THE STUDY OF VARIABILITY OF SOME OF THE PRODUCTION ELEMENTS IN THE AUTUMN OAT FROM S.C. D. A. LOVRIN

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Abstract. *The oats belong to the family Poaceae (Graminee), the genus Avena, and the most important cultivar is Avena sativa L (common oat) (BUTT et al., 2008; BOCZKOWSKA et al., 2016). The present paper analyzes the descriptors of the productivity elements, the mass of one thousand grains (MMB) and the length of panicle for 15 autumn oat genotypes, created and tested under pedoclimatic area conditions from S.C.D.A. Lovrin. Between the studied genotypes there are very significant differences with reference of the length of the panicle, respectively of the one thousand grains , with a very large amplitude of variation. The biometric analysis of 14 autumn oat lines and an homologate Sorin variety, used as a control with reference to the length of panic and the one thousand grains. The data were aggregated on an agricultural year. In this case, a number of 10 plants of each studied line was studied, and the results were compared with the control variety. In terms of climatic conditions, the agricultural year 2017/2018 was a favorable year for autumn oat crops. The following lines Lv 2502, Lv 2503, Lv 2505, Lv 2510, Lv 2511, Lv 2513, Lv 2514 have been shown to have values statistically ensured as very significant, showing increases between 18.4 and 32.4% versus the witness Sorin, respectively a difference of 3.8 - 6.7 cm. With reference to MMB from the determinations analyzed, the lines Lv 2504, Lv 2513, which showed an increase of 18.5% and 14.3%, with a difference of 5.1 - 6.6g compared to the Sorin witness variety, very statistically significant values. For the two characters studied, the length of the panicle and the MMB, in the lines Lv 2504, Lv 2511, Lv 2513 recorded significant positive differences compared to the control variety. The study of the correlation between the length of panicle and the mass of one thousand grains for the 14 analyzed lines and the control variety, Sorin, show that there is a positive linear correlation between the two studied elements.*

Keywords*: autumn oat, MMB, length of panicle*

INTRODUCTION

Avena sativa L. is one of the crops known since antiquity, being cultivated at first for green fodder or hay, and later as cereals (ȘANDRU, 1993). It is a crop favorable to sustainable agriculture, being a cereal that doesn't require additional production costs (MURARIU, 2017). Oats need less nutrient (N, P, K) than wheat or maize due to the special characteristics of the oat roots, it has a high solubility of the nutrients found in soil in poorly soluble combinations (ȘANDRU, 1993). Oats are predominantly cultivated in American and European countries, especially in Russia, Canada and the United States of America (AHMAD ET AL., 2010). In the cereal group, the oats occupy the sixth place in the cereal group as production, after maize, rice, wheat, barley and sorghum (FAOSTAT, 2017). Oats are grown throughout the globe, the largest oat crops are located in the northern hemisphere between latitude 40 ° and 60 ° N in North America, Europe and Asia (LOSKUTOV, 20017). The major producers are Russia, Canada and Poland. In the last decades, the annual average of oat production was 23 million tons/year, representing half of the 1960 oat production (FAO, 2013). This decrease in production is due to increased yields on more profitable cereals, declining horsepower and better specialization of the agricultural sector (HOFFMAN, 1987). After STRYCHAR (2011) in developed countries about 75% of total oats are for animal consumption and 25% for human food, in underdeveloped countries the percentage for animals can be substantially higher. In both cases, oats were a qualitative component, playing an important role in agricultural and crop development both in Europe and the rest of the world (RICHARD J. MOORE-COLYER, 1995). Due to the large number of species found within this species, including the high degree of alogamy, the variability of the Avena genus is very high (COFFMAN, 1930, QUOTED BY BAUM IN 1968). The length of the panic influences the productivity of the plant due to the fact that long panicles have a larger number of floors and several branches, compared to the small panicles (MADOȘĂ , 1998). An indirect indicator of quality is the

size of the grain cereal, considering that larger grains have better germination and superior germ energy (TIPPLES K. H., 1995).

MATERIAL AND METHODS

The researches were carried out under pedoclimatic conditions from S.C.D.A. Lovrin on a typical, slightly gleize, silt-loam epicarpic chernozem, with medium nitrogen and phosphorus content, and a pH of 6.8 (HO) (PUȘCĂ, 2002).. This paper presents the biometric analysis of 14 autumn oat lines and an homologate Sorin variety, used as a control with reference to the length of panic and the MMB. The data were aggregated on an agricultural year. In this case, a number of 10 plants of each studied line was studied, and the results were compared with the control variety. The plants analyzed were sown in the optimum period of autumn oats on October 4, 2017. Due to the favorable climate conditions, the rising occurred normally on 16 October respectively. In terms of climatic conditions, the agricultural year 2017/2018 was a favorable year for autumn oat crops.

RESULTS AND DISCUSSIONS

The data were capitalized and interpreted by ANOVA variance analysis. Statistical procedding and experimental data are performes by analysis of the variant (CIULCĂ, 2006). A total of 10 plants from each genotype were analyzed to statistically to highlight the differences between the quantitative tracked elements of the 14 genotypes taken in the study compared to the control variety, Sorin.

Table 1

Variance analysis for length of panicle at the 14 oat autumn lines

Source	Liberty degrees	Squares sum	Variant s^2	F Test	
				Value	Signification
Repetition	9	35.627	3.958		
Genotype	14	2288.760	163.483	40.1558	***
Error	126	512.976	4.071		
Total	149	2837.360			

Table 2

Variance analysis for MMB at the 14 oat autumn lines

Source	Liberty degrees	Squares sum	Variant s^2	F Test	
				Value	Signification
Repetition	9	35.627	3.958		
Genotype	14	2288.760	163.483	40.1558	***
Error	126	512.976	4.071		
Total	149	2837.360			

From the variance analysis presented in Tables 1 and 2 shows that the index of variation has a low index (cv: 9.07% for panicle length, cv: 7.13% for MMB). Between the 14 lines studied reported at the control variety there are very significant differences in reference to the length of the panicle and MMB.

Table 3

The length of panic and the significance degree

Genotype	Length of panic		Difference toward the witness	Signification
	cm	%		
Sorin	20.7	100	Witness	
Lv 2502	25.6	123.7	4.9	***
Lv 2503	24.5	118.4	3.8	***
Lv 2504	23.6	114	2.9	**
Lv 2505	27.4	132.4	6.7	***
Lv 2506	15.4	74.4	-5.3	000
Lv 2507	17.9	86.5	-2.8	00
Lv 2508	19.2	92.8	-1.5	
Lv 2509	18	87	-2.7	00
Lv 2510	26.6	128.5	5.9	***
Lv 2511	24.8	119.8	4.1	***
Lv 2512	22.2	107.2	1.5	
Lv 2513	25.5	123.2	4.8	***
Lv 2514	26.1	126.1	5.4	***
Lv 2515	16.1	77.8	-4.6	000

DL 5% = 1.78 DL 1% = 2.36 DL 0.1% = 3.04

From the analysis shown in Table 3 we can state that the genotypes Lv 2502, Lv 2503, Lv 2505, Lv 2510, Lv 2511, Lv 2513, Lv 2514, which registered an increase between 18.4 and 32.4% compared to the witness Sorin , respectively a difference of 3.8 - 6.7 cm, very statistically significant values. At the same time, the line Lv 2504 provided a 14% increase, a difference of 2.9 cm from the witness, statistically distinct significant. The variation of the analyzed lines can also be seen in the following figure.

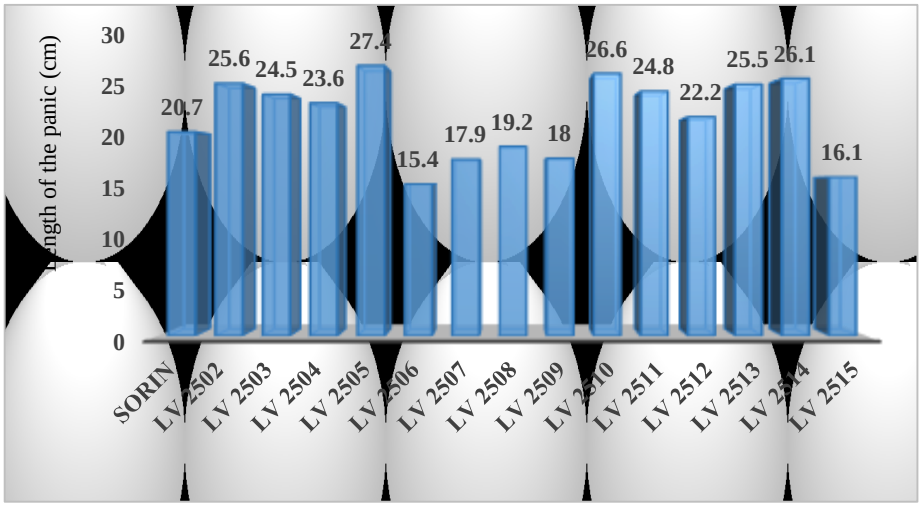

Fig. 1 The graphical presentation of the length of panicle at the 15th genotipes studied

From the determinations related in Table 4 regarding MMB at the 14 genotypes analyzed, the lines LV 2504, Lv 2513 presented an increase of 18.5% and 14.3%, with a difference of 5.1 - 6.6g compared to the control variety, very statistically significant values. The next place is the Lv 2511 genotype with a difference of 3.6 g to the Sorin witness and a 10.1% increase, value being distinctly significant. Of the studied lines, statistically significant value only records the Lv 2510 line, with a difference of 3.6 g and an increase of 10.1%. For the two characters studied, the length of the panicle and the MMB, Lv 2504, Lv 2511, Lv 2513 recorded significant positive differences from the Sorin witness variety.

Table 4

MMB and the significance degree

Genotype	MMB		Difference toward the witness(g)	Signification
	g	%		
Sorin	35.8	100.0	Witness	
Lv 2502	36.0	100.4	0.2	
Lv 2503	31.3	87.4	-4.5	000
Lv 2504	42.4	118.5	6.6	***
Lv 2505	35.6	99.5	-0.2	
Lv 2506	27.1	75.7	-8.7	000
Lv 2507	30.3	84.6	-5.5	000
Lv 2508	34.4	96.1	-1.4	
Lv 2509	33.1	92.3	-2.7	0
Lv 2510	38.2	106.5	2.3	*
Lv 2511	39.4	110.1	3.6	**
Lv 2512	35.9	100.2	0.1	
Lv 2513	41.0	114.3	5.1	***
Lv 2514	33.8	94.4	-2.0	
Lv 2515	26.1	73.0	-9.7	000

DL 5% = 2.19 DL 1% = 2.89 DL 0.1% = 3.72

The variation of MMB of the 15 genotypes studied can be seen in Figure 2.

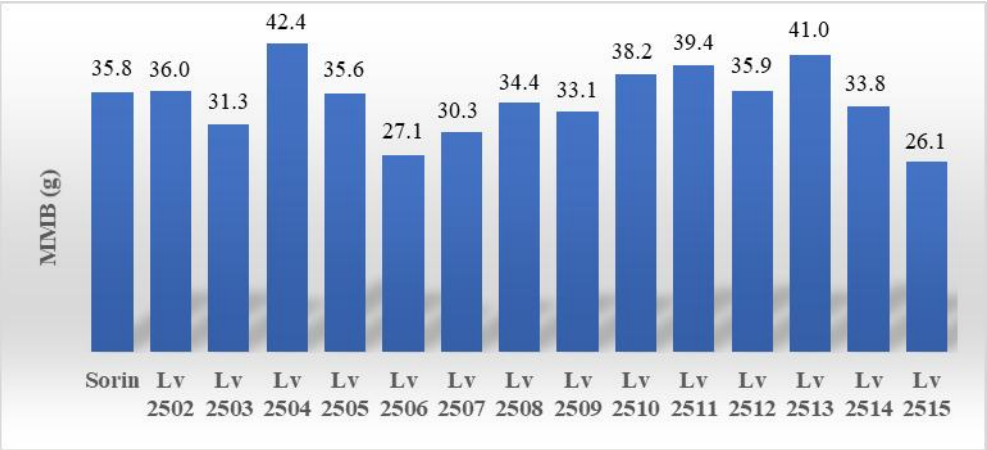

Fig. 2 The graphical presentation of the length of panic at the 15th genotypes studied

The study of the correlation between the length of the panicle and the MMB for the 15 analyzed genotypes shows that there is a positive linear correlation between the two studied elements (Figure 3). The graphical representation of this relationship is a straight line, determined by a degree I equation, y = 16.6795 + 0.8103 * x, with a correlation coefficient r = 0.70 **, being statistically assured for the transgression probability α = 1%.

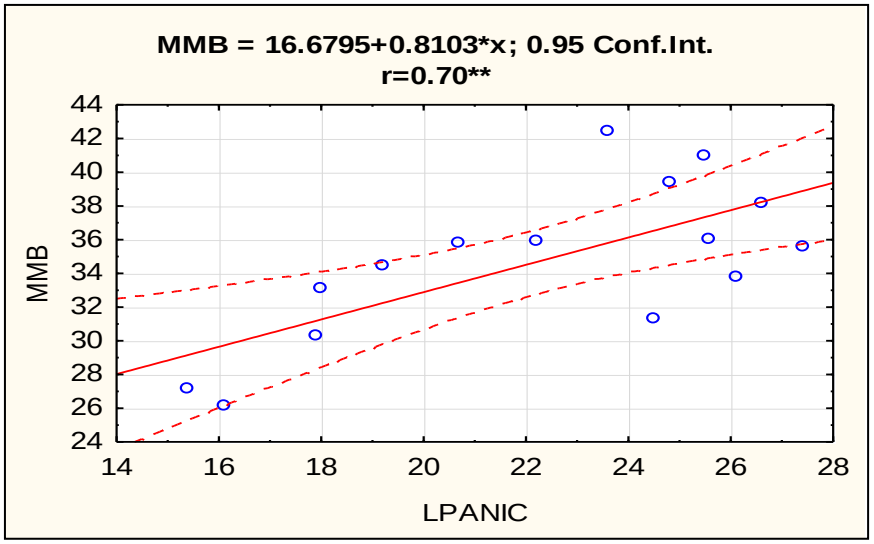

Fig. 3 Correlation between the length of panic and MMB at the 15th genotypes studied

CONCLUSIONS

The following lines Lv 2502, Lv 2503, Lv 2505, Lv 2510, Lv 2511, Lv 2513, Lv 2514 have been shown to have values statistically ensured as very significant, showing increases between 18.4 and 32.4% versus the witness Sorin, respectively a difference of 3.8 - 6.7 cm. With reference to MMB from the determinations analyzed, the lines Lv 2504, Lv 2513, which showed an increase of 18.5% and 14.3%, with a difference of 5.1 - 6.6g compared to the Sorin witness variety, very statistically significant values. For the two characters studied, the length of the panicle and the MMB, in the lines Lv 2504, Lv 2511, Lv 2513 recorded significant positive differences compared to the control variety. The study of the correlation between the length of panicle and MMB for the 15 analyzed genotypes shows that there is a positive linear correlation between the two studied elements.

BIBLIOGRAPHY

AHMED A., ANJUM F.M., ZAHOOR T., NAWAZ H., AHMED Z., 2010, Extractions and characterization of β- glucan from oat for industrial utilization, Int. Journal BioMacromol., n 46, pp 304 – 309;

BAUM B. R., 1968, The role of the lodicul and epiblast in determining natural hibrids of Avena sativa x fatua in cultivated oats, Can. J. Botany, 47: 85-91;

BAUM B. R., 1968, The role of the lodicul and epiblast in determining natural hibrids of Avena sativa x fatua in cultivated oats, Can. J. Botany, 47: 85-91;

BOCZKOWSKA M., PODYMA W., LAPINSKI B., 2016, Oat, chapter in the book Singh M. & Upadhyaya H. D., Genetic and Genomic Resources for Grain Cereals Improvement, Academic Pres Elsevier, pp 159- 225;

CIULCA S., 2006, Experimental Methods in Agriculture and Biology, Ed. Agroprint, Timisoara;

FAOSTAT 2017, Oats production in 2016, Crops/ World Regions/ Production/ Quantity from pick list". Food and Agriculture Organization, Statistics Division;

HOFFMAN L. A., LIVEZEY J., 1987, The Oats Industry Agricultural Economic Report, number 573;

LOSKUTOV G. IGOR, 2007, Oat (*Avena sativa L.*), Distribution, Taxonomy, Evolution and Breeding Value, Russian Academy of Agricultural Science, State Scientific Centre of the Russian Federation N. I. Vavilov All Russian, Researh Instiute of Plant Industri, Sankt Petersbourg;

MADOȘĂ E., 1998, Contributions to the study of the heredity and variability of some quantitative characters in autumn oats, pp 10 -30;

MOORE–COLYER R. J., WELCH W. R., 1995, The Oat Crop: Production and utilisation of Biologycal and Biomedica Science, Chapter 1: Oats and oats production in history and prehystory, Springer- Science + Business Media, pp 1-31;

MURARIU DANELA, PLĂCINTĂ DOMNICA DANIELA, 2017, The Oats, editura Pim;

PUȘCĂ I., 2002, Câmpia Banatului, Fundația Națională „Satul Românesc", Ed. Bucureşti;

Strychar R., Webster F. H. and Wood P. J., 2011, Oats: Chemistry and Technology, Chapter –World Oat Production, Trade and Usage, AACC International, pp 1-11;

TIPPLES K. H., JAYAS D. S., WHITE N., D., G., MUIR W. E., 1995, Stored – Grain Ecosystems, Chapter 10: Quality and Nutritional Changes in Store Grain, U.S.A., pp 325-351;

ȘANDRU D. I., 1993, The culture of the Oats, Editura de Vest, Timișoara.