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Studies concerning winter resistance of some autumn oat cultivars

Madoşă E.[1*], Vasilescu Nora[2], Ciulca S.[1], Velicevici Giancarla[1], Avadanei C.[1], Bîtea Nicoleta[1], Ciulca Adriana[1]

[1]Banat's University of Agricultural Sciences and Veterinary Medicine, Faculty of Horticulture and Sylviculture, [2]CR Buziaș

*Corresponding author: Email: madosae@yahoo.com

Abstract Oats is a plant that gives a very valuable production in terms of quality, however, is grown on small areas because of sensibility to winter conditions. A collection of 73 varieties and lines of winter oats originated from North America or West Europe, were studied. Behavior of evaluated collection material was different depending of year's specific conditions. Within the collection there are stable genotypes, which lies on the same position compared to the control variety. For the breeding process the folowing varieties can be recommended as initial material: Norline, Blamouth, CI 1908, Emperor. The romanian variety Florina has a wick winter resistance, in years of the harshest winter, the risk of compromising culture apears.

Key words

autumn oats, winter resistance

Oats is a plant that gives a very valuable production in terms of quality, however is grown on small areas because of disadvantages: modest production, susceptibility to falling, and for autumn oats sensitivity to winter conditions. The first forms of autumn oats were obtained by selection from spring oats. The first winter resistant oat cultivar was Winter Truf variety, and then Culberson, Wintak and Cimarron varieties were created. [2].

Genetic determinism of this character is not well known. It is considered that the frost resistance is a polygenic trait conditioned by the interaction with environmental factors. According to some authors the repens port of plants is correlated with good winter resistance. [5] For the reasons given above, we obtain a very slow progress, over a period of 35 years of selection, an average annual increase of 0.26% winter resistance was obtained . [3]

Beaucause increasing cold resistance of autumn oats is a hard to solve problem, it was necesary to find other elements that coud help plants to overcome difficult periodes due to low temperatures. Thus, in autumn oats a rapid emergence leads to a proper growth of plants and prepare them better for winter entering. This rapid emergence depends primarily on the time of germination. For this, the oats has high variability and sensitivity, which makes them believe that this character is genetically determined. [8,9]

Studies show that low temperatures and vernalization duration has less influence on productivity and over other characters, with some differences between autumn oats and spring oats. [10] From this we can surmise that between the two types of oats there are differences. These differences are of genetic nature being reflected in differences of biochemical nature. [7]

Winter oats was studied in Romania with interruptions. Although this type of oats has advantages compared with spring oats on productivity, quality and disease resistance, autumn oats is not grown because of the risk of compromising the culture in some years. [4,6]

Materials and Methods

The research was conducted at the Didactical Station of University of Agricultural Sciences and Veterinary Medicine of Banat, Timisoara, during 2006-2008, on a chernozem soil type. During testing, climatic factors were within normal limits.

Biological material was composed of 73 varieties and lines of autumn oats. With the exception of Florina variety which was used as a witness, all other varieties or lines are foreign, of North American or Western Europe origin.

The study was done in a field of collection, placed in three repetitions. Scoring of winter resistance was conducted on a scale from 0 to 9, after the resumption of spring vegetation.

The obtained data were statistically analyzed by analysis of variance and t test after [1]

Results and Discussions

Winter hardiness is the main deficitar feature of autumn oats, which restricts the cultivation of the this variety in Romania, being able to say even that it prevents the entry into culture of existing varieties.

Foreign varieties and Florina variety (the first Romanian variety) succeed in culture only the western part of the country in the conditions of normal winter for this part of the country. During harsh winters, and in case of cultures insufficiently prepared for crossing winter, crops can be easily compromised.

Comparing the scores of the three experimental years (Figure 1) it shows that there are fluctuations from year to year depending on winter conditions. Highest scores for winter resistance were granted in 2006 and the lowest in 2008. Scores of 2005 were situated in the averaje of the two experimental years. The behavior was fluctuant also compared to the witness genotypes, and even Florina variety. Compared to witness variety, there are genotypes with constant behavior, but also some that in a year were more resistant and in an other year more sensitive. This fact must be taken into account in the exploitation of collection, these genotypes being not recommended as genitors for breeding programs of autumn oats.

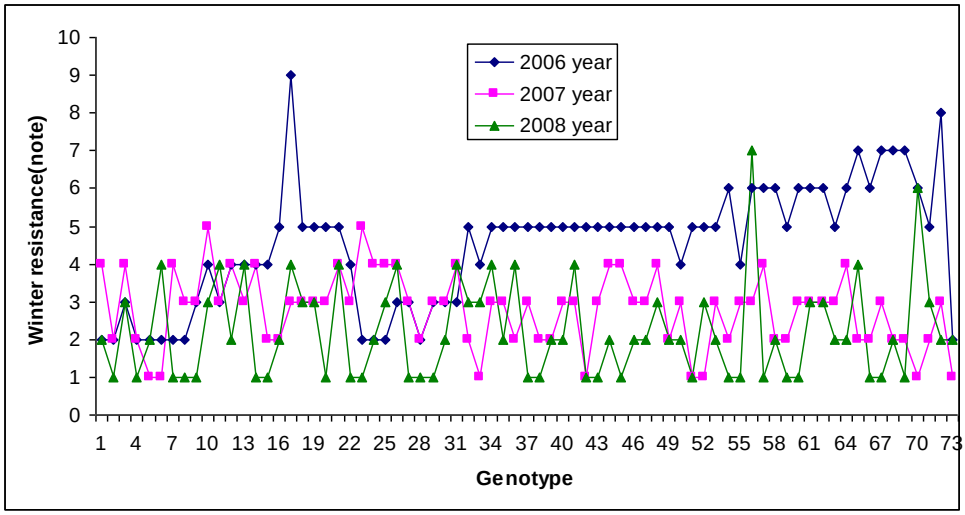

Fig. 1 Results concening the winter resistance during experimental years

Making an overall characterization of the collection folowing the average score of the three experimental years (Figure 2), it appears that over a third of the collection genotypes are resistant, average score being between 3 and 4. Very sensitive forms are few (only two), but not much more are more resistant (five genotypes). The most important part of the collection is represented by the genotypes with average scores between 2 and 3, which are the most stable from year to year.

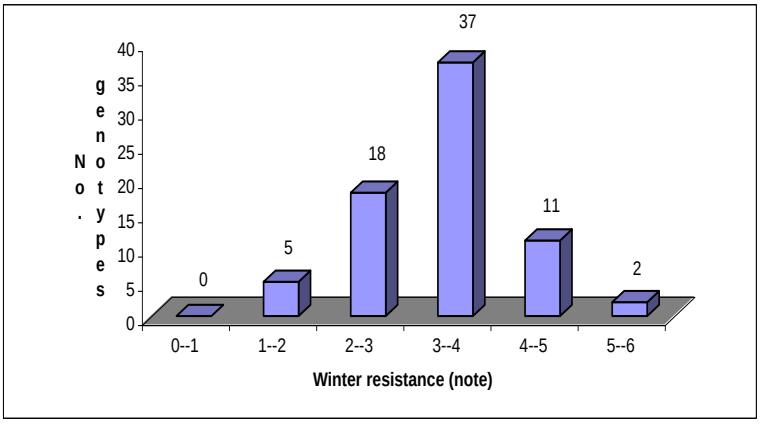

Fig. 2 Results on the average score for winter resistance.

After applying a statistical calculation on the results of the scoring resistance to wintering in the three experimental years shows that, although the scores differs from the Florina witness variety ones, statistical assurance to witness media, it exist only in very few cases. (Table 1).

During the experiment, only Walken and Marys Quest varieties proved to be more susceptible to winter than the Florida variety. Scores for these varieties are significantly higher than the score of the control variety. Given the fact that the witness variety is not very resistant, it can be concluded that in the studied collection there are genotypes medium resistant to winter. There were not reported very valuable forms, with a very high level of resistance, on the contrary, some are even sensitive.

Table 1

Results concerning the winter resistance of studied autumn oats genotypes

No. crt.	Genotype	Average score	Percent from witness	Difference from witness	Signification
0	1	2	3	4	5
1.	Florina (control.)	2,66	100,00	0	control
2.	Norline	1,66	62,5	-1,00	-
3.	Arlingthon	3,33	125,0	0,67	-
4.	Blamouth	1,66	62,5	-1,00	-
5.	CI 1908	1,66	62,5	-1,00	-
6.	Cimarron	2,33	87,5	-0,33	-
7.	Crater	2,33	87,5	0,33	-
8.	Earlygrain	2,00	75,0	-0,66	-
9.	Excel	2,33	87,5	-0,33	-
10.	Fergushon	4,00	150,0	1,34	-
11.	Fulwood	3,33	125,0	0,67	-
12.	Jeferson	3,33	125,0	0,67	-
13.	Le Conte	3,66	137,5	1,00	-
14.	Nortex	3,00	112,5	0,34	-
15.	Suergrain	2,33	87,5	-0,33	-
16.	Thonson	3,00	112,5	0,34	-
17.	Walken	5,33	200,0	2,67	**
18.	Compact	3,66	137,5	1,00	-
19.	Pennwin	3,66	137,5	1,00	-
20.	2288	3,00	112,5	0,34	-
21.	3378	4,33	162,5	1,67	-
22.	834-4-1-3	2,66	100,0	0,00	-
23.	3412	2,66	100,0	0,00	-
24.	S Dak 40	2,66	100,0	0,00	-
25.	3868	3,00	112,5	0,34	-
26.	Cocker 41-51	3,66	137,5	1,00	-
27.	4444	2,33	87,5	-0,33	-
28.	4451	1,66	62,5	-1,00	-
29.	4458	2,33	87,5	-0,34	-
30.	4472	2,66	100,0	0,00	-
31.	4475	3,66	137,5	1,00	-
32.	4476	3,33	125,0	0,67	-
33.	4477	2,66	100,0	0,00	-
34.	4478	4,00	150,0	1,34	-
35.	4480	3,33	125,0	0,67	-
36.	4482	3,66	137,5	1,00	-
37.	4483	3,00	112,5	0,34	-
38.	4484	2,66	100,0	0,00	-
39.	4488	3,00	112,5	0,34	-
40.	4492	3,33	125,0	0,67	-

41.	5029	4,00	150,0	1,34	-
42.	5032	2,33	87,5	-0,33	-
0	1	2	3	4	5
43.	Marrettos Anderson	3,00	112,5	0,34	-
44.	8276	2,66	137,5	1,00	-
45.	PA 522-7	3,33	125,0	0,67	-
46.	PA 522-23	3,33	125,0	0,67	-
47.	PA 621-3274	3,33	125,0	0,67	-
48.	PA 724-2580	4,00	150,0	1,34	-
49.	PA 725-2154	3,00	112,5	0,34	-
50.	PA 725-4743	3,00	112,5	0,34	-
51.	PA 725-4787	2,33	87,5	-0,33	-
52.	PA 725-6113	3,00	112,5	0,34	-
53.	PA 822-818	3,33	125,0	0,67	-
54.	ARK 0151-61	3,00	112,5	0,34	-
55.	AR 104-18	2,66	100,0	0,00	-
56.	Marys Quest	5,33	200,0	2,67	**
57.	Wodan	3,66	137,5	1,00	-
58.	Gospodarski 48	3,33	125,0	0,67	-
59.	5183	2,66	100,0	0,00	-
60.	Tripolis	33,3	125,0	0,67	-
61.	Krusevac	4,00	150,0	1,34	-
62.	Boer	4,00	150,0	1,34	-
63.	Algerian	3,33	125,0	0,67	-
64.	Mirabel	4,00	150,0	1,34	-
65.	Gerald	4,33	162,5	1,67	-
66.	Nuptiale	3,00	112,5	0,34	-
67.	Solva	3,66	137,5	1,00	-
68.	Valiant	3,66	137,5	1,00	-
69.	Barra	3,33	125,0	0,67	-
70.	Carie	4,33	162,5	1,67	-
71.	Krypton	3,33	125,0	0,67	-
72.	Chamois	4,33	162,5	1,67	-
73.	Emperor	1,66	62,5	-1,00	-
DL 5%=1,99; DL 1%= 2,67; DL 0,1%= 3,50					

Conclusions

1. Behaviour of biological material from the evaluated collection vary depending on the specific year. In none of experimental years, no genotypes without a loss of plant were noticed.
2. Comparing of behavior to witness variety shows that there are stable genotypes, which lies on the same position to the witness. The resistant ones can be recommended as initial material in the breeding process: Norline, Blamouth, IC 1908, Emperor.
3. In the collection there are genotypes that have not constant behavior to witness, in some years being superiors, in others inferiors. They have to be studied a longer period for to be well characterized.
4. Making an overall characterization, it appears that over a third of the collection are resistant genotypes. Sensitive or highly resistant genotypes are very rare. These forms located at the extreme limits and most stable ones.
5. During the experiment, Walken and Marys Quest varieties were more sensitive to winter than the Florina variety. Compared to this variety have not been reported more resistant genotypes.
6. The romanian variety Florina has a mediocre winter resistance, which does not give safety to autumn oats cultivation in western Romania. The risk of compromising the culture appears in the years with harshest winter conditions.

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