
Resistance of meadow fescue wild ecotypes to foliar diseases

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Investigation of rust and leaf spot infection level on the plants of 12 wild ecotypes of meadow fescue collected in the territory of Kėdainiai, Kaišiadorys and Trakai regions showed meadow fescue to be not resistant to leaf rusts and moderately resistant to leaf spots. Of the 12 populations tested (each containing 100 plants), 135 plants (11.2%) were resistant to crown rust and 91 plants (7.6%) to leaf spots, however, only a small part of them was sufficiently productive. These plants were dug out and cloned for further breeding work as initial breeding material for the development of high-yielding varieties resistant to foliar diseases.

Key words: meadow fescue, diseases, correlation, selection

INTRODUCTION

Foliar diseases cause the greatest damage to the herbage yield of meadow fescue [1]. These diseases result not only in reduced herbage and seed yields, but also in a poorer forage quality. Furthermore, the disease-affected leaves are subject to faster withering and poorer assimilation processes in them. Such plants are not able to accumulate adequate supplies of nutrients and in the conditions of severe droughts or frosts are more readily killed. The youngest leaves are subject to most severe infections. Disease resistance of leaves increases with age. Meadow fescue is most badly affected by leaf rust (*Puccinia coronata* Corda) and various leaf spots [2]. The most widespread leaf spots are helminthosporiosis (*Drechslera dictyoides* Drechsl.) and ascochyta (*Ascochyta graminicola* Sacc.) [3, 4].

Various plant diseases can be controlled: (1) by using various fungicides; (2) by developing resistant varieties [5–7].

To develop disease-resistant varieties, appropriate initial breeding material is essential.

The opinion prevails that local wild ecotypes growing in natural conditions in the course of many years have become better adapted to survive. In 1994–2000, expeditions were arranged to collect wild ecotypes in various regions of Lithuania. Altogether 119 wild ecotypes of meadow fescue were collected. They were thoroughly investigated in breeding nurseries.

MATERIALS AND METHODS

Wild ecotypes of meadow fescue were investigated on sod gleyic medium heavy drained loamy soil with the pH value in the arable layer varying from 6.4 to 7.2 and the humus content from 1.9 to 2.2%. A conventional soil tillage system was employed. N₁₅₀ P₁₂₀ K₁₈₀ was applied. Phosphorus and potassium fertilizers were applied in the year of planting after soil levelling. Nitrogen fertilizer was applied in the year of use in several applications: in spring N₆₀, and after the 1st and 2nd cuts N₄₅. Meadow fescue herbage was studied for two years. In the year of use herbage was cut twice by a small MF-70 hay mower.

Experimental plots were established from 12 wild ecotypes of meadow fescue collected in Lithuania during expeditions in 1997, and grown in a greenhouse; 100 plants of each population were planted at 50 x 50 cm distances. All plants of each population were assessed for susceptibility to crown rust and leaf spots. The collected data were processed by the methods of variation statistics, correlation and dispersion analysis using the 'Selekcija' computer software package [8].

RESULTS AND DISCUSSION

The experimental objective was to investigate the variation of disease resistance between and within wild ecotypes, to determine a correlation between disease susceptibility and yield and to select resis-

tant plants for further breeding work. On investigating the leaf rust and leaf spot infection level on the plants of 12 wild populations of meadow fescue collected in the territory of Kėdainiai, Kaišiadorys, and Trakai, it was ascertained that meadow fescue was not resistant to leaf rust and was moderately resistant to leaf spots. When assessing plant resistance in some populations there were found several plants resistant to rust and leaf spots (Table).

The study populations contained 33% to 68% of plants slightly affected by crown rust (1–3 points), 29% to 58% of plants moderately affected (5 points), and 2% to 21% of strongly and very strongly rust-affected plants (7–9 points). The greatest number of slightly rust-affected plants was found in the populations No 3982 (Kaišiadorys region, slope of the Kruonis HPS) (66%) and No 3985 (68%) (Trakai region, slope of the Verknė stream).

The greatest number of moderately and strongly crown-rust-affected plants was found in the populations No 3976 (Kėdainiai region, Paberžė village) and No 3984 (Trakai region, Aukštadvaris regional park). They accounted for 67% and 70%, respectively. Almost in all the populations plants with a damage score of 3 and 5 points prevailed. They accounted for from 50% to 98%.

The plants of meadow fescue wild populations were less affected by leaf spot than by crown rust. Weakly spot-affected plants in the investigated populations made up 19% to 72%. Moderately affected plants accounted for the largest part (45–76%). Of the 12 investigated populations, only 6 populations contained 2% to 22% of strongly spot-affected plants. The least spot-resistant plants were found in

the populations No 3981 (Kėdainiai region, Dvariškiai village, territory of the sand pit), 3983 (Trakai region, hill near Aukštadvaris regional park) and 3984 (Trakai region, Aukštadvaris regional park).

In the populations, moderately and strongly spot-affected plants accounted for 81%, 80% and 74%. The populations where plants were more heavily affected by crown rust were also more heavily affected by leaf spots. As the occurrence of foliar diseases is most severe in the second half of summer, the yields of the 2nd and 3rd cuts are most markedly affected. Some literature references report that plants 70–90% affected by crown rust produce a 20–45% lower herbage yields [9].

The correlation between the disease injury and the yield of the 2nd cut implies a negative correlation between the yield and disease injury. In individual populations the correlation between the yield of the 2nd cut and crown rust injury reached 0.045 to 0.329 and between the yield of the 2nd cut and leaf spot injury from 0.009 to 0.378.

Experimental findings suggest that disease resistance of various ecotypes and individual plants within the ecotype is very diverse. Of all investigated populations, No. 3982 collected on the slope of Kruonis HPS Kaišiadorys region was most resistant to foliar diseases. Resistance of the plants of this population to crown rust was assessed by 2.88 and to leaf spots by 3.78 points.

The presence of disease-resistant plants in the populations shows that selection for disease resistance is feasible. Of all the 12 populations tested (each containing 100 plants), 135 (11.2%) plants were resistant to crown rust and 91 (7.6%) plants were re-

Table. Susceptibility of meadow fescue plants of wild populations to foliar diseases

Catalogue No.	Affected plants, %											
	rusts						leaf spots					
	point of injury						point of injury					
	1	3	5	7	9	mean	1	3	5	7	9	mean
3975	2	48	37	12	1	4.31	2	52	46	0	0	3.67
3976	8	25	49	18	0	4.54	1	47	52	0	0	4.02
3977	1	39	42	18	0	4.62	2	49	49	0	0	3.99
3978	4	45	34	17	0	4.31	2	38	60	0	0	4.19
3979	0	57	41	2	0	3.90	0	52	48	0	0	3.96
3980	12	36	31	20	1	4.45	8	47	45	0	0	3.91
3981	1	46	50	3	0	5.12	1	18	58	23	0	5.18
3982	45	21	29	5	0	2.88	24	28	33	15	0	3.78
3983	11	31	54	4	0	4.05	2	18	76	4	0	4.68
3984	14	16	58	12	0	4.36	1	25	61	13	0	4.76
3985	27	41	30	2	0	3.18	26	46	26	2	0	3.12
3986	10	46	37	7	0	3.82	22	44	32	2	0	3.28
Total:	135	451	492	120	2		91	464	586	59	0	

sistant to leaf spots. It is noteworthy that only a small part of these plants were sufficiently productive. These plants were dug out and cloned for further breeding work as initial breeding material for the development of high-yielding, foliar disease-resistant varieties.

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TIKRUJŲ ERAIČINŲ LAUKINIŲ EKOTIPŲ ATSPARUMAS LAPŲ LIGOMS

S a n t r a u k a

Ištyrus 12 tikrųjų eraičinų laukinių populiacijų, surinktų Kėdainių, Kaišiadorių bei Trakų rajonų teritorijose, nustatyta, kad šie augalai neatsparūs lapų rūdims ir vidutiniškai atsparūs dėmėligėms. Iš visų 12-os tirtų populiacijų (kiekvienos po 100 augalų) vainikuotosioms rūdims buvo atsparūs 135 (11,2%), o dėmėligėms – 91 (7,6%) augalas, tačiau tik nedidelė dalis iš jų buvo pakankamai derlingi. Šie augalai buvo iškasti ir klonuoti tolimesniam selekciniam darbui kaip pradinė selekcinė medžiaga kuriant derlingas, lapų ligoms atsparias veisles.