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Sweet, Jeremy, Lara, Szymon Wojciech, Brus, Jan, Ryan, Philippa and Smykal, Petr (2026) Evolution and future adaptation of rye in Europe. In: Cultivating connections: interdisciplinary insights from Diversicrop, Recrop and Pangeos, 4-6 May 2026, Prague, Czech Republic. (Submitted)

<https://doi.org/10.13140/RG.2.2.28726.2592>

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T3.9. Evolution and future adaptation of rye in Europe

Jeremy Sweet¹, Szymon Wojciech Lara^{2,3}, Jan Brus⁴, Philippa Ryan² & Petr Smýkal⁵

¹*Sweet Environmental Consultants, Cambridge CB24 5JA, United Kingdom*

²*Royal Botanic Gardens, Kew, Richmond, TW9 3AE, United Kingdom*

³*University of West London, Mary's Road, Ealing, London, W5 5RF, United Kingdom*

⁴*Dept of Geoinformatics, Faculty of Science, Palacký University Olomouc, Olomouc, CZ*

⁵*Department of Botany, Faculty of Science, Palacký University Olomouc, Olomouc, CZ*

E-mail: jeremysweet303@aol.com

Rye's 10,000-year history traces its evolution from a Middle Eastern cereal weed to a dominant northern European crop, reflecting strong tolerance to drought, poor soils, low fertility, and temperature extremes. As climate conditions become warmer and more variable, these traits make rye increasingly relevant to future cereal production.

This presentation draws together historical, agronomic and breeding perspectives to assess how rye's biological characteristics align with emerging climate pressures and current crop adaptation needs in Northern Europe.

We show that rye's resilience is not only rooted in its evolutionary history, but can also be strengthened through modern breeding. Hybrid systems are improving yield, disease resistance, and stress stability, while landraces and polyploid research offer underutilised genetic resources for adaptation. At the same time, climate change is expected to intensify threats from ergot, BYDV, rusts, and Fusarium, increasing the need for targeted breeding for flowering traits, virus tolerance, and fungal resistance.

We argue that rye should be repositioned within climate adaptation strategies for Northern Europe, not as a marginal cereal, but as a strategically important crop for climate-resilient agriculture. Its future expansion is likely to depend on genetics and digital agronomy rather than higher inputs.

Acknowledgement: *The authors gratefully acknowledge the financial support from COST Action DIVERSICROP CA22146, supported by COST (European Cooperation in Science and Technology), and colleagues in Diversicrop WG3.*