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BIOGRAPHICAL NOTICE

The 90th birthday of RNDr. Erik Schwarzbach, Dr. agr. habil. (*6 April 1936)



Dr Erik Schwarzbach was a member of the editorial board of the Czech Journal of Genetics and Plant Breeding from 1995 to 2022 and served for several years as co-editor. He continues to review manuscripts, and his work has always been highly valued. I am honoured to write this tribute to his life and achievements.

Our shared interest in barley genetics and resistance to powdery mildew brought us into contact early in our careers. We first met shortly after the collapse of the communist regime at a conference on statistical methods in Slovakia. In 1992, at the Agricultural Research Institute in Kroměříž, where I worked, several units of his patented Jet spore trap (1979) were reproduced under his supervision. The device collected airborne pathogen spores onto living barley leaves from large volumes of air and became widely used in epidemiological studies across Europe. Our collaboration resulted in a joint publication in 1994, and working with him was an invaluable lesson in scientific writing.

Dr Schwarzbach began his career at a cereal breeding station in southern Moravia. He contributed to the development of the spring barley variety Diamant, an X-ray mutant derived from the tall malting variety Valtický. Diamant (registered 1965) was the first variety combining high malting quality with short straw and prolific tillering. It became a founder variety and remains present in the pedigrees of most European malting barleys.

However, Diamant was highly susceptible to powdery mildew. Dr Schwarzbach succeeded in inducing a resistant mutant in Diamant. Its genetic analysis, conducted with Professor Ilse Nover (University of Halle), revealed a recessive mutation conferring resistance to all known mildew races. The mutation differed from resistance genes previously used in breeding but was allelic with several other recessive resistance genes preserved in genetic collections. It was later designated *mlo9*.

Following the invasion of Czechoslovakia by Warsaw Pact armies in 1968, he left for Germany and continued his research at the Technical University of Munich, Faculty of Agriculture in Freising-Weihenstephan. As known *mlo* alleles also caused unfavourable effects, he analysed them in a series of genetic experiments and showed that these could largely be controlled by an appropriate genetic background. This helped to open the way to the broad acceptance of *mlo*-based resistance in modern barley breeding.

He became scientific adviser to the breeder Josef Breun, who utilised the advantages of the *mlo9* mutation and the variety Diamant in breeding the varieties Alexis (1986) and Barke (1996), and later also of *mlo11* in Scarlett (1997). These varieties became, for about two decades, the most widely grown malting barleys in Europe.

At Weihenstephan, under Professor G. Fischbeck, he focused on plant disease epidemiology and collaborated closely with Professor M.S. Wolfe (Cambridge). Together they developed the concept of virulence analysis, describing pathogen populations by the frequency of individual virulence factors rather than by physiological races. He also developed computer programs for multiple-trait selection and for the analysis of field trials with recognition of soil fertility patterns. His habilitation thesis on multiple-trait selection earned him the title Dr. agr. habil.

Supported by a Heisenberg Fellowship, he collaborated with colleagues at Tel Aviv University and the Hebrew University of Jerusalem to select disease-resistant lines of *Hordeum spontaneum* from natural

populations in Israel. The selected lines were tested in Israel against local pathogen populations, and the most promising were subsequently tested against highly virulent European pathotypes in Germany. He crossed the best of these lines (for example 1-B-53 and RS 1-12) with leading European barley varieties and made the resulting prebreeding lines available to breeders. Many commercial varieties were later derived from this work. However, resistance based on *H. spontaneum* genes often proved short-lived under large-scale cultivation because of new pathotypes, in contrast to the durable resistance conferred by *mlo*.

To investigate whether the pathogen could adapt to *mlo*-based resistance, Dr Schwarzbach conducted a renowned multicycle selection experiment. Leaves of *mlo* barley were inoculated with a pure avirulent mildew strain, and spores from occasional colonies were used as inoculum for the next cycle. After about 40 cycles with around 10^7 spores each, infection efficiency increased about 100-fold. The experiment demonstrated the evolutionary potential of powdery mildew under strong selection pressure. To prevent the possible escape of highly adapted strains, the experiment was discontinued.

In 1984, together with L.A.J. Sloodmaker, G. Fischbeck and M.S. Wolfe, he proposed a breeding strategy to preserve the durability of *mlo*-based resistance. The strategy, widely adopted by breeders and still respected today, avoids the use of *mlo* in winter barley breeding, thereby reducing selection pressure for *mlo*-virulence.

In 1982, Dr Schwarzbach moved to Austria to become scientific director of a cereal breeding company near Vienna and lectured at BOKU University Vienna. After the collapse of communist rule in Czechoslovakia, he was appointed Director of the Czech Plant Variety Office, a position he held until retirement.

Following retirement, he resumed mildew research in his home laboratory, analysing airborne powdery mildew samples from Austria, Czechia and western Europe. He investigated possible adaptation of mildew populations to *mlo*-based resistance under agricultural conditions. Although isolates with increased pathogenicity towards *mlo* barley were detected, their pathogenicity never approached the levels observed in the selection experiment. In 2000, he spent six months as a visiting scientist at ETH Zurich.

Deeply concerned about climate change, Dr Schwarzbach follows climate science closely, gives public lectures and writes for the general public. He translated or edited four books on ecology and climate change for the PORTÁL series Encyclopaedia for Schoolchildren. Recently, his hometown published his translation of a recently discovered historical chronicle written in Old German script, reflecting the breadth of his intellectual interests.

He lives in Miroslav, Czech Republic, with his wife, one of his daughters and her family, including three grandchildren. We wish him continued good health, fulfilment in his family life and enduring enthusiasm for his many interests.

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