Occurrence of *Parastagonospora nodorum* blotch, *Parastagonospora avenae* blotch and *Zymoseptoria tritici* blotch on wheat and triticale in Poland.

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Introduction

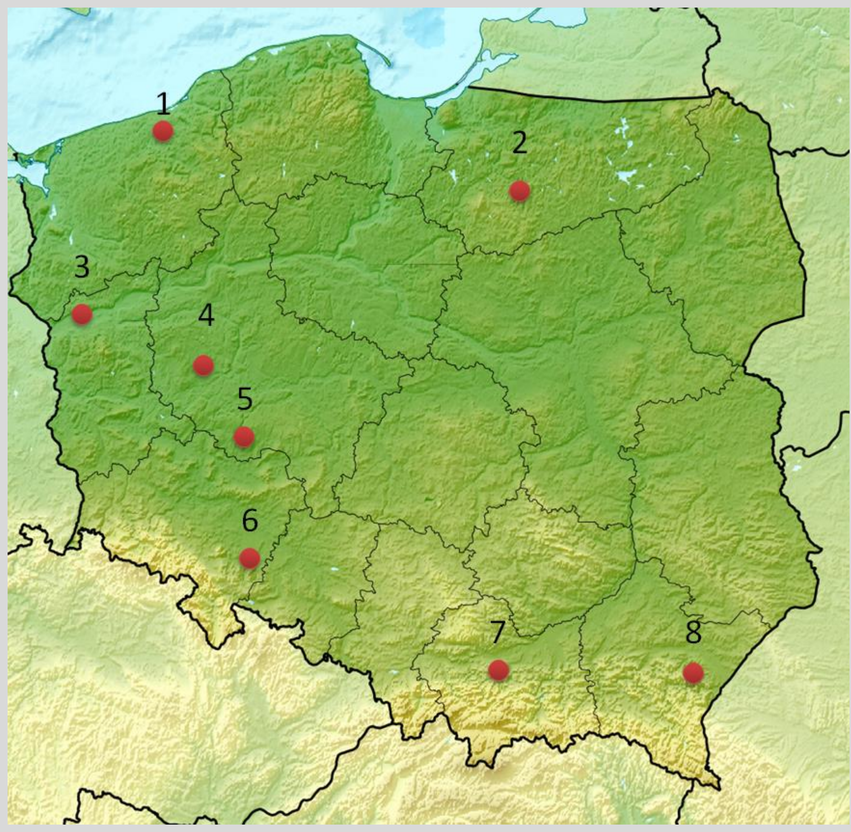
Septoria diseases belong to the most devastating diseases in central Europe. Casual agents causing septoria leaf spot in Poland are *Phaeosphaeria nodourm* (E. Müller) (anamorph: *Parastagonospora nodourm* (Berk.)), *Phaeosphaeria avenaria* (G. F. Weber) (anamorph: *Parastagonospora avenae* (A. B. Frank)), *Mycosphaerella graminicola* (Fuckel) (anamorph: *Zymoseptoria tritici* (Desm.). Yield losses due to *P. nodorum* wheat infection can reach up to 31%, while *Z. tritici* can cause even 50% yield reduction. *P. avenae* was host-specific to oats (*P. avenae* f. sp. *avenae*), however presently there are specified forms that are pathogenic to wheat, triticale and barley (*P. avenae* f. sp. *triticeae*).

Breeding for resistance is one of the key elements of integrated plant protection. It offers the possibility to improve the resistance levels to septoria disease complex through phenotyping and selection of resistant cereal types. The aim of this paper is to assess wheat and triticale varieties according to their resistance to septoria leaf spot (LS) and glume blotch (GB) and to determine occurrence of *Parastagospora spp.* and *Zymoseptoria tritici* in different geographical regions of Poland.

Materials and methods

Field experiments consisted of 6 spring wheat varieties, 6 spring triticale varieties, 10 winter wheat and 10 winter triticale varieties. Experiments were set up at 8 locations in Poland (Fig. 1) to determine the natural infection levels of the small grain cereal species by the septoria complex pathogens. Disease severity ratings of leaves and glumes were made on percentage scale at 10 % intervals. Affected leaves and glumes were collected and mature pycnidia were analyzed under binocular 10-45X and inverted microscope at 200X magnification. The length and width of pycnidiospores were measured to identify pathogen species. For identification purposes spores were plated on solid media to observe morphology of fungal cultures. Identification of species of the pathogens was based on dimensions [length by width] of spores reported in the literature as follows: *P. avenae* f. sp. tritici 25-45 x 3-4 µm, *P. nodorum* 15-32 x 2-4 µm and *Z. tritici* 35-98 x 1-3 µm. The incidence frequencies on cereals were determined separately for each pathogen species .

Fig. 1. Locations of field experiments, 1-8 marked with red points:



Results and findings

The study shown that *Z. tritici* was the predominant wheat pathogen that affects leaves of winter wheat most severely. In 6 locations *Z. tritici* prevailed on spring wheat leaves and it was the cause of the largest disease levels. *P. nodorum* had greater significance in spring wheat green parts than in winter wheat ones, however, this pathogen affected leaves significantly less severely than *Z. tritici*. *P. nodorum* was predominant on spring wheat among all studied pathogens in locations 2 and 3. Occurrence of *P. avenae* f. sp. *triticea* was rare on wheat in all geographical locations, however, *P. avenae* isolation percentage from diseased plant organs of winter and spring triticale averaged to 19% and 38%, respectively. Surprisingly *P. avenae* in certain geographical regions was predominant among all pathogens in question – studied on spring and winter triticale. Spring triticale was severely affected by *P. nodorum* in 5 locations, while winter triticale in 4 locations (Tab. 1).

The largest GB severity was observed on winter cereal varieties (Tab. 1). GB severity correlated positively with northern latitudes: r = 0,497 for spring wheat and r=0,711 for winter wheat. The most resistant varieties according to total LS and GB severity were: Borwo (LS = 29%, GB = 10%) – winter triticale, Ostroga (LS = 34%, GB = 15%) – winter wheat, Torka (LS = 24%, GB = 7%) – spring wheat and Andrus (LS = 26%, GB = 3%) – spring triticale.

Tab. 1. Occurrence and severity rating of GB – Glume Blotch, LS – Leaf Spot of *Parastagonospora* spp. and *Zymoseptoria tritici* under field conditions in 8 locations from 2015 to 2017:

		Number of isolation:			*Percent of isolation:*			*LS severity [%]*			*GB severity [%]*
Cereal type	**Location**	***P. nodorum***	***P. avenae***	***Z. tritici***	***P. nodorum***	***P. avenae***	***Z. tritici***	***P. nodorum***	***% P. avenae***	***% Z. tritici***	***P. nodorum***
Spring wheat	1	9	0	13	41	0	59	12	0	18	21
	2	13	0	3	81	0	19	23	0	5	9
	3	43	5	4	83	10	8	20	2	2	5
	4	11	0	66	14	0	86	3	0	17	10
	5	5	4	12	24	19	57	6	5	15	7
	6	5	1	15	24	5	71	6	1	17	7
	7	3	0	103	3	0	97	1	0	41	4
	8	0	0	72	0	0	100	0	0	42	4
Winter wheat	1	67	6	275	19	2	79	9	1	37	24
	2	33	1	285	10	0	89	5	0	41	19
	3	241	15	346	40	2	57	18	1	26	20
	4	21	13	395	5	3	92	2	1	35	15
	5	8	7	443	2	2	97	1	1	50	21
	6	21	8	355	5	2	92	2	1	39	14
	7	12	0	618	2	0	98	1	0	44	6
	8	3	0	563	1	0	99	0	0	41	7
Spring triticale	1	8	1	1	80	10	10	29	4	4	12
	2	2	12	0	14	86	0	4	24	0	9
	3	26	8	0	76	24	0	14	4	0	2
	4	8	3	1	67	25	8	17	6	2	8
	5	9	17	1	33	63	4	9	16	1	4
	6	5	0	0	100	0	0	21	0	0	6
	7	22	11	3	61	31	8	27	13	4	0
	8	0	0	0				0	0	0	4
Winter triticale	1	188	7	23	86	3	11	37	1	4	23
	2	23	14	24	38	23	39	17	11	18	24
	3	204	68	15	71	24	5	33	11	2	19
	4	23	26	15	36	41	23	14	15	9	17
	5	82	17	12	74	15	11	33	7	5	18
	6	12	16	1	41	55	3	14	19	1	13
	7	41	31	52	33	25	42	15	12	19	11
	8	26	5	42	36	7	58	13	3	21	14
Spring wheat	total/mean	89	10	288	23	3	74	7	1	22	8
Winter wheat	total/mean	406	50	3280	11	1	88	5	1	39	16
Spring triticale	total/mean	80	52	6	58	38	4	17	11	1	6
Winter triticale	total/mean	599	184	184	62	19	19	26	8	8	17

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