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The molecular mechanisms underlying the polyploidization of a forage grass

June 5, 2026

Eragrostis curvula plants naturally have two to eight sets of chromosomes, making the forage grass a great model species for studying polyploidy. Photo by USDA-NRCS Tucson Plant Materials Center (PMC) and courtesy of the USDA-NRCS PLANTS Database.

What happens when a species carries more than two sets of homologous chromosomes? *Eragrostis curvula*, a perennial forage grass, serves as a model species for studying polyploidy, in which the nucleus contains more than two sets of chromosomes. This species includes cytotypes with varying ploidy levels and reproductive strategies.

To understand how increased DNA content affects molecular and biological processes, researchers went beyond basic phenotypic analysis and used high-throughput RNA-seq to identify genes regulating these traits. The study revealed that more genes are expressed at higher ploidy levels, suggesting that genome duplication alters the plant's regulatory network rather than simply adding copies with the same instructions. Several genes associated with stress responses, hormone signaling, epigenetic regulation, protein turnover, and cell wall remodeling were specifically modulated at higher ploidies. The study also identified candidate genes involved in lignin biosynthesis and cell wall structure, suggesting a possible trade-off: Higher stress tolerance may come at the cost of reduced forage digestibility.

By identifying ploidy-sensitive genes involved in the ploidy transition, these findings provide valuable insights for breeding *E. curvula* varieties aimed at balancing resilience, biomass quality, and digestibility, supporting sustainable forage production.

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Santoro, D. F., Carballo, J., Pasten, M. C., Gallo, C. A., Albertini, E., & Echenique, V. (2026). Traversing the effects of ploidy changes in different Eragrostis curvula genotypes through high-throughput RNA sequencing. *The Plant Genome*, *19*,

e70227. https://doi.org/10.1002/tpg2.70227

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