



# **Breeding and Genetic Improvement for a Net-Zero Future**

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## Variability and heritability of dry matter yield components of perennial ryegrass (*Lolium perenne* L.) genotypes

D. Sokolović, S. Babić, J. Radović, Z. Lugić, M. Prijović

Institute for forage crops Kruševac, Globoder, 37251 Kruševac, Serbia

### Keywords

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Perennial ryegrass (*Lolium perenne* L.) is one of the most important perennial forage grasses in the northern climate. It is characterized with high quality, digestibility and dry matter yield. The aim of breeding of this species is obtaining cultivars with high stable yield, quality and field resistance, with different time of maturity. Wild populations are good initial breeding material, which have high variability and adaptability what is important prerequisite for selection of superior genotypes. The main disadvantage of that material is lack of uniformity, which is hard to achieve before cultivar registration. In the directed breeding process, despite decreasing of some traits total variability, some desirable level of heterogeneity remain what gives the genotype better adaptability. Nevertheless, improvement of some important agronomic traits interact with value of other ones.

Investigations of variability parameters (variance components and coefficients of variation) and heritability of perennial ryegrass genotypes for agronomic most important traits are shown here, as well as their correlations. Prosperous perennial ryegrass genotypes originated from wild populations were investigated in space-plant nursery (60x60cm). Time of tillering, plant height, sward diameter, number of tillers per plant, dry matter yield (DMY) and crude protein content were investigated. For plant height and DMY the highest differences between genotypic and phenotypic variance components were determined and the lowest heritability (16.4% and 25.4%), respectively. Highest heritability is determined for time of tillering (83.26%) and sward diameter (79.87%). According the data, breeding of genotypes for improvement of these traits could provide effective results in short period. Also high heritability was detected for number of tillers per plant and crude protein content.

It was determined that generally highest variability parameters between genotypes were for number of tillers per plant and DMY. Phenotypic coefficients of variation for these two traits were about 15%, while genotype of plants is responsible for 80% of total phenotypic variations. Also, 91% of variability for time of tillering originated from genotypes, although total variability is relative low (3.77%).

Highest coefficients of correlation were estimated between sward diameter and plant height (0.86), and between plant height and crude protein content (-0.87), respectively. According to determined coefficients of correlations, time of tillering is negatively connected with plant height and number of tillers per plant, while DMY is increasing with late tillering of plants. Higher plants and plants with wider swards showed higher DMY, confirming that breeding of these two yield components in this perennial ryegrass genotypes collection may indirectly result in increasing of DMY. It can be concluded that investigated perennial ryegrass genotypes represent promising germplasm for the further breeding.

Table 1. Indicators of variability and heritability of the agronomically most important traits of perennial ryegrass genotypes

Traits	Genetic CV (%)	Phenotypic CV (%)	Genetic variance	Phenotypic variance	Heritability
Time of tillering	3.44	3.77	4.92	5.92	83.26
Plant height	1.85	4.57	1.83	11.16	16.43
Sward diameter	4.98	5.57	5.95	7.45	79.87
Number of tillers per plant	11.87	14.91	1708.9	2694.3	63.43
DMY	7.51	14.89	64.74	254.96	25.39
Crude protein content	6.56	9.16	1.31	2.56	51.26

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