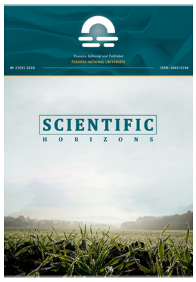
SCIENTIFIC HORIZONS

Journal homepage: https://sciencehorizon.com.ua
Scientific Horizons, 28(1), 41-49



UDC 631.527:633.32
DOI: 10.48077/scihor1.2025.41

Productivity of selection numbers of perennial ryegrass (*Lolium perenne* L.) in the nursery of competitive variety testing

Volodymyr Oleksiak*
Postgraduate Student
Institute of Agriculture of Carpathian Region of the National Academy of Sciences of Ukraine
81115, 5 Hrushevskyi Str., Obroshyne Village, Ukraine
https://orcid.org/0000-0001-9412-2102
Lesia Baistruk-Hlodan
PhD in Agricultural Sciences, Senior Research
Institute of Agriculture of Carpathian Region of the National Academy of Sciences of Ukraine
81115, 5 Hrushevskyi Str., Obroshyne Village, Ukraine
https://orcid.org/0000-0002-8446-5758
Oleg Stasiv
Doctor of Agricultural Sciences, Senior Research,
Institute of Agriculture of Carpathian Region of the National Academy of Sciences of Ukraine
81115, 5 Hrushevskyi Str., Obroshyne Village, Ukraine
https://orcid.org/0000-0003-3737-739X
Hryhorij Konyk
Doctor of Agricultural Sciences, Senior Research,
Institute of Agriculture of Carpathian Region of the National Academy of Sciences of Ukraine
81115, 5 Hrushevskyi Str., Obroshyne Village, Ukraine
https://orcid.org/0000-0003-2841-2982

Article's History:
Received: 10.06.2024
Revised: 09.12.2024
Accepted: 30.12.2024

Abstract. Increasing the efficiency of perennial ryegrass cultivation is possible by improving breeding work and clear organisation of seed production, as the variety plays a decisive role in this process. The purpose of this study was to evaluate promising perennial ryegrass material for productivity in haymaking and pasture use and to select the best numbers for submission for scientific and technical expertise. The study was conducted during 2022-2024 at the Precarpathian Research Department of the Institute of Agriculture of the Carpathian Region of NAAS (Drohobych district, Lviv region). The selection of breeding material and phenological observations were performed following the "Methodology for breeding perennial legumes and cereals in the Carpathian region" (2015) and "Formation and conservation of genetic diversity of forage and lawn grasses in the Carpathian region" (2015). In the competitive variety trial for haymaking, 2 selection numbers

Suggested Citation:
Oleksiak, V., Baistruk-Hlodan, L., Stasiv, O., & Konyk, H. (2025). Productivity of selection numbers of perennial ryegrass (*Lolium perenne* L.) in the nursery of competitive variety testing. *Scientific Horizons*, 28(1), 41-49 doi: 10.48077/scihor1.2025.41.

**Corresponding author*

of perennial ryegrass (PFZ 02082 and PFZ 02514) were distinguished by plant height; 4 numbers – by leafiness (PFZ 02082; PFZ 02136; PFZ 02320; PFZ 02514), 2 numbers (PFZ 02082; PFZ 02514), 2 numbers – by green mass yield (PFZ 02082; PFZ 02514), and 2 numbers (PFZ 02082; PFZ 02514) – by dry matter yield. Under the pasture method of use, the best were the numbers PFZ 02082 and PFZ 02514 in terms of plant height, PFZ 02082; PFZ 02081 and PFZ 02514 in terms of leafiness, PFZ 02082; PFZ 02081; PFZ 02514 in terms of green mass yield, and PFZ 02082; PFZ 02081; PFZ 02514 in terms of dry matter yield. The highest seed yields were provided by PFZ 02082; PFZ 02136; PFZ 02081; PFZ 02514 (0.41 t/ha, 0.39 t/ha, 0.37 t/ha, and 0.35 t/ha). The promising numbers PFZ 02082 and PFZ 02514 for hayfield and pasture use were identified, which will be submitted to the State Scientific and Technical Expertise after multiplication

Keywords: perennial ryegrass; selection; green mass; dry matter; seeds

INTRODUCTION

Perennial ryegrass (*Lolium perenne* L.) is a lowland perennial, loosely bushy cereal. It grows best in areas with sufficient rainfall. When used for pasture, it grows quickly and forms numerous shoots. Generative organs are developed on shoots formed in summer and autumn. It is prone to lodging. It stays in the grass stand for three or more years, forming a dense turf. It reaches full development in the second or third year after sowing. The seed stand is used for one or two years, ripening in the first or second decade of July. The seeds are very crumbly when ripe.

The natural diversity of ecotypes is significant for grassland species. J. L. Blanco-Pastor *et al.* (2019) investigated the genetic structure and origin of perennial ryegrass in 481 populations, finding that it's spread across Europe during the Pleistocene contributed to a decrease in tree dominance in favour of grasses. Modern cultivars are closely related to the natural diversity of northwestern Europe, but do not capture the wide genetic variation of natural populations. T. Keep *et al.* (2020) emphasise the importance of natural genetic diversity for breeding programmes aimed at climate adaptation. Using molecular markers, the researchers identified key associations of genetic traits with phenological characteristics that contribute to adaptation and ecotype differentiation. Genomic predictive models proved effective in breeding for adaptive and agronomic traits.

Over the past decades, the problem of climate change (specifically global warming) has become extremely relevant. Rising temperatures affect a series of physiological processes (including photosynthesis). The growth rate of perennial ryegrass plants, their productive longevity in grass stands and high fodder quality depend on meteorological and soil conditions. K. Jaškūnė *et al.* (2020) note that global warming will affect agriculture, which will suffer from reduced water availability. Due to changes in precipitation, moderate summer droughts are expected to become more frequent even in temperate regions. The researchers assessed the response to moisture deficit for perennial ryegrass genotypes using a high-precision phenotyping platform. The study revealed phenotypic variation in growth-related traits and major differences in leaf growth under normal conditions in subgroups of lawn and pasture-type cultivars. Phenotypic data were combined with genotypic variants identified by sequencing genotyping to perform a genome-wide association study.

P. Beukes *et al.* (2021) predicted the yield of perennial ryegrass in New Zealand under climate change and identified optimal and risky areas for cultivation, taking into account changes since the middle of the last century, and emphasised the need to develop better adapted plant varieties for pastures that can cope with the challenges of climate change. S. Khulan *et al.* (2021) conducted a study to determine the effect of temperature and salinity on seed germination. The findings revealed that seed germination occurred over a wide range of salinities (0 to 100 mM NaCl) and temperatures (15-30°C), with the highest germination between 0 and 25 mM NaCl at 15-20°C. Plants were capable of germinating under moderate salinity conditions and germinating as normal when salinity conditions were removed, but at optimum temperatures. A. Lina and A. Escobar-Gutiérrez (2022) determined the germination of perennial ryegrass plants of various origins at varying temperatures. Temperature was the key factor controlling plant development. Overall, the relative growth rates of roots and shoots were slow at 5°C, peaked within 25-30°C, and then decreased sharply. These findings indicate high genetic variability in the source material in terms of the response to temperature at the initial stages of ryegrass plant development.

A prominent element in plant breeding is resistance to diseases and pests. K. Jaškūnė *et al.* (2022) point out that fungal diseases (in particular crown rust) can also lead to serious losses in seed yields as they affect plant growth and development. In some varieties, this can reduce yields by up to 30% and impair feed quality. As the disease also reduces plant vigour and competitiveness, the composition of plant mixtures is gradually changing. Increased tolerance and resistance to rust is a genetically determined trait that can be controlled by various breeding methods. The fastest and most efficient way to develop varieties is to combine phenotypic and molecular breeding. D. Chapman *et al.* (2023) conducted research on ryegrass plants and obtained several highly efficient and widely adapted combinations of varieties and endophytes (Epichloë) for pasture production in New Zealand. The coefficients of increase in yield, nutritional value, phenological and morphological traits, as well as the economic value of these traits were estimated among the functional groups of ryegrass by date of cultivation, ploidy, etc. Z. Chen *et al*. (2020) stated that soil with low nutrient content is the key factor limiting the normal growth and development of plants. This study was conducted to determine the effect of the endophyte Epichloë on the growth, survival, and nutrient content of *Lolium perenne* L. under low fertility conditions. P. P. Freitas *et al*. (2020) also covered this issue while investigating the endophyte *Epichloë sp*. in perennial ryegrass plants.

Apart from varieties with greater yields, the demand for lawn varieties is constantly growing. K. Wolski *et al*. (2021) found that grass mixtures based on the dominance of perennial ryegrass are described by higher quality for football fields (and, accordingly, lawns) compared to grass mixtures based on red fescue (*Festuca rubra* L.). The values of the 6 studied traits (general visual appearance, turf, colour, leaf blade width, disease susceptibility, and overwintering) were statistically different depending on the year and mixtures. T. Głąb *et al*. (2021) investigated the effects of plant growth regulators, which are widely used in lawns to reduce mowing frequency and inhibit the development of generative shoots. However, they can also affect turf colour, density, and resistance to trampling. Competitive variety trials are a key part of the breeding process in the development of varieties. As of 2024, 40 varieties of perennial ryegrass were included in the State Register of Plant Varieties Suitable for Distribution in Ukraine. These include 30 varieties of foreign selection and 10 varieties of Ukrainian selection (Ruslana, Mriia, Dovbushanka, Aitera, Slavetna, Vinnytska, Kyivska 101, Obrii, Drohobytskyi 16, Osyp). Two varieties (Drohobytskyi 16 and Osyp) were selections of the Institute of Agriculture of the Carpathian Region of the National Academy of Agrarian Sciences (State Register of Plant Varieties., 2021).

However, despite the considerable number of varieties, further breeding improvement of this crop is necessary. Therefore, the purpose of this study was to investigate the selection numbers of perennial ryegrass in competitive variety testing and to identify promising numbers for economic and valuable indicators.

MATERIALS AND METHODS

Field studies were conducted during 2022-2024 at the Precarpathian Research Department of the Institute of Agriculture of the Carpathian Region of the National Academy of Agrarian Sciences (Drohobych district, Lviv region) on soddy-medium podzolic surface-alkaline medium acid loam soils formed on deluvial deposits. The key agrochemical parameters of the arable (0-20 cm) layer of these soils were as follows: humus content by Tyurin (DSTU 4289:2004, 2005) – 1.22 %, pH of salt extract (potentiometric method) (DSTU ISO 10390:2007, 2009) – 4.6; hydrolytic acidity (Kappen-Hilkowitz) (DSTU 7537:2014, 2015) – 4.23 mg-eq. per 100 g of soil; Hr (sum of absorbed bases) (DSTU 8806:2018, 2019) – 11.8 mg-eq. per 100 g of soil; mobile forms of phosphorus (according to Kirsanov) (DSTU 4405:2005, 2006) – 118 mg, exchangeable potassium (according to Kirsanov) (DSTU 4405:2005, 2006) – 82 mg, easily hydrolysed nitrogen (according to Kornfild) (DSTU 7863:2015, 2016) – 108 mg per 1 kg of soil.

To evaluate the biological characteristics and productivity of perennial ryegrass in 2021, a competitive variety testing nursery was established in the summer sowing season. Accounting and phenological observations were performed in the second and subsequent years of the crop's life (2022-2024). The predecessor was pure fallow. Agricultural technology of perennial ryegrass cultivation in the experiment is generally accepted for the Western region of Ukraine. The material for the research in the competitive variety testing nursery was 6 selection numbers of perennial ryegrass. The standard was the Osyp variety of the Institute of Agriculture of the Carpathian region of NAAS (Table 1).

Table 1*. Characteristics of selection numbers of perennial ryegrass used in the nursery of competitive variety testing*

Institutional registration number	Sample
PFZ 00735(St)	St Osyp (standard)
PFZ 02082	individual selection from No. 1679 (hybrid population of Drohobytskyi 16× Alduva)
PFZ 02136	mass selection from No. 1112 (selection from Sviatoshynskyi)
PFZ 02081	individual selection from No. 1678 (individual selection from No. 907)
PFZ 02320	individual selection from No. 1098 (individual selection from the local Lithuanian population No. 3474 / 660)
PFZ 02514	long-term mass selection from No. 1684 (individual selection from No. 980 (Drohobytskiy 16)

Source: *compiled by the authors of this study*

The registered area of the plots for fodder productivity was 2.5 m^2, seed productivity – 5 m^2, sowing area – 10 m^2. Replication was fourfold. Yields of green mass, dry matter, and seeds were determined for haymaking and pasture use. The selection of breeding material and phenological observations were performed according to the "Methodology of selection of perennial leguminous and cereal grasses in Precarpathia" (2015) and "Formation and preservation of genetic diversity of forage and lawn grasses in Transcarpathia" (2015). The fodder productivity was recorded for haymaking (two mowings) and pasture (four mowings) methods of use. For haymaking use, mowing was recorded in the phase of earing – beginning of flowering, and for pasture use – at the beginning of pasture ripeness at a grass height of 15-25 cm.

The yield of green mass and dry matter was determined by mowing and weighing the grass, followed by the conversion of green mass to dry matter by the percentage of shrinkage of 1 kg test sheaves. Seed yield was recorded by threshing, wiping, cleaning, and weighing separately from each plot. The findings obtained during the analysis were expressed as a percentage, rounded to the nearest whole number, for each trait. The statistical processing of the data on fodder and seed productivity was performed by the method of analysis of variance on a PC using a special application program for Windows 98.

The weather conditions of 2022-2024 had a series of specific features, which helped to evaluate the selection numbers for the main productivity indicators in a more comprehensive way. In 2022, during the growing season (March–August), the average monthly temperature was 14.1°C, with a long-term average of 12.3°C. The amount of precipitation during the growing season was 316.2 mm, compared to the long-term average of 509 mm. In 2023, the average monthly temperature for the growing season was 14.2°C. The amount of precipitation during the growing season was 737.7 mm. The average monthly temperature for the growing season in 2024 was 15.4°C, while the amount of precipitation was 493.7 mm. In conducting the study, the authors followed the standards established by the Convention on Biological Diversity (1992) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (1979).

RESULTS AND DISCUSSION

During the three years of observations, the average monthly temperature of the growing season of perennial ryegrass exceeded the long-term average. In terms of precipitation during the growing season, in 2022 it was insufficient (316.2 mm), in 2023 excessive (737.7 mm), and in 2024 close to the long-term average (493.7 mm). Thus, during the study, there were significant differences from the average long-term data of precipitation and temperature during the growing season, which helped to better assess the specific features of the development of fodder and seed productivity of perennial ryegrass (Table 2).

***Table 2**. Meteorological indicators of the vegetation period of perennial ryegrass for 2022-2024 (according to the meteorological station of Drohobych)*

Year	Month					
	March	April	May	June	July	August
Average monthly air temperature, °C						
2022	2.5	7.3	15.1	19.5	20.3	20.0
2023	5.5	7.9	13.5	17.1	20.1	20.9
2024	6.1	11.5	14.5	19.4	20.9	19.9
Average long-term indicator	1.8	7.9	13.2	16.2	17.6	17.0
Total precipitation per month, mm						
2022	15.8	53.6	25.8	36.9	85.9	98.2
2023	85.2	71.4	46.1	187.9	217.3	129.8
2024	71.1	44.7	44.2	91.2	127.0	115.5
Average long-term indicator	38.0	53.0	97.0	119.0	110.0	92.0

***Source:** compiled by the authors of this study*

On average, for three years of research in the nursery of competitive variety testing, the height of selection numbers of perennial ryegrass under haymaking method of use ranged from 75 cm (PFZ 02081) to 79 cm (PFZ 02082; PFZ 02514), daily growth ranged between 0.67-1.20 cm (PFZ 02320) to 0.68-1.21 cm (PFZ 02081), and leaf area was between 42.0% (PFZ 02081) to 43.9% (PFZ 02082). In terms of green mass yield relative to the standard, the following selection numbers exceeded the standard: PFZ 02082 (+2.7 t/ha) and PFZ 02514 (+1.5 t/ha). In terms of dry matter yield, the numbers PFZ 02082 (+0.4 t/ha) and PFZ 02514 (+0.1 t/ha) exceeded the standard with LSD_{05} at 0.23–0.35 (Table 3).

Table 3. Productivity of perennial ryegrass selection numbers in the nursery of competitive variety testing under haymaking method of use, average for 2022-2024

Samples	Plant height, cm		Daily growth	Leafiness, %		Green mass yield, t/ha		Dry matter yield, t/ha	
	average	± to St	average	average	± to St	average	± to St	average	± to St
St-Osyp	77	-	0.69-1.20	42.7	-	25.8	-	6.7	-
PFZ 02082	79	+2	0.69-1.13	43.9	+1.2	28.5	+2.7	7.1	+0.4
PFZ 02136	77	-	0.68-1.19	43.0	+0.3	23.8	-2.0	6.0	-0.7
PFZ 02081	75	-2	0.68-1.21	42.0	-0.7	23.7	-2.1	5.9	-0.8
PFZ 02320	76	-1	0.67-1.20	43.3	+0.6	23.4	-2.4	6.0	-0.7
PFZ 02514	79	+2	0.67-1.25	43.0	+0.3	27.3	+1.5	6.8	+0.1
LSD_{05} 2022	1.29			0.93		1.13		0.35	
2023	1.63			0.63		1.15		0.32	
2024	0.97			0.35		1.03		0.23	

Source: *compiled by the authors of this study*

Under the pasture method of use, the height of the selection numbers of perennial ryegrass ranged from 22.8 cm (PFZ 02136; PFZ 02320) to 24.3 cm (PFZ 02514), daily growth ranged between 0.67-0.70 cm (PFZ 02136; PFZ 02081) to 0.70-0.74 cm (PFZ 02514), and leaf area was between 71.4% (PFZ 02320) to 74.6% (PFZ 02082). In terms of green mass yield relative to the standard, a significant excess was observed in three selection numbers: PFZ 02514 (+1.7 t/ha), PFZ 02081 (+1.2 t/ha), PFZ 02082 (+1.1 t/ha) with LSD_{05} at 0.59-1.01. In terms of dry matter yield, the excess compared to the standard was in PFZ 02514 (+0.6 t/ha), PFZ 02081 (+0.4 t/ha), and PFZ 02082 (+0.3 t/ha) with LSD_{05} at 0.25-0.32 (Table 4).

Table 4. Productivity of perennial ryegrass samples in the nursery of competitive variety testing for pasture use, average for 2022-2024

Samples	Plant height, cm		Daily growth	Leafiness, %		Green mass yield, t/ha		Dry matter yield, t/ha	
	average	± to St	average	average	± to St	average	± to St	average	± to St
St-Osyp	23.3	-	0.68-0.74	73.5	-	26.5	-	6.6	-
PFZ 02082	24.2	+0.9	0.69-0.72	74.6	+1.1	27.6	+1.1	6.9	+0.3
PFZ 02136	22.8	-0.5	0.67-0.70	72.5	-1.0	23.3	-3.2	5.8	-0.8
PFZ 02081	23.2	-0.1	0.67-0.70	73.6	+0.1	27.7	+1.2	7.0	+0.4
PFZ 02320	22.8	-0.5	0.68-0.74	71.4	-2.1	24.9	-0.6	6.3	-0.3
PFZ 02514	24.3	+1.0	0.70-0.74	74.1	+0.6	28.2	+1.7	7.2	+0.6
LSD_{05} 2022	0.88			1.02		1.01		0.25	
2023	0.20			1.01		0.74		0.32	
2024	0.99			1.05		0.59		0.26	

Source: *compiled by the authors of this study*

On average, over the three years of research, the number of generative stems was between 481 (PFZ 02320) and 682 (PFZ 02136); the number of seeds per ear was between 24 pcs. (PFZ 02514) and 26 pcs. (PFZ 02082; PFZ 02081); vegetation period – between 106 days (PFZ 02082) and 111 days (PFZ 02081; PFZ 02320); thousand-kernel-weight was between 2.40 g (PFZ 02514) and 2.46 g (PFZ 02081). The following numbers exceeded the standard in terms of seed yield: PFZ 02136 (+0.08 t/ha), PFZ 02082 (+0.06 t/ha), PFZ 02514 (+0.04 t/ha), PFZ 02081 (+0.02 t/ha) (Table 5).

Table 5. Seed productivity and structural elements of perennial ryegrass selection numbers in the nursery of competitive variety testing, average for 2022-2024

Samples	Quantity, pcs.			Vegetation period, days	TKW, g	Seed yield, t/ha	
	generative stems		seeds in the ear			average	± to St
	average	± to St					
St-Osyp	554	–	25	110	2.41	0.33	–
PFZ 02082	642	+88	26	106	2.42	0.39	+0.06
PFZ 02136	682	+128	25	110	2.44	0.41	+0.08
PFZ 02081	584	+30	26	111	2.46	0.35	+0.02

Table 5. Continued

Samples	Quantity, pcs.			Vegetation period, days	TKW, g	Seed yield, t/ha	
	generative stems		seeds in the ear			average	± to St
	average	± to St					
PFZ 02320	481	-73	25	111	2.42	0.29	-0.04
PFZ 02514	619	+65	24	108	2.40	0.37	+0.04
LSD_{05} 2022	33.7		0.46	1.54	0.04	0.02	
2023	51.1		0.22	1.32	0.03	0.02	
2024	46.0		0.24	1.25	0.03	0.02	

Note: *TKW – thousand-kernel-weight*
Source: *compiled by the authors of this study*

The development of vegetative and generative organs depends on the supply of moisture and nutrients to plants. It is known that there is a direct correlation between yield, plant height, and green mass, as stems and leaves are the primary organs that transport organic and mineral substances. Researchers noted a direct correlation between leaf area and vegetative mass formation. A. Dzyubaylo *et al.* (2020) investigated the fodder productivity of sown grass, revealing the influence of the botanical composition of the mixture (specifically, perennial ryegrass) on productivity. G. Heineck *et al.* (2020) studied the relationship between fodder and seed production in perennial ryegrass plants, disease and pest resistance in the state of Minnesota, USA. V. Moisienko and T. Sladkovska (2019) found that high productivity of grasses can be obtained only in crops that effectively form the optimum leaf surface area capable of active work for a long time. A prominent factor that influenced the formation of leaf area of perennial ryegrass was the variety. I. Komar *et al.* (2020) pointed out that seed production is significant for the success of perennial ryegrass varieties but is limited by the complexity of yield components and low correlations between breeding and production environment, the study showed that seed yield per ear affects overall plant yield. The fidnings suggested that increased competition in the nursery and selection for high fertility can more accurately identify the best plant material compared to environments with less competition.

T. Sladkovska *et al.* (2022) investigated herbs with significant phytoremediation capacity (*Lolium perenne*, *Festuca rubra*, and *Poa pratensis*). These species are among the basic ones in lawn mixtures and can be used for phytoextraction of lightly contaminated agricultural soils or for phytostabilisation of soils with low or moderate concentrations of trace elements. Herbs have considerable potential for stabilising trace elements in soil, sediments, and wastewater. M. Scotton (2018) studied the seed production process of the major grass species in temperate pastures (specifically, perennial ryegrass). Investigating the seed production of herbaceous species can help to conserve grassland habitats and restore new high-value grasslands. J. Pranga *et al.* (2021) monitored the biomass yield of perennial ryegrass, although the reliability of the methods they developed needs to be confirmed with independent data (other samples, locations, years, etc.). Scientists demonstrated that the combination of multispectral imagery and radio frequency modelling approaches can provide accurate yield forecasts for perennial grasses.

A series of scientists have conducted research on samples of other types of perennial cereals and legumes in breeding nurseries. O. Perehrym *et al.* (2020) investigated creeping clover samples in preliminary and competitive variety testing. The researchers identified No. 1076, which provided a yield of green mass of 38.6 t/ha, dry matter of 5.85 t/ha, seeds of 0.18 t/ha for haymaking, and 47.8 t/ha of green mass and 7.19 t/ha of dry matter for pasture. M. Chomiak (2019) studied 16 samples of *Dactylis glomerata* L. for the environmental parameters of plasticity and stability under the influence of environmental changes. The researcher identified valuable genetic sources with high indicators of the main environmental parameters of the green mass yield. Overall, all researchers noted the significance of investigating the selection numbers of crops in the context of climate change with the subsequent transfer of selected promising numbers for scientific and technical expertise. The findings obtained should be considered when creating varieties of perennial grasses for specific uses and selecting parental components for hybridisation.

CONCLUSIONS

As a result of phenological observations, it was found that the duration of the vegetation period of the studied ryegrass accessions from the beginning of the growing season to economic ripeness in 2022-2024 ranged from 106 days in selection number PFZ 02082 to 111 days in numbers PFZ 02081 and PFZ 02320. According to the yield of green mass, on average for three years of research in haymaking, the numbers PFZ 02514, PFZ 02081, PFZ 02082 stood out, which considerably exceeded the standard by 1.7 t/ha, 1.2 t/ha, and 1.1 t/ha, respectively. In terms of dry matter yield, the best were the selection numbers PFZ 02082 and PFZ 02514, which gave an increase of 0.4 t/ha and 0.1 t/ha, respectively.

For pasture use, the numbers PFZ 02514, PFZ 02081, and PFZ 02082 stood out, exceeding the standard in terms of green mass yield by 1.7 t/ha, 1.2 t/ha, and

1.1 t/ha, respectively, and dry matter yield by 0.6 t/ha, 0.4 t/ha, and 0.3 t/ha, respectively. Selection numbers PFZ 02136, PFZ 02082, PFZ 02514, and PFZ 02081 stood out for their seed yields, which were 0.41 t/ha, 0.39 t/ha, 0.37 t/ha, and 0.35 t/ha of seeds, which is 0.08 t/ha, 0.06 t/ha, 0.04 t/ha, and 0.02 t/ha greater than the standard. At the next stages of selection work, promising numbers (PFZ 02082 and PFZ 02514) were identified, which will be multiplied for submission to the State Scientific and Technical Expertise.

ACKNOWLEDGEMENTS

None.

CONFLICT OF INTEREST

The authors of this study declare no conflict of interest.

REFERENCES

[1] Beukes, P., Babylon, A., Griffiths, W., Woodward, S., Kalaugher, E., Sood, A., & Chapman, D. (2021). Modelling perennial ryegrass (*Lolium perenne*) persistence and productivity for the Upper North Island under current and future climate. *Resilient Pastures – Grassland Research and Practice,* 17, 297-306. doi: 10.33584/rps.17.2021.3450.
[2] Blanco-Pastor, J.L. *et al.* (2019). Pleistocene climate changes, and not agricultural spread, accounts for range expansion and admixture in the dominant grassland species *Lolium perenne* L. *Journal of Biogeography,* 46(7), 1451-1465. doi: 10.1111/jbi.13587.
[3] Chapman, D.F., Ludemann, C.I., Wims, C.M., & Kuhn-Sherlock, B. (2023). The contribution of perennial ryegrass (*Lolium perenne* L.) breeding to whole pasture productivity under dairy cattle grazing in New Zealand. 2. Rates of gain in production traits and economic value. *Grass and Forage Science*, 78(1), 85-100. doi: 10.1111/gfs.12589.
[4] Chen, Z., Jin, Y., Yao, X., Chen, T., Wei, X., Li, Ch., White, J., & Nan, Z. (2020). Fungal endophyte improves survival of *Lolium perenne* in low fertility soils by increasing root growth. Metabolic activity and absorption of nutrients. *Plant and Soil*, 452, 185-206. doi: 10.1007/s11104-020-04556-7.
[5] Chomiak, M. (2019). The manifestation of stability and plasticity of orchard grass (*Dactylis glomerata* L.) variety-samples in Pre-Carpathian conditions. *Foothill and Mountain Agriculture and Stockbreeding,* 65, 133-145. doi: 10.32636/01308521.2019-(65)-12.
[6] Convention on Biological Diversity. (1992, June). Retrieved from https://zakon.rada.gov.ua/laws/show/995_030#Text.
[7] Convention on International Trade in Endangered Species of Wild Fauna and Flora. (1979, June). Retrieved from https://zakon.rada.gov.ua/laws/show/995_129#Text.
[8] DSTU 4289:2004. (2005). *Soil quality. Methods for determination of organic matter.* Retrieved from https://online.budstandart.com/ua/catalog/doc-page.html?id_doc=56400.
[9] DSTU 4405:2005. (2006). *Soil quality. Determination of mobile phosphorus and potassium compounds by the Kirsanov method in the modification of the SIC IGA*. Retrieved from https://online.budstandart.com/ua/catalog/doc-page?id_doc=60252.
[10] DSTU 7537:2014. (2015). *Soil quality. Determination of hydrolytic acidity.* Retrieved from https://online.budstandart.com/ua/catalog/doc-page?id_doc=62116.
[11] DSTU 7863:2015. (2016). *Soil quality. Determination of easily hydrolysable nitrogen by the Cornfield method*. Retrieved from https://online.budstandart.com/ua/catalog/doc-page.html?id_doc=62745.
[12] DSTU 8806:2018. (2019). *Steel channels, bent, equipolar. Product range*. Retrieved from https://online.budstandart.com/ua/catalog/doc-page.html?id_doc=78665.
[13] DSTU ISO 10390:2007. (2009). *Soil quality. Determination of pH (ISO 10390:2005, IDT).* Retrieved from https://online.budstandart.com/ua/catalog/doc-page.html?id_doc=29452.
[14] Dzyubaylo, A.G., Marcinko, T.I., & Golovchuk, M.I. (2020). Formation of productivity of leguminous-cereal grass mixtures depending on fertilizer. *Foothill and Mountain Agriculture and Animal Husbandry*, 67(1), 39-54. doi: 10.32636/01308521.2020-(67)-1-3.
[15] Formation and preservation of genetic diversity of fodder and lawn grasses in Transcarpathia. (2015). Obroshino.
[16] Freitas, P., Hampton, J., Rolston, M., Glare, T., Miller, P., & Card, S. (2020). A tale of two grass species: Temperature affects the symbiosis of a mutualistic Epichloë endophyte in both tall fescue and perennial ryegrass. *Frontiers in Plant Science*, 11, aticle number 530. doi: 10.3389/fpls.2020.00530.
[17] Garett, Heineck, G.C., Ehlke, N.J., Altendorf, K.R., Denison, R.F., Jungers, J.M., Lamb, E.G., & Watkins, E. (2020). Relationships and influence of yield components on spaced-plant and sward seed yield in perennial ryegrass. *Grass and Forage Science*, 75(4), 424-437. doi: 10.1111/gfs.12499.
[18] Głąb, T., Gondek, K., & Szewczy, W. (2021). Effects of plant growth regulators on the mechanical traits of perennial ryegrass (*Lolium perenne* L.). *Scientia Horticulturae*, 288, article number 110351. doi: 10.1016/j.scienta.2021.110351.

[19] Jaškūnė, K., Aleliunas, A., Statkeviciute, G., Kemesyte, V., Studer, B., & Yates, S. (2020). Genome-wide association study to identify candidate loci for biomass formation under water deficit in perennial ryegrass. *Frontiers in Plant Science*, 11, article number 570204. doi: 10.3389/fpls.2020.570204.
[20] Jaškūnė, K., Kemesyte, V., Aleliunas, A., & Statkeviciute, G. (2022). Genome-wide markers for seed yield and disease resistance in perennial ryegrass. *The Crop Journal,* 10(2), 508-514. doi: 10.1016/j.cj.2021.07.005.
[21] Keep, T., *et al.* (2020). High-throughput genome-wide genotyping to optimize the use of natural genetic resources in the grassland species perennial ryegrass (*Lolium perenne* L.). *Genes Genomes Genetic,* 10(9), 3347-3364. doi: 10.1534/g3.120.401491.
[22] Khulan, S., Yeongmi, Y., Ser-Oddamba, B., & Jin-Woong, Cho (2021). Understanding seed germination of forage crops under various salinity and temperature stress. *Journal of Crop Science and Biotechnology,* 24, 545-554. doi: 10.1007/s12892-021-00101-9.
[23] Komar, O., Bobos, I., & Fedosiy, I. (2022). Adaptive potential of fenugreek species at different sowing times. *Plant and Soil Science,* 13(1), 17-26. doi: 10.31548/agr.13(1).2022.17-26.
[24] Lina, A.Q., & Escobar-Gutiérrez, A.J. (2022). Unexpected intraspecific variability of perennial ryegrass (*Lolium perenne* L.) in response to constant temperature during germination and initial heterotrophic growth. *Frontiers in Plant Science*, 13, article number 856099. doi: 10.3389/fpls.2022.856099.
[25] Methodology of selection of perennial leguminous and cereal grasses in Precarpathia: methodical recommendations. (2015). Obroshino.
[26] Moisienko, V.V., & Sladkovska, T.A. (2019). Formation of the leaf surface of phytocenoses of perennial ryegrass in conditions of climate change. *Scientific Reports of NUBiP of Ukraine*, 3(79), 21-29. doi: 10.31548/dopovidi2019.03.011.
[27] Perehrym, O., Baystruk-Hlodan, L., & Ivantsiv, R. (2020). The results of preliminary and competitive variety testing of white clover in the conditions of Peredkarpattya. *Foothill and Mountain Agriculture and Stockbreeding,* 68(2), 104-117. doi: 10.32636/01308521.2020-(68)-2-7.
[28] Pranga, J., Borra-Serrano, I., Aper, J., De Swaef, T., Ghesquiere, A., Quataert, P., Roldán-Ruiz, I., Janssens, I. A., Ruysschaert, G., & Lootens, P. (2021). Improving accuracy of herbage yield predictions in perennial ryegrass with UAV-based structural and spectral data fusion and machine learning. *Remote Sensing*, 13(17), article number 3459. doi: 10.3390/rs13173459.
[29] Scotton, M. (2018). Seed production in grassland species: Morpho-biological determinants in a species-rich semi-natural grassland. *Grass Forage Science*, 73(3), 764-776. doi: 10.1111/gfs.12359.
[30] Sladkovska, T., Wolski, K., Bujak, H. (2022). A review of research on the use of selected grass species in removal of heavy metals. *Agronomy,* 12(10), article number 2587. doi: 10.3390/agronomy12102587.
[31] State Register of Plant Varieties Suitable for Distribution in Ukraine for 2021. (2021). Retrieved from https://minagro.gov.ua/napryamki/roslinnictvo/reyestr-sortiv-roslin-ukrayini/reyestr-sortiv-roslin-ukrayini.
[32] Wolski, K., Markowska, J., Radkowski, A., Brennensthul, M., Sobol, Ł., Pęczkowski, G., Bujak, H., Grzebieniarz, W., Radkowska, I., & Khachatryan, K.. (2021).The influence of the grass mixture composition on the quality and suitability for football pitches. *Scientific Reports*, 11, article number 20592. doi: 10.1038/s41598-021-99859-9.

Продуктивність селекційних номерів пажитниці багаторічної (*Lolium perenne* L.) в розсаднику конкурсного сортовипробовування

Володимир Олексяк
Аспірант
Інститут сільського господарства Карпатського регіону
Національної академії аграрних наук України
81115, вул. Грушевського, 5, с. Оброшине, Україна
https://orcid.org/0000-0001-9412-2102
Леся Байструк-Глодан
Кандидат сільськогосподарських наук, старший науковий співробітник
Інститут сільського господарства Карпатського регіону
Національної академії аграрних наук України
81115, вул. Грушевського, 5, с. Оброшине, Україна
https://orcid.org/0000-0002-8446-5758
Олег Стасів
Доктор сільськогосподарських наук, старший науковий співробітник, член-кореспондент
Національної академії аграрних наук
Інститут сільського господарства Карпатського регіону
Національної академії аграрних наук України
81115, вул. Грушевського, 5, с. Оброшине, Україна
https://orcid.org/0000-0003-3737-739X
Григорій Коник
Доктор сільськогосподарських наук, професор, член-кореспондент
Національної академії аграрних наук
Інститут сільського господарства Карпатського регіону
Національної академії аграрних наук України
81115, вул. Грушевського, 5, с. Оброшине, Україна
https://orcid.org/0000-0003-2841-2982

Анотація. Підвищення ефективності вирощування пажитниці багаторічної можливе за рахунок поліпшення селекційної роботи та чіткої організації насінництва, адже визначальну роль при цьому відіграє сорт. Метою дослідження була оцінка перспективного матеріалу пажитниці багаторічної за ознаками продуктивності при сінокісному та пасовищному способах використання та виділення кращих номерів для передачі на науково-технічну експертизу. Дослідження проведено протягом 2022-2024 рр. в Передкарпатському відділі наукових досліджень Інституту сільського господарства Карпатського регіону НААН (Дрогобицький район Львівської області). Підбір селекційного матеріалу та фенологічні спостереження проводили згідно з «Методологією селекції багаторічних бобових і злакових трав у Передкарпатті» (2015) та «Формування та збереження генетичного різноманіття кормових і газонних трав у Передкарпатті» (2015). У конкурсному сортовипробуванні при сінокісному способі використання було виділено за висотою рослин 2 номери пажитниці багаторічної (PFZ 02082; PFZ 02514); за облиствленістю 4 (PFZ 02082; PFZ 02136; PFZ 02320; PFZ 02514), за врожайністю зеленої маси 2 номери (PFZ 02082; PFZ 02514), за врожайністю сухої речовини 2 номери (PFZ 02082; PFZ 02514). При пасовищному способі використання за висотою рослин кращими були номери PFZ 02082 та PFZ 02514, за облиственістю PFZ 02082; PFZ 02081 та PFZ 02514, за врожайністю зеленої маси номери PFZ 02082; PFZ 02081; PFZ 02514, за врожайністю сухої речовини PFZ 02082; PFZ 02081; PFZ 02514. Найбільший показник врожайності насіння забезпечили номери PFZ 02082; PFZ 02136; PFZ 02081; PFZ 02514 (0,41; 0,39; 0,37 та 0,35 т/га). Виділено перспективні номери PFZ 02082 та PFZ 02514, сінокісно-пасовищного напряму використання, які після розмноження будуть передані на Державну науково-технічну експертизу

Ключові слова: пажитниця багаторічна; селекція; зелена маса; суха речовина; насіння