
Spreading of diseases in winter wheat on soils of different granulometric composition in Western Lithuania

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Spreading of diseases in winter wheat on soils of different granulometric composition (JP_1^v and J_2^v) was investigated in the experiment "Evaluation of biological and intensive cropping system in the soil of West Lithuania". This experiment was carried out by S.G. in 1995–1998 on JP_1^v (gleyic sod podzolic, pH_{KCl} 5.7) and J_2^v (moderately sod podzolic, pH_{KCl} 4.87) soils. Both soils were limed to pH_{KCl} 6.25 and fertilized with manure (60 t/ha). The place of winter wheat in rotation was after clover. The sort of winter wheat was "Moskovskaja nizkostebel'naya".

According to the average data, septoria (*Septoria tritici* Rob. et Desm and *Septoria nodorum* Berk) injured 1.6% of plants on JP_1^v soil, and eyespot (*Cercospora herpotrichoides* Fron) infested more than 3.25% of plants on J_2^v soil. Spreading of diseases in winter wheat depended on the agrochemical qualities of soil differently, because the correlation (h) among the spreading of diseases in wheat and the agrochemical qualities of soil varied from 0.21 to 0.91. The correlation (η) of the grain yield with the spread of septoria on wheat-ears in 71 DK phase was close ($\eta = 0.9$) and with the spread of eyespot in 71 DK phase on the stems was $\eta = 0.5$.

The influence of soil granulometric composition on the spread of diseases in wheat wasn't revealed, because after liming and incorporation of manure the agrochemical qualities of soils became similar.

Key words: winter wheat, soil, agrochemical qualities of soil, septoria, eyespot

INTRODUCTION

Recently, especially in West Lithuania, septoria and eyespot have become widespread in winter wheat and cause significant yield losses [3, 9, 15]. Poor crops are more injured by diseases. Winter wheat, according to scientific recommendations, should be cultivated under high conditions and should be sown into the limed soil fertilized with mineral and organic fertilizers [1, 4, 7, 8, 10]. Fertilizers are necessary in the life of a plant as they adjust its nourishment system and influence the yield, its quality and sickness [5, 18, 19]. In the world, however, at present much attention is being paid to biological and organic-biological cultivation [2, 4, 5, 6, 11]. The plant yield correlates with soil mobile P_2O_5 and K_2O and is described by a quadratic equation ($y = a + bx + cx^2$) [7, 13, 14, 18]. It is not clear,

however, how diseases spread in winter wheat in West Lithuania on limed, fertilized with manure soil of different granulometric quality.

The aim of the study was to evaluate the spread of septoria and eyespot in Western Lithuania on JP_1^v and J_2^v limed and manured soil.

METHODS

The spread of diseases in winter wheat crops was investigated in the field trials "Evaluation of biological and intensive cropping system in the soil of West Lithuania". The soil JP_1^v was soddy podzolic gleyed and loamy (pH_{KCl} 5.7), and J_2^v was soddy podzolic sandy loam on loam (pH_{KCl} 4.87).

Neither mineral fertilizers were applied nor pesticides were used. The soil was limed only with limestone powder to pH_{KCl} 6.25. In the field of rotation

(fodder beet) manure was incorporated (60 t/ha). Rotation of crops: fodder beet, barley, clover, winter wheat. The place of winter wheat in rotation was after clover. The sort of wheat was “Moskovskaja nizkos-tebelnaja”.

Sickliness of winter wheat is evaluated in 30 DK, 51 DK and 71 DK phases (Zadox). In every field in 20 plants were analysed three upper green leaves, ears and stems. The percentage of injured plants, leaves, ears as well as the development of the disease according to the percentage scale (5; 10; 25; 50; 100 – a part of the area injured by the disease) were defined.

The data were processed by methods of mathematical statistics, correlation regression dependence and the average of arithmetical mean [6, 14, 17].

In the years of investigations the meteorological conditions varied greatly, but on the whole were rather favourable, as in 1995, 1996, 1997 and 1998 the HTK (hydrometric efficiency) was 2.15, 1.96, 1.88 and 1.61. respectively.

RESULTS

Soil. After liming the acidity of soil decreased, and pH_{KCl} increased to 6.2 in JP_1^v and J_2^v soils. Mobile P_2O_5 in limed JP_1^v soil increased to 31–36 mg/kg and in J_2^v soil to 122 mg/kg. The content of mobile

K_2O in JP_1^v soil increased to 8–11 g/kg and in J_2^v soil, quite rich in it before liming, hardly changed. The amount of humus changed significantly (0.72–0.99% of a unit). The amount of microelements was slightly changing depending on the amounts of B, Cu, Mn in soil.

It was observed that in 30 DK phase winter wheat was injured by septoria and eyespot.

Septoria. Winter wheat in Western Lithuania is injured by this disease significantly. *S. tritici* parasitizes leaves and leaf-axil and *S. nodorum* all overground parts of the plant (leaves, stems and ears). In such ears infected grains are smaller and bear symptoms of the disease. The agents of the disease may overwinter in the remains of infected plants [3, 9, 11]. In all years of investigations septoria injured leaves and stems of winter wheat in 30 DK and 51 DK phases and ears in 71 DK phase (Table 1). The data in JP_1^v soil were collected during two years (1997–1998) and in J_2^v soil during four years (1995–1998). The average data of two years indicate that the amount of wheat injured by septoria during the vegetation period slightly increased (1.6% of a unit), in JP_1^v soil more than in J_2^v . The correlation-regression dependence of the spreading of septoria in the crops on the agrochemical qualities of soil indicates rather different data: in 30 DK ($\eta = 0.43-0.51$), in 51 DK ($\eta = 0.21-0.91$) and in 71 DK ($\eta = 0.35-0.80$).

Table 1. Spreading of septoria in winter wheat on soils of different granulometric composition (JP_1^v and J_2^v) in West Lithuania

Vėžaičiai, 1995–1998								
Soil	Sickliness of wheat by decimal code (DK)	Injured	1995	1996	1997	1998	Average	
							1995–1998	1997–1998
JP_1^v	30	plants	–	–	58.3 ± 3.37	20.8 ± 0.55	–	39.55 ± 1.96
J_2^v			13.3 ± 1.16	21.3 ± 6.9	58.2 ± 2.82	19.8 ± 0.84	28.15 ± 3.75	39.0 ± 1.83
JP_1^v	51	plants	–	–	62.8 ± 0.58	30.0 ± 6.89	–	46.4 ± 3.73
		leaves	–	–	12.5 ± 0.29	9.5 ± 2.04	–	11.0 ± 1.16
J_2^v		plants	35.0 ± 2.2	85.3 ± 8.36	36.5 ± 0.66	25.0 ± 7.22	45.5 ± 5.64	30.75 ± 1.69
		leaves	11.6 ± 0.79	30.4 ± 1.95	16.8 ± 0.42	9.3 ± 2.96	17.02 ± 1.83	14.0 ± 6.29
JP_1^v	71	ears	–	–	17.5 ± 5.33	10.5 ± 5.52	–	14.0 ± 6.29
J_2^v		ears	30.0 ± 0.40	35.0 ± 1.13	19.1 ± 5.58	34.0 ± 5.52	29.5 ± 3.98	26.55 ± 5.55
JP_1^v	weight through vegetation	plants	–	–	151.1 ± 2.39	70.8 ± 4.18	–	110.95 ± 3.29
		leaves, ears						
J_2^v		plants	79.9 ± 0.94	172.0 ± 4.56	130.6 ± 2.37	88.1 ± 4.13	124.13 ± 3.8	109.35 ± 3.25
		leaves, ears						

Table 2. Spreading of eyespot in winter wheat on soils of different granulometric composition (JP_1^v and J_2^v) in West Lithuania

Vėžaičiai, 1995–1998 years							
Soil	Sickliness of wheat is evaluate along decimal code (DK)	1995	1996	1997	1998	Average	
						1995–1998	1997–1998
Injured plants, %							
JP_1^v	30	–	–	12.3 ± 8.34	10.2 ± 2.1	–	11.25
J_2^v		0	0	10.8 ± 5.0	18.2 ± 5.0	7.25	14.8
JP_1^v	71	–	–	0	0	–	0
J_2^v		36.7 ± 5.03	35.0 ± 2.0	0	0	17.92	0

Eyespot. This disease is widely spread, especially in humid, cool climate zones. It injures winter wheat under favourable conditions and causes great losses. Inside the stem and in the area injured by the disease, plenty of light grey and later brownish mycelium appear. Such stems bend in the injured area, lean on one side and break. The most favourable temperature for the agent to develop is +5–9 °C. At a temperature of +24 °C eyespot doesn't injure the plants. Sick plants either die out or produce grains of little value. Eyespot was observed in plants in 30 DK and 71 DK phases (Table 2). During vegetation, plants injured by the disease were 3.25% of a unit more numerous in J_2^v soil. Spreading of the disease very much depends on the chemical qualities of the soil. Therefore, the correlation of eyespot spread in the crops with the agrochemical qualities of the soil turned out to be different, *i.e.* η varied from 0.28 to 0.83.

CONCLUSIONS

1. Average data of two years indicate that the percentage of wheat injured by septoria during the period of vegetation was slightly higher (1.6% of a unit) in JP_1^v than in J_2^v soil, and eyespot, on the contrary, 3.25% of a unit higher in J_2^v than in JP_1^v .

2. Spreading of diseases in wheat differently depended on the agrochemical qualities of the soil and varied for septoria from 0.21 to 0.91 and for eyespot from 0.28 to 0.83.

3. The relationship of grain yield and spreading of septoria on the ears in 71 DK was similar ($\eta = 0.9$) and with spreading of eyespot in 71 DK was medium ($\eta = 0.5$).

4. The influence of soils of different granulometric composition on spreading of diseases in wheat wasn't revealed, as after incorporation of manure and liming the qualities of soils became similar.

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ŽIEMINIŲ KVIEČIŲ LIGŲ PLITIMAS SKIRTINGOS GRANULIOMETRINĖS SUDĖTIES DIRVOŽEMIUOSE VAKARŲ LIETUVOJE

S a n t r a u k a

Straipsnyje nagrinėjamas žieminių kviečių ligų plitimas skirtingos granulometrinės sudėties dirvožemiuose (JP_1^v ir J_2^v) atliekant apskaitą įrengtame S. Gužio 1995–1998 m. bandyme „Biologinės ir intensyvios žemdirbystės įvertinimas Vakarų Lietuvos dirvožemiuose“. JP_1^v dirvožemis yra glėjiškas velėninis jaurinis priemolis ant smėlingo priemolio, mažai rūgščios reakcijos (pH_{KCl} 5.74). J_2^v dirvožemis – vidutiniškai pajaurėjęs velėninis jaurinis smėlingas prie-

molis ant priemolio, rūgštokas (pH_{KCl} 4,87). Abu dirvožemiai kalkinti iki pH_{KCl} 6,25, o vienas sėjomainos laukas (pašariniai runkeliai) tręštas mėšlu 60 t/ha. žieminių kviečių vieta sėjomainoje po dobilų. Kviečių veislė ‘Moskovskaja nizkostebelnaja’.

Vidutiniais dviejų metų tyrimo duomenimis, septoriozė (*Septoria tritici* Rob. et Desm ir *Septoria nodorum* Berk) 1,6% daugiau augalų pažeidė JP_1^v dirvožemyje, o stiebalūžė (*Cercospella herpotrichoides* Fron) 3,25% daugiau J_2^v dirvožemyje. Ligų plitimas žieminiuose kviečiuose nevienodai priklausė nuo dirvožemio agrocheminių savybių, nes koreliacijos santykis (η) tarp ligų plitimo ir dirvožemio agrocheminių savybių buvo nuo 0,21 iki 0,91. Grūdų derliaus santykis esant varpų septoriozei 71 DK tarpsnyje buvo glaudus ($\eta = 0,9$), o stiebalūžės ant stiebų plitimo atveju – vidutinis ($\eta = 0,5$). Kadangi po kalkinimo ir tręšimo mėšlu supanašėjo dirvožemių agrocheminės savybės, skirtingos granulometrinės sudėties dirvožemių poveikis ligų plitimui kviečiuose neišsryškėjo.