

Septoria Complex Diseases of Wheat in the Area of Novi Pazar

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Abstract: *Septoria/Stagonospora diseases are major economically important wheat diseases caused by three fungal pathogens: Septoria tritici, Stagonospora nodorum, and Stagonospora avenae f. sp. triticea. In favorable conditions, these filamentous fungi can cause serious yield losses. Incidence and severity of Septoria/Stagonospora diseases in the environmental conditions of Novi Pazar („Terra” LTD) were estimated in this study. Three wheat varieties were researched: Enola, Todora and Apache, grown in the fields of Novi Pazar and the nearby village Pamukchi in rotation with maize and wheat. The severity of the diseases was scaled from one to five for each wheat variety throughout the plants growing stages. Incidence, duration and severity of Septoria diseases were different for the each wheat variety and disease dependency on the crops used in the rotation was observed.*

Keywords: *wheat, Septoria, varieties, disease severity.*

1. INTRODUCTION

Since the end of the 20th century Septoria complex diseases have been reported as diseases with significant economical importance worldwide (Rodeva, 2004, Rodeva, 1989, Cunfer, Ueng, 1999, Lucas, Bowyer, Anderson, 1999, Loughman, Lagudah, Trottet, Wilson, Mathews, 2001). Septoria/Stagonospora leaf blotches are caused by three different filamentous fungi (anamorphs: *Septoria tritici*, *Stagonospora nodorum* and *Stagonospora avenae f. sp. triticea*). When these pathogens occur together, they are referred to as the Septoria leaf spot (blotch) complex. In the past they were thought to belong all to the Septoria genus (Cunfer, Ueng, 1999)) but researches over the years proven that the latter two species belong to the *Stagonospora* genus (Rodeva, 2004). In Bulgaria *Mycosphaerella graminicola* (anamorph: *Septoria tritici*), *Phaeosphaeria nodorum* (anamorph: *Stangospora nodorum*), and *Phaeosphaeria avenariaf. sp. triticea* (anamorph: *Stagonospora avenae f. sp. triticea*) are also very important wheat pathogens (Rodeva, 1989). Septoria complex disease is characterized by necrotic lesions on the leaves and stems of the infected plants and is more prevalent in cool and wet weather. Except for the climatic conditions, the level of resistance of wheat varieties, growing the wheat in monoculture, and the presence of post-harvest residues and volunteer plats (Rodeva, 2004) are also important factors favoring the infection with Septoria complex. The initial sign of Septoria/Stagonospora infection is the presence of small chlorotic spots on the leaves of the seedlings soon after their emergence.

The extensive application of conventional agriculture implicating technologies, fertilizers and pesticides is wide whereas the genetic selection of resistant varieties is a slower process still inadequate.

The area of Novi Pazar is highly important for Bulgarian wheat production, which is why this study focuses on the incidence and severity of Septoria diseases in wheat varieties from this area.

2. MATERIALS AND METHODS

This research was performed for two consequent years: 2012 and 2013 in the fields of „Terra” LTD, Novi Pazar and the nearby village Pamukchi. Three wheat varieties were examined: Enola, Todora and Apache, grown in or out of rotation with sunflower. Septoria disease incidence and severity were estimated from early growth stage until plant maturation. Results were obtained once in a month (for three months) by examination of 500 plants from each variety. Disease severity was rated 0-4 using a scale: plants having no symptoms were rated 0 whereas those with necrotic lesions on the flag leaf

were given a value of 4. Disease severity indexes (SI) were calculated using McKynney formula (Rodeva, 2004). Climatic data for the study period was also obtained (Table1 and Table 2).

Table1. Precipitation in 2012-2013 (mm)

Year	Average month precipitation (mm)												Average year precipitation (mm)
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2012	108	46	6	64	145	29	33	40	16	54	27	145	714
2013	49	80	57	37	56	142	54	30	-	-	-	-	505

Table2. Temperature in 2012-2013 (C°)

Year	Average month temperature (C°)												Average year temperature(C°)
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2012	-1.1	-3.9	6.3	13.5	18.3	22.1	28.1	23.9	19.3	15.2	8.2	-0.3	12.46
2013	1.5	2.7	6.7	12.3	18.6	21.6	21.6	24.5	-	-	-	-	13.68

2.1. Meteorological Conditions

The area of Novi Pazar is in the continental climatic zone producing cold winters and hot and dry summers with highest temperatures measured in July. Average annual precipitation is about 550 mm. Lately, prolonged droughts have become typical during the summer months which make supposedly good prognosis for building up Septoria complex resistance since precipitation is essential for its occurrence.

3. RESULTS AND DISCUSSION

Septoria complex disease incidence and severity were estimated for the three wheat varieties grown in Novi Pazar (Table 3) and Pamukchi (Table 4). Results were divided whether or not the wheat was rotated with sunflower. The overall results in the area of Novi Pazar for 2012 and 2013 showed low rate of Septoria complex diseases (higher in the early growth stages and decreasing through the season). When wheat was cropped the prior year, disease incidence was 10.6%, 10.3% and 9.5% in Enola, Apache and Todora respectively in the early vegetation. The fashion was maintained in the second month but incidence dropped (8.4% in Enola, 8.2% in Apache and 6.7% in Todora). The third examinations (prior harvesting) revealed the presence of single diseased plants and insignificant rate differences between the three varieties (5% in Enola, 4.7% in Apache and 4.2% in Todora). The calculated severity indexes (SI) were 0,97, 0,92 and 0,65 for Enola, Apache and Todora respectively. When wheat varieties were cropped after sunflower, disease incidence was lower in all the varieties. A reduction of 2.3% in the early stages to 2.6% prior harvesting was measured for Enola (SI 0.72); 2.4% to 2.7% for Apache (SI 0.82); 2% to 2.5% in Todora (SI 0.45). In 2013 in the fields with no rotation, Septoria diseases were again most prevalent in Enola (11%), followed by Todora (10.5%) and Apache (10.2%). Before the harvest, the incidence was reduced to 7.5% in Todora, 7% in Enola and 6,5% in Apache (SI 1.3, 1.1 and 1 for Todora, Enola and Apache respectively). Those wheat varieties cropped after sunflower were less attacked by Septoria complex diseases similarly to the previous year. One more time, the highest disease rate was measured in Enola (10.3% to 6.9%; SI 0.63) and lowest in Apache (9.5% to 5.6%; SI 0.3). The incidence measured in Todora was 8.4% to 5.9% (SI 0.59). Average values calculated for and were highest for Enola (9.3 % after wheat (SI 1)), and 6.9% after sunflower (SI 0.6). The average rate and severity index were lowest for Apache (9%, SI 1 after wheat and 5.6%, SI 0.5 after sunflower).

The results of the parallel studies in Pamukchi are presented in Table 4. In 2012 Septoria complex disease incidence and severity were higher in the early growth stages compared to the results from Novi Pazar but again there was a decreasing tendency during the growth. Cropping wheat without rotation with sunflower led to the following results: 11% to 5.9% incidence, SI 0.75 in Enola; 10.5% to 5.3%, SI 0.7 in Todora, and 10.8% to 4.9%, SI 0.6 in Apache. When the wheat was rotated with sunflower, Septoria complex incidence fell from 8.7% to 3% in Enola; rates were reduced with 2.5% in Todora and 2.4% in Apache), and severity indexes were 0.35, 0.4 and 0.35 respectively.

Similar results were obtained for Septoria complex incidence and severity in 2013: higher when wheat was not rotated with sunflower (14% to 8%, SI 1.7 in Enola). Incidence in Todora was 12.2% to 7.4 %, SI 1.5, and in Apache: 13.2% to 7 %, SI 1.3. After rotation with sunflower incidence in Enola was

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9.2% to 4.2%, SI 0.52; 9% to 3.3 %, SI 0.40 in Todora; and 8.6% to 3%, SI 0.3 in Apache. Avaragely, Enola was most severely attacked (SI 1.2), followed by Todora (SI 1.1) and Apache (SI 0.9).

Table3. Incidence and severity of Septoria complex diseases in Novi Pazar (2012- 2013)

Wheat variety	da	Incidence (%/da)							Severity index (bal)		
		15.05		15.06		05.07		Avarage	16.07		
		2012	2013	2012	2013	2012	2013		2012	2013	Avarage
Todora	20	9.5	10.5	6.7	13.7	4.2	7.5	8.7	0.65	1.3	0.98
Enola	30	10.6	11.0	8.4	13.5	5.0	7.0	9.3	0.97	1.1	1.03
Apahе	15	10.3	10.2	8.2	14.0	4.7	6.5	9.0	0.92	1.0	0.96
Mean		10.1	10.6	7.8	13.7	4.6	7.0	9.0	0.84	1.13	0.99
After sunflower											
Todora	20	8.5	9.0	5.2	5.8	2.8	3.3	5.8	0.30	0.40	0.35
Enola	30	8.7	9.2	5.5	6.2	3.0	4.2	6.1	0.35	0.52	0.44
Apahе	20	7.9	8.6	4.8	5.0	2.5	3.0	5.3	0.25	0.35	0.30
Mean		8.4	8.9	5.1	5.7	2.8	3.5	5.7	0.30	0.41	0.35
GD 5 %		12,3	10.7	11,2	3.9	6,1	5.3		12,3	10.7	
GD 1 %		19,6	14.9	17,8	6.2	11,3	11.6		19,6	14.9	
P %		4,3	3.8	4,1	3.1	3,6	2.9		4,3	3.8	

Table4. Incidence and severity of Septoria complex diseases in Pamukchy (2012- 2013)

Wheat variety	da	Disease Incidence -%/da						Mean	Severity index (bal) 15.07		
		15.05		15.06		05.07			2012	2013	Avarage
		2012	2013	2012	2013	2012	2013				
Todora	20	10.5	12.2	7.2	9.5	5.3	7.4	8.7	0.70	1.5	1.1
Enola	30	11.0	14.0	9.4	11.0	5.9	8.0	9.9	0.75	1.7	1.2
Apahе	15	10.8	13.2	8.0	10.0	4.9	7.0	9.0	0.60	1.3	0.9
Mean		10.8	13.1	8.2	10.2	5.4	7.5	9.2	0.68	1.5	1.1
After sunflower											
Todora	20	8.5	9.0	5.2	5.8	2.8	3.3	5.8	0.30	0.40	0.35
Enola	30	8.7	9.2	5.5	6.2	3.0	4.2	6.1	0.35	0.52	0.44
Apahе	20	7.9	8.6	4.8	5.0	2.5	3.0	5.3	0.25	0.35	0.30
Mean		8.4	8.9	5.1	5.7	2.8	3.5	5.7	0.30	0.41	0.35
GD 5 %		12,3	6,2	11,2	9,8	6,1	3,9		12,3	6,2	
GD 1 %		19,6	11,3	17,8	17,2	11,3	7,6		19,6	11,3	
P %		4,3	3,6	4,1	4,3	3,6	3,1		4,3	3,6	

4. CONCLUSION

In the studied period of time (2012-2013), Septoria complex diseases were more prevalent in the fields of Novi Pazar compared to the fields in Pamukchi. Overall, the prevalence was low to average. From the three researched wheat varieties, Enola was most attacked by the Septoria complex and the disease was most severe regardless of crop rotation and location with disease incidence 8.2% and SI 0.78). Data obtained for Apache proved it more resistant than the other two wheat varieties, with disease incidence 7.4% and SI 0.46.

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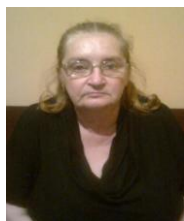
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