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Wheat leaf diseases dynamics in Albania

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ABSTRACT: *The field observations were carried out in 2009–2010, 2010–2011 and 2011-2012 in conjunction with the National Test of Seeds and Saplings Office in the experimental fields Agricultural Technology Transfer Centre (ATTC) Lushnje, Korçë, Fushë Krujë and Shkodër in Albania. Eight wheat cultivars were planted at each of four locations (ATTC). Plots were assessed four times during the growing season for powdery mildew, Septoria/Stagonospora leaf blotch, and leaf rust. Disease incidence and disease index of wheat leaf diseases were determined. Septoria / Stagonospora leaf blotch complex (SLB; Septoria tritici Desm. and Stagonospora nodorum).and the wheat leaf rust (LR; Puccinia triticina f. sp. tritici Roberge ex Desm), were the most harmful diseases at the time of research (incidence 20–100% and index 10–65%, for SLB) and (incidence 15-–100% and index 1–55%, for LR). Also the incidence and index of powdery mildew (PM) , caused by (Blumeria graminis (DC.) Speer) was high (4–100% and 1-45% respectively). Changes in disease epidemics were determined and showed the differences between the analyzed diseases.*

Keywords: *wheat, Brown rust, Septoria leaf blotch, powdery mildew, disease incidence, disease index.*

I. INTRODUCTION

Winter wheat is one of the most important cereal crops in Albania. Diseases, especially leaf diseases, of wheat are causing important losses of the yield [1]. Since the 1990 wheat has been grown under increasingly intensive management regimes in part of the farms. These changes in the cropping system have increased incidence and severity of the wheat diseases [2] Assessment of incidence and severity of each disease and epidemics analysis are the main tasks for the present. Changes in the epidemics of disease are reflected by alterations in the disease progress curve. The most important parameters are rate of infection, shape of the curve and area under the disease progress curve .[3] The primary infections of winter wheat crops by and SLB (Septoria leaf blotch), brought about by *Septoria tritici* (teleomorph *Mycosphaerella graminicola*) are initiated in autumn by air-borne ascospores of the teleomorph stage, which originate from sources outside the crop. At the Agricultural University of Tirana trials for wheat breeding has been in place in the last five decades enabling also long-term resistance trials [4]. Genetic resistance is the most profitable control approach for all leaf diseases from both economical and ecological perspectives. Growing resistant wheat cultivars is one of the most economical and effective methods of control wheat LR (leaf rust) (*Puccinia triticina* f. sp. *Tritici* Roberge ex Desm.), and the SLB (Septoria/Stagonospora leaf blotch) complex *Septoria tritici* Desm.. Powdery mildew, caused by *Blumeria graminis* was observed every year, but it is harmful only in some cases under the conditions of Albania. Development of powdery mildew depends mainly on wheat density, level of nitrogen and variety Where environmental conditions are favorable for disease development, yield losses ranging from 20 to 43% have been reported [5] Management of these diseases should be based on the use of resistant varieties since the persistence of available fungicides is not sufficient to protect the plant during the whole cycle [6. The detailed studies of the life cycle, distribution and dynamics of development of wheat leaf diseases help to understand better the development and propagation of diseases what may improve control strategy.

II. MATERIAL AND METHODS

2.1 Locations and experimental design.

In conjunction with the National Test of Seeds and Saplings Office in the experimental fields Agricultural Technology Transfer Centre (ATTC) Lushnje, Korçë, Fushë Krujë and Shkodër in Albania. Disease incidence (P) and Disease Index (DI = Imc) and grain yield data were collected over three growing seasons, 2009–2010, 2010–2011and 2011-2012, here after referred to as 2010,2011 and 2012. Wheat cultivars are planted in randomized blocks with four replications. Each plot was 20 m². Agro-technical practices have been the same based on type protocol established previously for the distance of planting, seed rate, doses of fertilizers, hoeing, etc.

2.2 . ***Plant material*****.**

In the National Test of Seeds Office were planted 8 promising cultivars for production for the two years study period (Bullgar 3 x KB 703 (L1), IKB-P6 (L2), L V S -93 (L3), Ni 792(L4), Progresi (L5), Regina x L-7769 (L6), Salgema (L7), Dajti (X kontroll) (L8). Cultivars planted in the performance tests included both public and private materials and experimental lines submitted by small grain breeders.

2.3 Disease assessments.

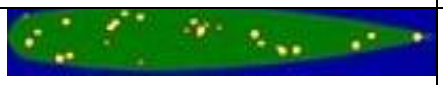
Visual estimation of disease severity from natural infection by Septoria leaf blotch *(Septoria tritici* Roberge in Desmaz).and Wheat leaf rust (caused by *Puccinia recondita* f.sp. *tritici*; *Prt*) was used. Assessment of Septoria leaf blotch *(Septoria tritici* Roberge in Desmaz).and Wheat leaf rust (caused by *Puccinia recondita* f.sp. *tritici*; *Prt*) infections has been based on standard area diagrams (SADs) the percent of covered leaves surface occuped by the disease. (Fig 1. 2 and 3).

Severity grade	**DS* in %**	**Standard area diagrams SAD s**	**Description of DS for Wheat leaf rust (*Puccinia recondita* f.sp. *tritici*; *Prt*)**
0	**0**		no uredie visible, nekrotike lesions may be detected
1	**0.1-5**		small uredie appear, pustula are surrounded in a defined necrotic area.
2	**5.1-25**		spacious uredie of average size, necrotic lesions clearly defined
3	**25.1-50**		uredia are large, light cloroses appear in the center of infection, no visible necrosis.
4	**50.1-75**		uredia are mainly large or often combined, klorotike areas may be visible
5	**75.1-100**		uredia are mainly large or often combined, klorotike

*DS: Disease severity

Figure 1.

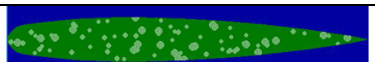
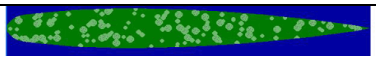
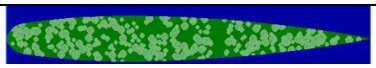
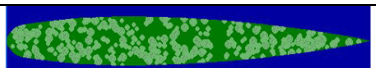
Standard area diagrams used to estimate Wheat leaf rust (***Puccinia recondita*** f.sp. ***tritici***; ***Prt***) in the Agricultural Technology Transfer Centre (ATTC) Lushnje, Korçë, Fushë Krujë and Shkodër Albania. (Images for SAD s created using Severity Pro software (Vrapi, H. et al 2012)

Severity grade	**DS* in %**	Standard area diagrams **SAD s**	**Description of DS for** Septoria leaf blotch *(Septoria tritici* Roberge in Desmaz).
0	**0**		No pycnidial formation, no symptoms or occasional hypersensitive fleck
1	**0.1-5**		No or only occasional isolated pycnidia formed,
2	**5.1-25**		Very light pycnidial formation
3	**25.1-50**		Light pycnidial formation
4	**50.1-75**		Moderate pycnidial formation lesions coalescing considerably
5	**75.1-100**		Large, abundant pycnidia, lesions coalescing extensively

*DS: Disease severity

Figure 2.

Standard area diagrams used to estimate Septoria leaf blotch *(Septoria tritici* Roberge in Desmaz). in the Agricultural Technology Transfer Centre (ATTC) Lushnje, Korçë, Fushë Krujë and Shkodër Albania. (Images for SAD s created using Severity Pro software (Vrapi, H. et al 2012)

Severity grade	**DS *in %**	Standard area diagrams **SAD s**	**Description of DS for** powdery mildew (*Blumeria graminis f.spp.tritici*)
0	**0**		No symptom of powdery mildew
1	**0.1-5**		Small scattered powdery mildew specks covering 5% or less leaf area
2	**5.1-25**		Small powdery lesions covering 5.1-25 % of leaf area
3	**25.1-50**		Powdery lesions enlarged covering 25.1-50% of leaf area
4	**50.1-75**		Powdery lesions coalesce to form big patches covering 50.1-75% of leaf area
5	**75.1-100**		Big powdery patches covering 75.1-100 % or more of leaf area and defoliation occur.

*DS: Disease severity

Figure 3

Standard area diagrams used to estimate powdery mildew **(***Blumeria* ***graminis f.spp.tritici***) in the Agricultural Technology Transfer Centre (ATTC) Lushnje, Korçë, Fushë Krujë and Shkodër Albania. (Images for SAD s created using Severity Pro software (Vrapi et al., 2012).

Severity and diffusion of infection were obtained by resorting to the McKinney index (McKinney, 1923) [7] (modified from Cooke, B. M. 2006) [8]. The McKinney index (Imc) was obtained by using the following formula:

$$(\text{Imc})\ \% = \frac{\Sigma\,(f \times v)}{N \times X} \times 100$$

where: f = infection class frequencies; v = number of plants of each class; N = total of observed plants; X = highest value of the evaluation scale.

2.4 . Yield analysis

Total yield was assumed to be related to the components of yield (number of tillers, number of kernels per head, and 500 kernel weight) by the following relationship:

$$y = tkwc$$

in which y = grain yield in kilograms per hectare, t = number of tillers per meter row, k =number of kernels per head where number of heads is assumed to equal number of tillers in a given area, w = weight of 500 kernels, c= a constant that includes correction for differences in units.

2.5 Statistical Date Analysis

All statistical analyses were performed using General Linear Modeling (GLM) procedure with Dunnett's Method using SAS 2009 [9]. System for Windows Version 9.1 software, SAS Institute, Cary, North California, USA, to compare different states with respect to disease index. In all the observational in field experiments dependent variables were subjected to analysis of variance (ANOVA).

III. RESULTS AND DISCUSSION

Three-year investigations 2010,2011 and 2012 in which 8 common wheat lines/genotypes were included to test their succeptibility against Septoria leaf blotch (*Septoria tritici*) Rob, Leaf rust *(Puccinia recondita) and* estimate Powdery mildew (*Blumeria graminis f.spp.tritici*) were carried out in the experimental field of Agriculture Technology Transfer Centre (ATTC) of Lushnje, Korçë, Fushë Krujë and Shkodër in

Albania. Observation of diseases symptomes and reaction results of common wheat lines against Septoria leaf , Leaf rust, Powdery mildew and grain yield are summarized in Figure 4 (A,B,C,D),

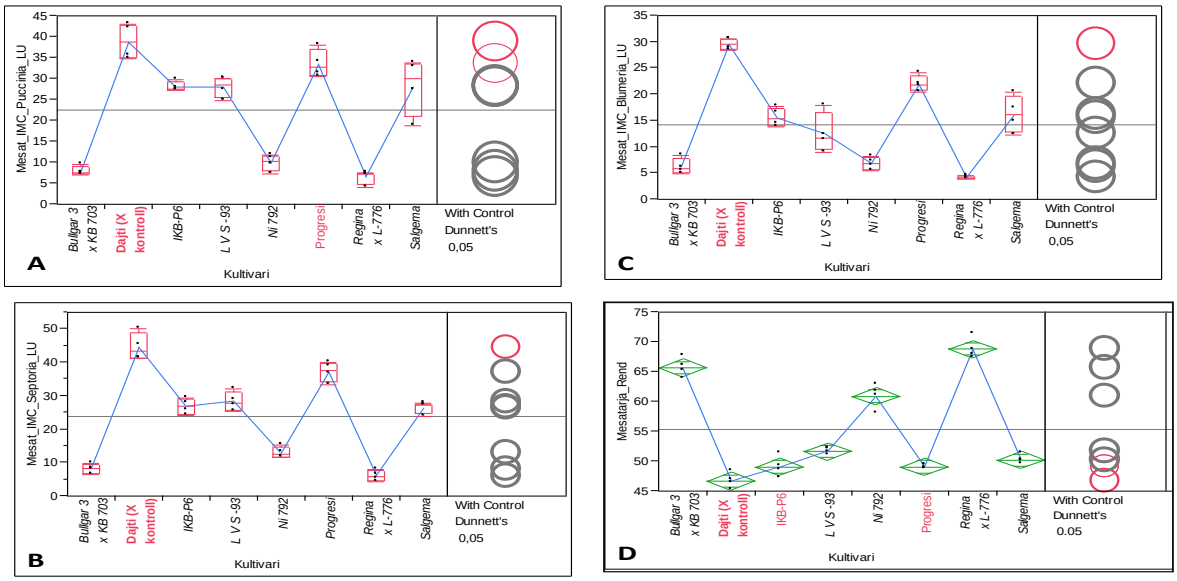


Figure 4

Evaluation of common wheat resistance against Leaf rust (A), Septoria leaf blotch(B), Powdery mildew(C) and grain yield (D) and Means Comparisons with a control using Dunnett's Method Control. Group = Dajti (control) Alpha 0.05 in the experimental field (ATTC) of Lushnje, Korçë, Fushë Krujë and Shkodër in Albania.(in year 2010,2011 and 2012 average date).

Table 1

Analysis of variance (ANOVA) for the disease index (Imc in %) for Leaf rust , Septoria leaf blotch(B), Powdery mildew(C) and grain yield (D) **(***Blumeria* ***graminis f.spp.tritici***) and grain yield in the experimental field (ATTC) of Lushnje, Korçë, Fushë Krujë and Shkodër in Albania.(in year 2010,2011 and 2012 average date).

Factor	Source	df*	SS** (df) 4 (R)	SSE*** (df) 24 (E)	SST**** (df) 31 (RE)	MS*****	F Ratio	Prob>F
Imc (LR)	cultivars	7	4429,89	274,57	4704,46	632,84	55,3163	<,0001
Imc (SLB)	cultivars	7	3036.44	146.07	3182.51	433.77	71.2696	<.0001
Imc (PM)	cultivars	7	2099,89	113,72	2213,62	299,98	63,3069	<,0001
yield	yield	7	2049.17	47.14	2096.32	292.74	149.0241	<.0001

* df: Degrees of freedom; ** SS :Sum of Squares; ***SSE: Sum of Squares Error; ****SST: Sum of Squares Total ; *****MS: Mean square.
LR; (*Puccinia triticina* f. sp. *tritici* Roberge ex Desm) , SLB;(*Septoria tritici)* Desm. and (*Stagonospora nodorum*). PM: (*Blumeria graminis* DC. Speer)

IV. CONCLUSION

Disease incidence and disease index of wheat leaf diseases were determined. Septoria / Stagonospora leaf blotch complex (SLB; *Septoria tritici* Desm. and (*Stagonospora nodorum*).and the wheat leaf rust (LR; (*Puccinia triticina* f. sp. *tritici* Roberge ex Desm), were the most harmful diseases at the time of research (incidence 20–100% and index 10–65%, for SLB) and (incidence 15-–100% and index 1–55%, for LR). Also the incidence and index of powdery mildew (PM) , caused by (*Blumeria graminis* (DC.) Speer) was high (4–100% and 1-45% respectively).

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