STUDY ON THE VARIABILITY IN DRY MATTER CONTENT OF SEVERAL *LOLIUM PERENNE* L. LINES MAINTAINED AND PRESERVED AT ARDS LOVRIN

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Abstract*: Preserving biodiversity in the agricultural landscape is a real challenge for this historical period of humanity, a challenge that arises from the need to understand the combined functions of agrobiodiversity - ecological and social - of its contributions to both the ecosystem and society. At present, about 90% of the food production is provided by approximately 120 species of crop plants. Besides the drastic reduction of specific diversity, with the advent of industrialized agriculture, an intensified process of genetic erosion has begun. Romania has the largest variety of regional and traditional plants in Europe: a "true treasure" (Friedrich Wilhem Graefe zu Baringdorf). There is a significant number of traditional varieties in Romania, as evidenced by the collection at the Gene Bank from Suceava - Romania. The traditional old seeds, the old germoplasm of the Romanian local populations, formed under the influence of natural selection, are a very precious heritage, an endangered wealth. In any research activity, the use of a properly and fully, correctly and fully biologically characterized, such as that existing germplasm collections, is a necessity. The germoplasm collection of the Lovrin Agricultural Research and Development Station, consisting of more than 2000 clones, was sampled from the plain permanent grasslands of the Banat Plain area and from the permanent grasslands of Caras-Severin, Arad and Hunedoara counties. After applying multiple selection cycles to the Lolium perenne ecotypes, 10 lines were selected, depending on the position of the shoots, the precocity and the width of the leaf. The 10 Lolium perenne lines were sown at the end of August 2017, and the first results on dry matter production were made in 2018. Three mowings were made, the share of which in the final production was the following: 48% at the first mowing; 34% at the second mowing; 18% at third mowing. By reference to the mean of all the results, the highest yield was obtained on the Lolium perenne 3 line (with a difference of 0.55 t/ha of dry matter), followed by the Lolium perenne 1 line (with a difference of 0.46 t/ha dry matter).*

Keywords: *Lolium perenne, dry matter, maintenance, conservation*

INTRODUCTION

Preserving biodiversity in the agricultural landscape is a real challenge for this historical period of humanity, a challenge that arises from the need to understand the combined functions of agrobiodiversity - ecological and social - of its contributions to both the ecosystem and society (CRISTEA, M. , 1983; KRAUSS, S.L., HE, T.H. , 2006).

One of the worst consequences of unfortunate anthropic activities is the extinction of many species. Over the course of its existence, man has used over 10,000 species of crop plants (ENJALBERT, J. N. ET Al., 2013).

At present, about 90% of the food production is provided by approximately 120 species of crop plants. Besides the drastic reduction of specific diversity, with the advent of industrialized agriculture, an intensified process of genetic erosion has begun (LARA-FIOREZE, A. C. C. ET. AL., 2013).

Romania has the largest variety of regional and traditional plants in Europe: a "true treasure" (F. W. GRAEFE ZU BARINGDORF, 2007). There is a significant number of traditional varieties in Romania, as evidenced by the collection at the Gene Bank from Suceava - Romania.

In order to be able to use a seed in the European Union (Directive 98/95 EEC transposed into Romanian legislation by L266 / 2002), the variety must be entered in a Official Catalog. DUS criteria (Distinction, Uniformity and Stability) in local varieties as well as high registration costs and obligatory chemical treatment will lower traditional local seeds that are innaturally and historically adapted to organic and traditional agriculture.

Traditional vegeal resources refer to local or traditional varieties and to their seeds - traditional, local or peasant seeds (PLATON, 2012). According to plant breeder HARLAN J.R. (1975), traditional seeds produce distinct local varieties (local, traditional, peasant varieties), adapted to several variants of natural and cultural interactions to wich the species have been gradually exposed.

In Directive 2008/62/EC, "local varieties" ("conservation varieties") are defined as "a population or clone of a plant species which is or naturally adapted to the conditionsthe environment of their region. "Local varieties represent crop populations that are in balance with their environment and remain relatively stable over a long period of time (International Council for Plant Genetic Resources, 1980).

A local variety is a dynamic population of a plant cultivated with a history of origin, a distinct identity lacking in the formal improvement of species, as well as of various genetic diversity, adapted to the local level and associated with traditional farming systems.

Types of local varieties:

- the primary variety - has never been subjected to formal reproduction, has developed due to the selection;
- the native variety - a variety cultivated in the original location, if it has developed its unique characteristics;
- allochthonous variety - a variety grown in a different location from that of origin;
- secondary variety - a variety that has been developed in the plant breeding sector, but for several years it is maintained by ”in situ” cultivation and selection.

For thousands of years farmers, especially peasants around the world, have produced, selected, improved and created new varieties of cereals, vegetables and various other plants. Moreover, they have respected the earth and the rules of nature. In ancient times there was no question of protecting genetic resources or the problem of sustainable agriculture because people knew clearly that a civilization that loses its seeds and destroys soil is a dying civilization (GUILLET, 2002).

The traditional old seeds, the old germoplasm of the Romanian local populations, formed under the influence of natural selection, are a very precious heritage, an endangered wealth. In any research activity, the use of a properly and fully, correctly and fully biologically characterized, such as that existing germplasm collections, is a necessity.Traditional varieties exhibit high adaptability to biotic and abiotic conditions (drought, pests, various diseases) as well as remarkable food quality that could justify their higher price compared to commercial varieties (SANCHEZ, E. ET AL, 2008).

Local varieties generally represent an inestimable genetic potential for obtaining new varieties of plants (NEGRI, 2003). Moreover, heterogeneity allows them to adapt permanently to changing natural conditions and take advantage of interactions with other plants. Also, in order to ensure long-term food security in the context of global warming, a rich genetic diversity will be needed.

Conservation of genetic resources in germplasm collections has as main objective the preservation of the genetic diversity of species/genus/plant populations that can subsequently be available for scientific and economic activities.

The germplasm collection is constituted from the representative genetic material of a species or genre that is kept/maintained safely, the genetic integrity of this material being kept from one generation to the next by vegetative propagation or by *in vitro* propagation.

Conservation ”in situ” and ”ex situ” are the two great strategies used to preserve plant genetic resources. Between these two strategies there is a fundamental difference: ”ex situ” conservation involves the sampling, transfer and storage of the population of a particular species away from the original site, while conservation ”in situ” (in the natural habitat) involves determining the variety of interest, management and monitoring their place of origin, within the community to which they belong (NEGRI ET AL., 2009, VETELÄINEN ET AL., 2009).

MATERIAL AND METHODS

The research were carried out on a typical chernozem soil, slightly gluey, epicalytic, medium loam-clay with the following agrochemical characteristics (0-20 cm depth): pH (H_2O) = 6.60; humus content of 3.55%; N-index of 3.07; mobile P content of 75.7 ppm; mobile K content of 205 ppm; the degree of saturation in bases (V) of 80%.

During the 2017/2018 agricultural year, the monthly average temperature (September 2017 - August 2018) was 12.8 ^{o}C, compared to the 10.9 ^{o}C multiannual monthly average, with a difference of 1.9 °C. The highest deviation from the multiannual monthly average was recorded in the growing season (April to August), by 2.92 ^{o}C higher, and the months with the highest temperatures were October 2017 (12.5 ^{o}C), January 2018 (5.3 ^{o}C), April 2018 (16.5 ^{o}C), May 2018 (19.9 ^{o}C), Jun (21.9 ^{o}C), August 2018 (24.7 ^{o}C).

Table 1

The main climatic elements (1 September 2017 - 31 August 2018)

Elemente climatice		2017				2018								AVERAGE/ TOTAL
		IX	X	XI	XII	I	II	III	IV	V	VI	VII	VIII	
Rainfall (mm)	Decade I	0	0	3	0	18	27	25	38	0	77	23	40	251
	Decade II	7	0	16	11	30	11	26	2	29	54	3	14	203
	Decade III	27	32	15	5	5	20	35	0	21	21	59	4	244
	Monthly average	34	32	34	16	53	58	86	40	50	152	85	58	698
	Monthly multiannual average	42.6	40.5	48	39.7	32.3	29.8	32.6	42.9	56.8	67.8	55.8	32.5	521.3
	Deviation	-8.6	-10.5	-13	-23.7	20.7	28.2	53.4	-2.9	-6.8	84.2	29.2	25.5	176.7
Temperature (t^0C)	Monthly average	17.7	12.5	6.5	2.9	5.3	0.8	3.6	16.5	19.9	21.9	22.3	24.7	12.8
	Monthly multiannual average	16.8	11.1	5.5	2.8	-1.1	0.8	5.2	10.7	16.3	19.8	22.2	21.7	10.9
	Deviation	0.9	1.4	1	0.1	6.4	0	-1.6	5.8	3.6	2.1	0.1	3	1.9

Over the same period, the annual rainfall was 698 mm, compared to 521.3 mm multiannual average (by 176.7 mm higher). The months with excess humidity are: January (20.7 mm), February (28.2 mm), March (53.4 mm), Jun (84.22 mm), July (29.2 mm), August (25.5 mm). During the vegetation period, only April (-2.9 mm) and more (-6.8 mm) recorded a rainfall shortage compared to the multiannual average (Table 1).

The germoplasm collection of the Lovrin Agricultural Research and Development Station, consisting of more than 2000 *Lolium perenne* clones, was sampled from the plain permanent grasslands of the Banat Plain area and from the permanent grasslands of Caras-Severin, Arad and Hunedoara counties.

After applying multiple selection cycles to the *Lolium perenne* ecotypes, 10 lines were selected, depending on the position of the shoots, the precocity and the width of the leaf (as described in Table 2). The 10 *Lolium perenne* lines were sown at the end of August 2017, and the first results on dry matter production were made in 2018.

RESULTS AND DISCUSSIONS

During the first year of vegetation, three crops (mowings) were made, the share of which in the final production was the following: 48% at the first mowing; 34% at the second mowing; 18% at third mowing.

Table 2

Production of dry matter of some *Lolium perenne* lines selected from the spontaneous flora
(first year of vegetation)

Variants (*Lolium perenne* lines)	Productin		Difference t/ha	Meaning
	t/ha	%		
Lolium perenne 1 (precocius, semierect shoots, wide leaf)	6.70	107.4	0.46	***
Lolium perenne 2 (precocius, semierect shoots, narrow leaf)	6.44	103.2	0.20	
Lolium perenne 3(precocius, crawler shoots, wide leaf)	6.79	108.8	0.55	***
Lolium perenne 4 (precocius, crawler shoots, narrow leaf)	6.32	101.3	0.08	
Lolium perenne 5 (semiprecocius, erect shoots, wide leaf)	6.49	104.1	0.25	*
Lolium perenne 6 (semiprecocius, erect shoots, narrow leaf)	6.05	97.0	-0.19	
Lolium perenne 7 (semiprecocius, semierect shoots, wide leaf)	6.12	98.1	-0.12	
Lolium perenne 8(semiprecocius, erect shoots, narrow leaf)	6.08	97.5	-0.15	
Lolium perenne 9 (tardy, crawler shoots, narrow leaf)	5.65	90.5	-0.59	000
Lolium perenne 10 (tardy, crawler shoots, wide leaf)	5.74	92.1	-0.49	000
Variant average	**6.24**	**100**	-	

DL 5% = 0,20 DL 1% = 0,27 DL 0,1% = 0,37

The data presented in Table 2 shows that in the first year of vegetation the dry matter production of *Lolium perenne* tested lines ranged between 5.74-6.72 t/ha. By reporting to the mean of all the results, the highest yield was obtained from *Lolium perenne* 3, 6.79 t/ha of dry matter with a difference of 0.55 t/ha of dry substance compared to the average of all studied lines, very high significant. The *Lolium perenne* 1 line also produced almost identical production as the *Lolium perenne* 3 line with a production of 6.70 t/ha of dry matter and a statistically ensured difference.These two lines are part of the precocius and wide leaf types. The crawler type and semiprecocius lines *Lolium perenne* 9 and *Lolium perenne* 10 have the lowest yields compared to the average of the results.

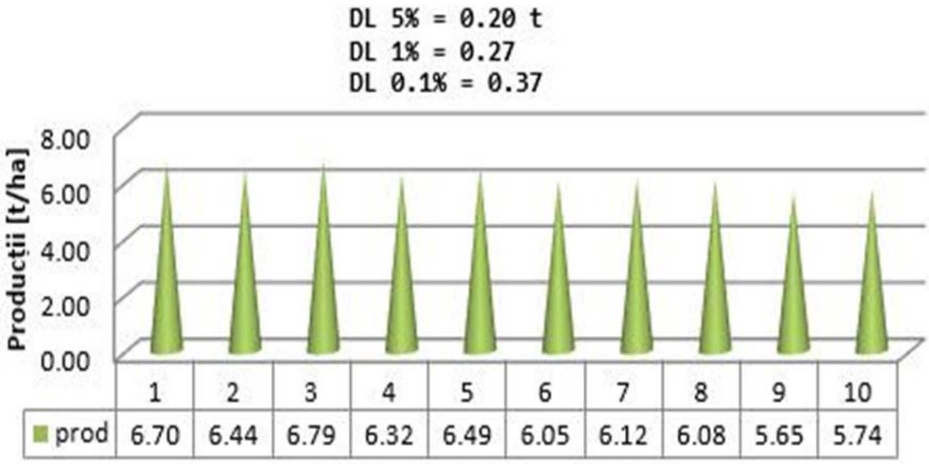

Fig.1. Production variation of the 10 *Lolium perenne* lines

The graphical representation of the dry matter production and the Duncan test (for a = 5%, DL5% = 0.19) group the selected Lolium perenne lines:

- Class A - *Lolium perenne* 1 and *Lolium perenne* 3, with very significant increases;
- Class B - *Lolium perenne* 2, *Lolium perenne* 4, *Lolium perenne* 5, with insignificant increases;
- Class C - *Lolium perenne* 6, *Lolium perenne* 7, *Lolium perenne* 8, with insignificant increases;
- Class D - *Lolium perenne* 9 and *Lolium perenne* 10, with insignificant increases.

CONCLUSIONS

In any research activity, the use of a properly and fully, correctly and fully biologically characterized, such as that existing germplasm collections, is a necessity.

The share in the final production of the tested *Lolium perenne* lines was 48% at the first mowing, 34% at the second mowing and 18% at third mowing.

In the first year of vegetation the dry matter production of *Lolium perenne* tested lines ranged between 5.74-6.72 t/ha.

Comparing to variant average the highest yield was obtained from *Lolium perenne* 3, 6.79 t/ha of dry matter with a difference of 0.55 t/ha of dry, followed by *Lolium perenne* 1 line with a production of 6.70 t/ha of dry matter.

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*** International Treaty on Plant Genetic Resources for Food and Agriculture, http://www.fao.org/plant-treaty/en/

***COMMISSION DIRECTIVE 2008/62/EC of 20 June 2008, providing for certain derogations for acceptance of agricultural landraces and varieties which are naturally adapted to the local and regional conditions and threatened by genetic erosion and for marketing of seed and seed potatoes of those landraces and varieties.

***COUNCIL DIRECTIVE 98/95/EC of 14 December 1998 amending, in respect of the consolidation of the internal market, genetically modified plant varieties and plant genetic resources.

***LEGEA 266/2002 (republicată 2014) privind producerea, prelucrarea, controlul si certificarea calitatii, comercializarea semintelor si a materialului saditor, precum si testarea si inregistrarea soiurilor de plante.