–31.

Professor Biljana Balen
University of Zagreb, Faculty of Science
Department of Biology
Division of Molecular Biology



Professor emerita Marijana Krsnik-Rasol during a field trip to Žumberak – Samobor hills Nature Park, locality Sošice - cret Jarak, organised by the Croatian Plant Biology Society, 2024 (photo: B. Balen).