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ORIGINAL PAPER

Variation in the species composition of leaf spotting fungi in durum wheat depending of climate variables

Spasimira Nedyalkova[1] • Zornitsa Stoyanova[2] • Veska Georgieva[3] • Valentin Kazandjiev[3] • Rossitza Rodeva[2]

[1] Field Crop Institute – Chirpan, Chirpan, Bulgaria
[2] Institute of Plant Physiology and Genetics – Sofia, Sofia, Bulgaria
[3] National Institute of Meteorology and Hydrology – Sofia, Sofia, Bulgaria

Corresponding Autor: Rossitza Rodeva; E-mail: r.rodeva@abv.bg

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Abstract

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Several leaf spotting fungi were found to co-exist together in durum wheat management systems in Bulgaria and to incite similar leaf symptoms. They appeared every year but their proportion in the complex varied. This investigation was undertaken to assess the occurrence of foliar pathogens over a range of different environmental conditions across time and space and to discuss the impact of some climate factors on the prevalence of individual fungal species. A 3-yr field survey (2012 to 2014) was conducted at three locations including General Toshevo (alt. 236 m), Radnevo (alt. 135 m) and Burgas (alt. 25 m). At every site specimens were taken from upper leaf level of two durum varieties (Predel and Saturn 1). At General Toshevo two new durum varieties (Mirela and Severina) created and released from Dobroudja Agricultural Institute were additionally included. Meteorological data were obtained from the weather station closest to each field and compared to climatic norm over long period of time (1981-2010). Among all analyzed leaves, three major leaf pathogens were found: *Pyrenophora tritici-repentis* (46%), *Monographella nivalis* (18%) and *Parastagonospora avenae* f. sp. *triticea* (15%). *Zymoseptoria tritici*, *Phaeophleospora* sp., *Cladosporium herbarum* and *Alternaria* sp. were represented by 4 to 6%. Parastagonospora nodorum and Cochliobolus sativus were not detected at all during the period of the investigation. There was a variation in the fungal community across the years. P. tritici-repentis had the greatest appearance level in 2012 and 2013. Percentage occurrence of *M. nivalis* was highest in 2014, moderate in 2012 and insignificant in 2013. *Pa. avenae* f. sp. *triticea* occurred every year but more noticeable in 2013 and 2014. *Z. tritici* was recorded in 2013 and 2014. Phaeophleospora sp. appeared only in 2014. The proportion in the leaf spotting complex varied between the locations. At General Toshevo the most common fungal species were *P. tritici-repentis* (36%), *Pa. avenae* f. sp. *triticea* (21%) and *M. nivalis* (19%). At Radnevo P. *tritici-repentis* was the most prevalent species (64%), followed by *M. nivalis* (23%) and Z. tritici (9%). At Burgas *P. tritici-repentis* was prevailing (45%). *Pa. avenae* f. sp. *triticea*, *Phaeophleospora* sp. and *M. nivalis* were found at 18, 15 and 13%, respectively. The occurrence and relative prevalence of the fungal pathogens was also depending on cultivars. Among the climate variables the most important role played temperature and in spring months from March to May. The obtained results showed the influence of years, locality, cultivar characteristics, and agrometeorological conditions on the occurrence of leaf spotting fungi.

Key words: Agrometeorological conditions, Fungal pathogens, Leaf spot diseases.

Introduction

The occurrence and severity of plant diseases is a result from the interactions of three factors: susceptible host plant, virulent pathogen, and favorable environmental conditions. This is represented with the classical disease triangle (Nelson, 1994; Velásquez et al., 2018). If any one of the three factors is missing, the triangle is not complete, no disease will occur. The alterations in environment influence host plants and pathogens as well as their interactions. The climate changes may impact on plant growth and modify host susceptibility but can also affect pathogen reproduction, dispersal, survival and activity (Ghini et al., 2008; Elad and Pertot, 2014). Plant pathogens are among the first to demonstrate the effects of climate change due to the numerous populations, ease of reproduction and dispersal, and short time between generations. The close relationship between the environment and diseases suggests that climate change will cause modifications in the different pathosystems, in each region (Ghini et al., 2008).

Several leaf spotting fungi were found to co-exist together in durum wheat management systems in Bulgaria and to incite similar leaf symptoms (Nedyalkova et al., 2013). They appeared every year but their proportion in the complex varied. This investigation was undertaken to assess the occurrence of leaf spotting pathogens at three locations in Bulgaria during three consecutive years and to discuss the effect of the main meteorological factors on the variation in fungal composition between years and locations.

Materials and Methods

Plant material, field surveys and pathogen identification

A 3-yr field survey (2012 to 2014) was conducted at the first half of June when the crop was approaching maturity. Three localities were visited including the district units of Executive Agency for Variety and Seed Control at General Toshevo (alt. 236 m), Radnevo (alt. 135 m) and Burgas (alt. 25 m). At every site the specimens were taken from the upper leaf level of two durum varieties (Predel and Saturn 1). At General Toshevo two new durum varieties (Mirela and Severina), created and released from Dobroudja Agricultural Institute, were additionally included in the study. The occurrence of nine leaf spotting fungi was of interest for the present investigation: 1) *Pyrenophora tritici-repentis* (Died.) Drechs. (*Ptr*); 2) *Parastagonospora avenae* (A.B. Frank) Quaedvlieg, Verkley & Crous f. sp. *triticea* T. Johnson (*Pat*); 3) *Parastagonospora nodorum* (Berk.) Quaedvlieg, Verkley & Crous (*Pan*); 4) *Zymoseptoria tritici* (Desm.) Quaedvlieg & Crous (*Ztr*); 5) *Phaeophleospora* sp. (*Pps*); 6) *Monographella nivalis* (Schaffnit) E. Müll. (*Mn*); 7) *Cochliobolus sativus* (S. Ito & Kurib.) Drechsler ex Dastur (*Cs*); 8) *Cladosporium herbarum* (Pers. : Fr.) Link (*Ch*); 9) *Alternaria* sp. (*Alt*). The pathogen identification was carried out in the phytopathological laboratory of the Institute of Plant Physiology and Genetics – Sofia based on disease symptoms and a combination of morphological and cultural characteristics with the highest taxonomic value.

Statistical analysis

The data were statistically processed using the software Statgraphics Centurion XVII. Analysis of variance, calculation of the least significant difference and Tukey-Kramer multiple comparison tests was performed at $P \leq 0.05$.

Meteorological data

Meteorological data were collected on site at the locations included in the survey with special emphasis to the major climate factors, temperature and rainfall. Long term air temperature and rainfall data from 1981 to 2010 were obtained from National Institute of Meteorology and Hydrology.

Two of the sites (General Toshevo and Radnevo) are located in the European-Continental climatic zone of Bulgaria. General Toshevo is situated in Eastern climatic region of the Danube Plain. The continental nature of the climate in this region is milder compared to the other regions of the Danube Plain and is approaching that of the North Black Sea. Winter is milder and summer is not too hot. The strong northeastern winds in winter are typical for this region, especially in the northern part. The milder winter affects also the distribution of solid precipitations.

Snowfall is only 40-45% of the precipitation in January and the snow cover is more unstable than in the rest of the Danube Plain. Spring is pretty cool, due to the frequent invasions of cold air masses from the northeast. Summer is not hot. The average monthly temperature in the warmest month during the period 1981-2010 in General Toshevo is 21.6°C, ranging between 19.2 and 24.7°C. The maximum air temperature in July is up to 30°C in a cold year and 36°C in a warm one. Due to the cool spring and not very hot summer, the sum of active temperature, higher than 10°C, is between 3000 and 3300°C. Autumn is warmer than spring. The deviation of monthly average temperature from climatic norm (1981-2010) at General Toshevo is presented in Figure 1. In general, the temperature in the studied period was 1-3°C higher compared to the climatic norm, especially in the spring.

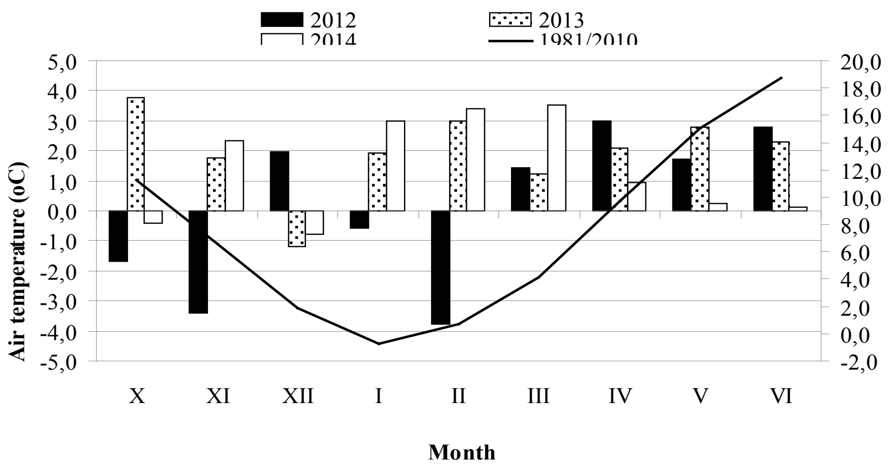

Figure 1. Deviation of monthly average air temperature for the 2012-2014 from climatic norm (1981-2010) at General Toshevo during the vegetation period of winter wheat

The precipitation regime also differs from that of the other climatic regions of the Danube Plain. The annual sum is averaged between 500 and 550 mm, outlining the area as one of the driest. Long periods (an average of 16-18 days) without rainfall are typical for the area, especially in summer and autumn, but in the northern parts of the region summer-autumn drought can last for 25-30 days. The maximum rainfall is in the summer, the minimum in winter. According to its orographic features, the area can be divided into two parts: northern – with a cooler and windy winter and less rainfall and a more pronounced difference between winter and summer rainfall; southern – with a mild winter and a relatively even distribution of precipitation. Deviation of monthly rainfall sum for the period 2012-2014 from climatic norm

(1981-2010) at General Toshevo is presented in Figure 2. In spring the rainfall sum was near to the climatic norm with exception of May 2012 and 2014 and June 2014 when it was higher.

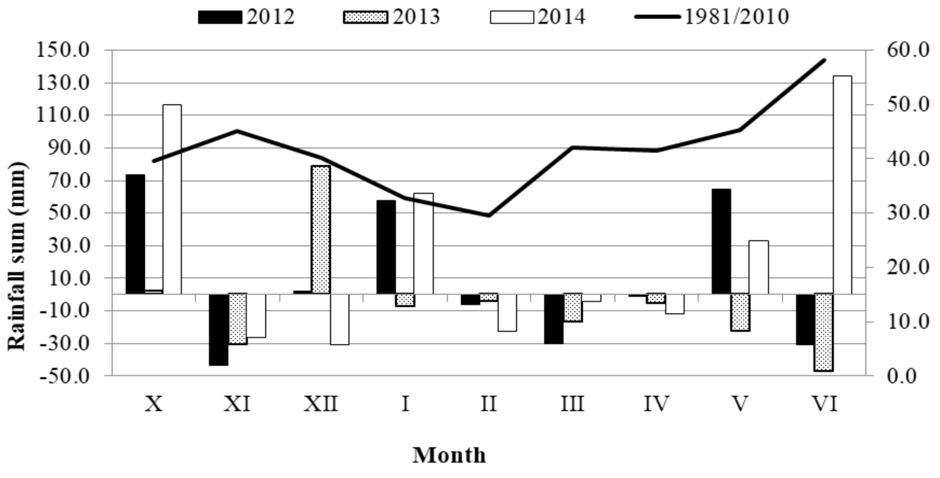

Figure 2. Deviation of monthly rainfall sum for the period 2012-2014 from climatic norm (1981-2010) at General Toshevo during the vegetation period of winter wheat

Radnevo is situated in the climatic region of Eastern Central Bulgaria. It is characterized by relatively mild winter (average air temperature in January is around 0^{o}C) and relatively more frequent warming due to the influence of Mediterranean cyclones. Stara Planina, which stops the weaker invasions of cold continental air, has also impact on the winter temperature conditions. Spring comes relatively early. It is a bit cooler than the autumn. The durable transition of the daily air temperature above 5^{o}C occurs at the end of February – beginning of March. Towards the end of November – beginning of December durable transition below 5^{o}C is registered. Summer is hot. The deviation of monthly average temperature from climatic norm for the period 1981-2010 at Radnevo is presented in Figure 3. In spring the monthly temperature was higher compared to the climatic norm.

Rainfall conditions in the climatic region of East Central Bulgaria have a continental character with a minimum in winter (February) and maximum in summer (June). Winter precipitation is about 100-150 mm, but only 30-35% of snowfall. The snow cover maintains for a relatively short period of time (20-30 days less than in northern Bulgaria). In the eastern parts of the region, seasonal rainfall amounts are almost equal, and in some locations the maximum is in spring or autumn, indicating that a transition from continental to continental-Mediterranean character of rainfall occurs in the climatic region of Eastern Central Bulgaria. In

2014 monthly rainfall sum of March, April and May exceeded the climatic norm and in 2012 only of May (Figure 4).

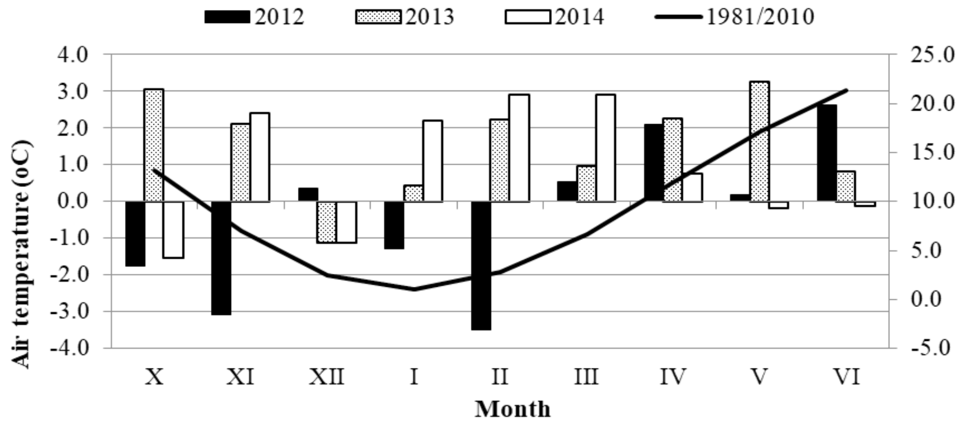

Figure 3. Deviation of monthly average air temperature for the 2012-2014 from climatic norm (1981-2010) at Radnevo during the vegetation period of winter wheat

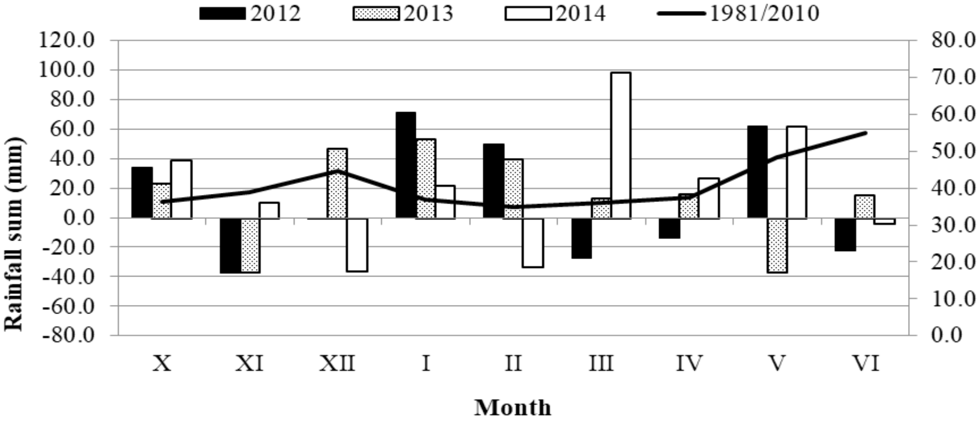

Figure 4. Deviation of monthly rainfall sum for the period 2012-2014 from climatic norm (1981-2010) at Radnevo during the vegetation period of winter wheat

Burgas is situated in the region of the Burgas lowland of the Black Sea climatic sub-region. The distinguishing feature of this sub-region is a relatively mild and humid winter and hot, dry and sunny summer. The winter is milder than at the Northern Black Sea coast. The average monthly air temperature in January is from 2 to 3°C, and the minimum temperature rarely falls below -6, -8°C. As a result of the relatively high air temperatures, the snow cover lasts for no more than 10-15 days

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in the winter. The spring is cool with an average monthly temperature in April up to 2-2.5°C lower than at the Thracian Valley. However, last spring frosts is observed two weeks earlier than in the other regions of the country. Summer is sunny, warm and dry. Due to the proximity of the sea, the maximum air temperature rarely exceeds 32-33°C. Autumn is considerably warmer than spring. The deviation of monthly average temperature for the studied period from climatic norm (1981-2010) at Burgas is presented in Figure 5. In the studied period the monthly temperature from February to June was 1-3°C higher than the climatic norm except February 2012.

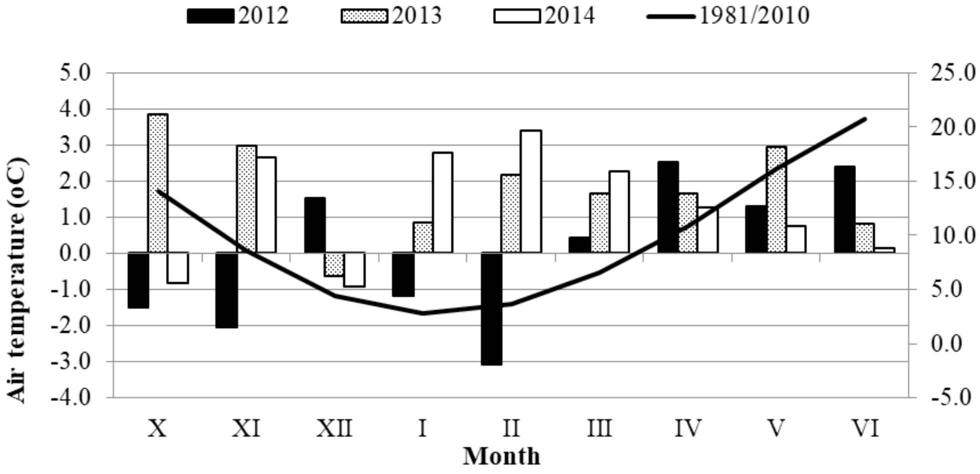

Figure 5. Deviation of monthly average air temperature for the 2012-2014 from climatic norm (1981-2010) at Burgas during the vegetation period of winter wheat

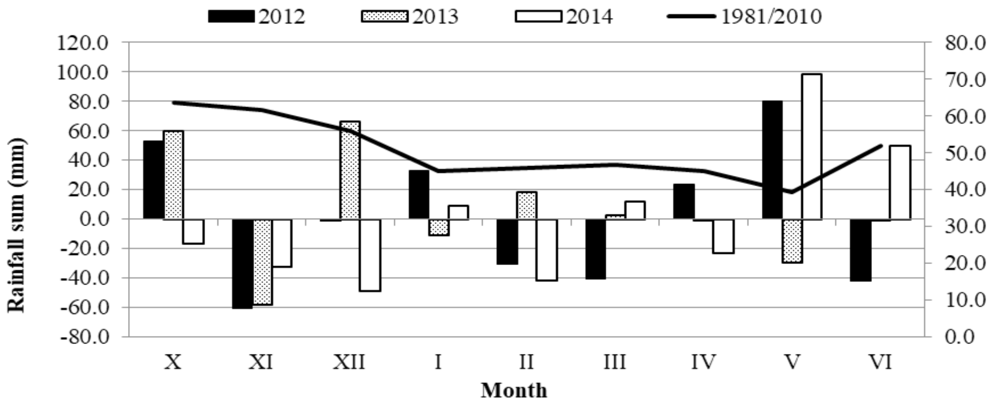

Figure 6. Deviation of monthly rainfall sum for the period 2012-2014 from climatic norm (1981-2010) at Burgas during the vegetation period of winter wheat

On the coastal zone, the maximum rainfall is in November, unlike the transitional continental climatic zone, where it is in June. In seasons the maximum is in autumn and winter (120-150 mm). The monthly rainfall sum of April and May 2012 as well as of March and May 2014 was higher compared to the climatic norm (Figure 6).

Results

Altogether 425 durum wheat leaves were collected and examined in the period 2012-2014. Seven of nine leaf spotting fungi were found, out of which five were identified to the species level and two to the genus level. The sum of the leaf specimens bearing each of the studied pathogens was 525. It was higher than the number of examined leaves because often the spots on one leaflet were caused by two or more different pathogens. Among all analysed leaves, three major leaf pathogens were found: *Ptr* (46%), *Mn* (18%) and *Pat* (15%). *Ztr*, *Pps*, *Ch* and *Alt* were represented by 4 to 6% (Figure 7). *Pan* and *Cs* were not detected at all during the period of the investigation.

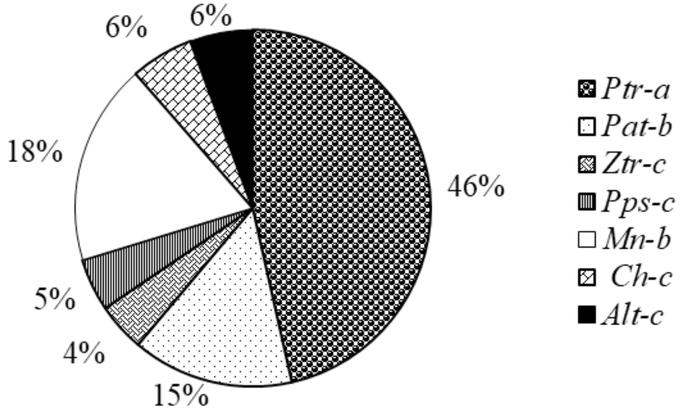

Figure 7. Leaf spotting pathogens on durum wheat found during the period 2012-2014, (%); the same letters after pathogens abbreviations mean no significant difference in their occurrence according to the Tukey-Kramer multiple range test ($P \leq 0.05$)

There was a variation in the fungal community across the years (Figure 8). *Ptr* had the greatest appearance level in 2012 and 2013. *Ptr* and *Pat* often co-occurred on the same leaf. Percentage occurrence of *Mn* was highest in 2014, moderate in 2012 and insignificant in 2013. *Pat* occurred every year but more noticeable in 2013 and 2014. *Ztr* was recorded in 2013 and 2014. *Pps* appeared only in 2014.

In 2012 five pathogens were found (Figure 8a). *Ptr* was the most common species (60%), followed by *Mn* (16%). *Pat*, *Ch* and *Alt* were represented by 8, 7 and 9%, respectively. *Ztr* was not noticed. Six pathogens were recorded in 2013

(Figure 8b). Among them *Ptr* was predominant (68%). From the other pathogens *Pat* had a greater participation in the complex (15%). *Ztr*, *Ch* and *Alt* had a smaller share (4 to 8%). The most insignificant was the occurrence of *Mn* (1%) in 2013. In 2014 seven pathogens were recorded (Figure 8c). *Mn* dominated (35%), followed by *Ptr* (20%) and *Pat* (18%). Percentage frequency of *Pps*, *Ztr* and *Ch* was 12, 8 and 6%, respectively. *Alt* was isolated at 1%.

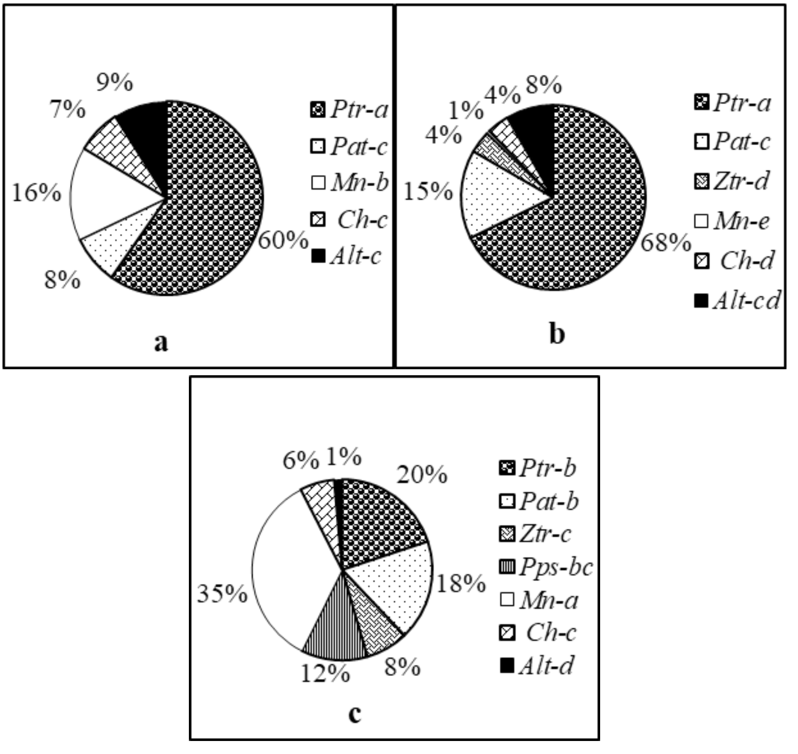

Figure 8. Leaf spotting pathogens on durum wheat recorded in 2012 (a); 2013 (b) and 2014 (c), (%); the same letters after pathogens abbreviations mean no significant difference in their occurrence according to the Tukey-Kramer multiple range test (P≤0.05)

The proportion in the leaf spotting complex varied between the locations. *Ptr* had consistently the greatest percentage occurrence at all locations (Figure 9). At General Toshevo 165 leaf specimens were collected in the period 2012-2014. The most common fungal species were *Ptr*, *Pat* and *Mn*, percentage occurrence being 36, 21 and 19%, respectively (Figure 9a). *Ztr* represented the smallest share (3%). *Pan, Pps* and *Cs* were not found during the period of the investigation. At Radnevo 109 diseased leaves were collected (Figure 9b). Six pathogens were found altogether. *Ptr* was the most prevalent species (64%), followed by *Mn* (23%) and

Ztr (9%). *Pat*, *Ch* and *Alt* were established in just a few samples (1-2%). During the studied period *Pan*, *Pps* and *Cs* were not found at all. At Burgas 150 leaf samples were collected. Seven of nine pathogens were found, including the new species *Phaeophleospora* (*Pps*) (Figure 9c). *Ptr* was the prevailing species (45%), followed by *Pat* (18%), *Pps* (15%), *Mn* (13%) and *Alt* (6%). *Ztr* and *Ch* was recorded at 1 and 2%, respectively.

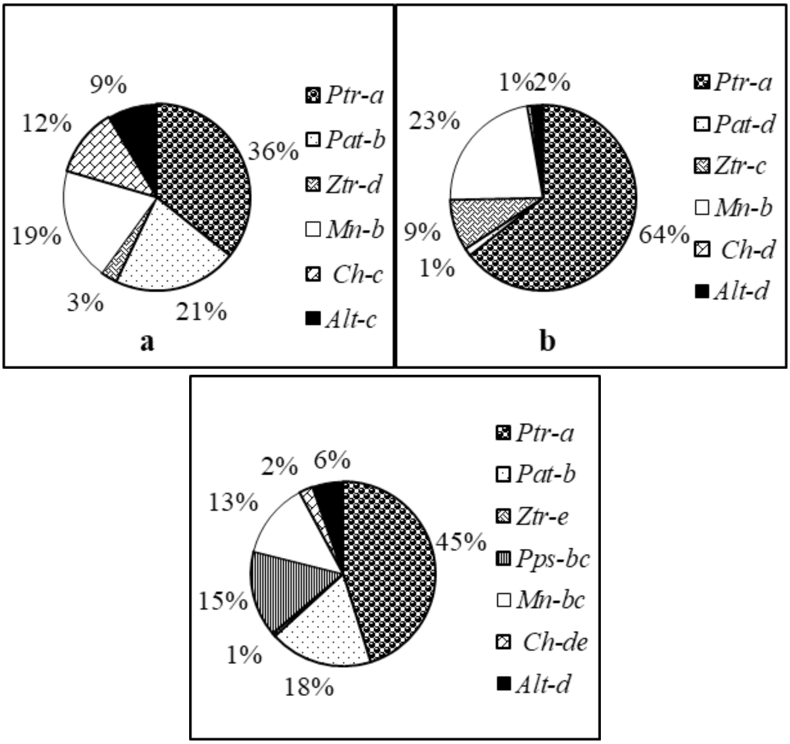

Figure 9. Leaf spotting pathogens on durum wheat found at General Toshevo (a), Radnevo (b) and Burgas (c) during the studied period, (%); the same letters after pathogens abbreviations mean no significant difference in their occurrence according to the Tukey-Kramer multiple range test (P≤0.05)

The occurrence and relative prevalence of the fungal pathogens varied depending on cultivars across the years. At General Toshevo *Ptr* was the predominant species in 2012 and 2013, especially on Saturn 1 and Predel, but it was not established on any of the varieties in 2014, when *Mn* dominated on Saturn 1, Mirela and Severina (Figure 10). No leaf spots were observed on Predel in 2014, but a high level of yellow rust attack was recorded not involved in present study. *Ch* was isolated from Severina and Predel annually with exception of Predel in 2014. Of the fungi belonging to Septoria complex, *Pat* appeared every year, but more noticeable on

Predel and Saturn 1 in 2013 and on Severina in 2014. *Ztr* was recorded only on Predel in 2013 and Saturn 1 in 2014. *Alternaria* isolates were obtained from Predel and Saturn 1 in the years with higher temperature during the spring months of April-June (2012 and 2013).

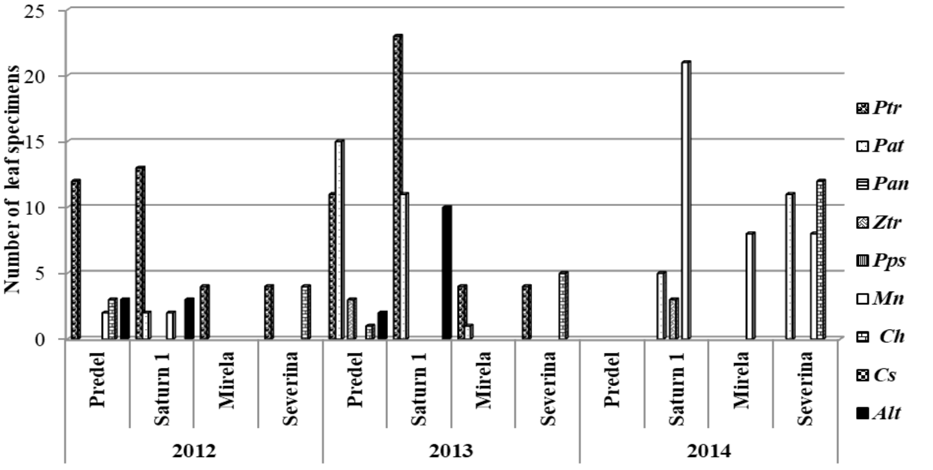

Figure 10. Variation in fungal community between the different cultivars across the years at General Toshevo

At Radnevo *Ptr* was present on both varieties with some predominance on Saturn 1 in all studied years (Figure 11). *Mn* was established on Predel and Saturn 1 but only in 2014. *Ztr* was not found in 2012. It appeared rarely in 2013 and more significantly on Saturn 1 in 2014. *Pat* was recorded only on Saturn 1 in 2012. *Alt* and *Ch* were isolated only from Predel in 2013 and 2014, respectively.

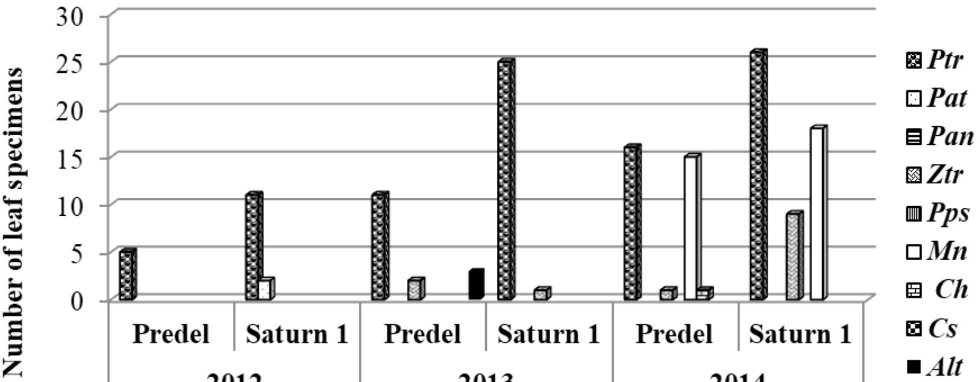

Figure 11. Variation in fungal community between the different cultivars across the years at Radnevo

At Burgas *Ptr* was prevalent on both cultivars in 2012 and 2013, but it was not present in the fungal population in 2014 (Figure 12). *Pat* and *Mn* appeared every year, but more prominently in 2014 and 2012, respectively. *Pps* occurred on both cultivars more noticeable on Predel but only in 2014. *Ztr* was not observed in 2013. It was recorded on Saturn 1 in 2013 and 2014. *Ch* was isolated only from Predel in 2012 and 2013. Isolates of *Alt* were obtained from Predel and Saturn 1 in 2012 and from Saturn 1 in 2014.

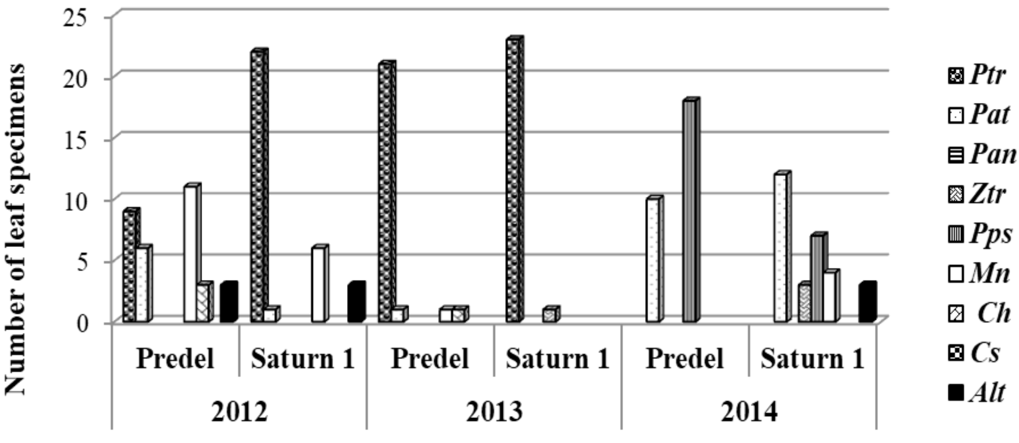

Figure 12. Variation in fungal community between the different cultivars across the years at Burgas

Discussion

Meteorological conditions are important factors for the development of fungal diseases in winter wheat. Two meteorological variables (air temperature and rainfall) were taken into consideration in the present investigation. Temperature is one of the major factors that determine plant growth, development, and yield. Global wheat production is estimated to fall by 6% for each °C of further temperature increase (Asseng et al., 2015). For every plant –pathogen interaction, there is an optimal temperature range at which disease develops (Velásquez et al., 2018). Pathogen survival in the absence of a host (e.g. overwintering and oversummering) can be affected by temperature. A prolonged period of temperature below -2°C has adverse effects on the fungal pathogens resulting in low survival and thus reduces inoculum to infect the wheat crop. Elevated temperatures reduce plant stress during the winter but increase the stress on the plant during the summer (Elad and Pertot, 2014). Juroszek & von Teidemann (2013) found that temperature was the most widely used environmental parameter in disease models, with leaf wetness duration or another variable representing moisture used if necessary. For cereal pathogens (leaf rust of wheat and net blotch of barley), it was assumed that the critical period of infection occurred from March to May during the spring, when the three top leaves emerge (Launay et al., 2014). Foliar pathogens develop onto and into leaves during their growth cycle. Indeed, the leaf temperature, which may significantly differ from the air temperature, has greater influence on development of fungal pathogens. Moreover, the relationship between temperature and the development of foliar pathogens is nonlinear (Bernard, 2012). Thus, the influence of air temperature alterations on the appearance and variation in the population of leaf spotting fungi should be discussed with some caution.

Many foliar diseases require extended periods of leaf wetness for infection to take place (Huber & Gillespie, 1992). High relative humidity and several hours of free surface water are critical for both spore germination and successful infection. Rainfall is a key requirement for the development of Septoria diseases as it allows for the swelling of pycnidia and aids the dispersal of spores in splash to the upper leaves of wheat plant (Gladders et al., 2001). Temperature and water availability interact to determine fungal infection, and the required moisture is most commonly available during the overnight dewfall (Harvell et al., 2002) or after rainfall events.

In the present work deviations of monthly average air temperature and monthly rainfall sum from climatic norm for the period 1981-2010 are presented and discussed in relation to fungal pathogen occurrence. Across the three years of the study the air temperature in March to May was 1-3°C higher compared to the climatic norm at all three locations (General Toshevo, Radnevo and Burgas). It could be suggested that leaf infections have initiated earlier in the growing season, allowing more time for pathogen reproduction and dissemination. On the other hand, increased temperature may result in lower relative humidity levels especially in 2013. At all locations the precipitation for the same three months followed the similar pattern during the studied period. It was higher in 2012 (especially in Burgas) and 2014 (especially in Radnevo), while 2013 was drier and warmer than the other two years. At General Toshevo spring rainfall sum was lower compared to other two locations but the relative air humidity was always higher, which is a climate characteristic of this locality and may ensure prolonged leaf wetness duration.

Among all analyzed leaves, three major leaf pathogens were found: *Ptr*, *Mn* and *Pat*, confirming the results of a previous study (Nedyalkova et al., 2013). The same authors established that these fungal species easily produced sexual morph under the conditions of our country, which is one of the possible explanations for their prevalence in the leaf spotting complex.

Ptr is found in most countries of the world where wheat is grown (Ciuffetti et al., 2014). Its widespread distribution and the great adaptability to diverse environments may be related to the capability of spores to germinate at different temperatures (Tonin et al., 2014). The spread and infection of *Ptr* can occur under a wide range of environmental conditions; in general, temperatures between 10 and

30°C and 6- to 48-hour humid periods are sufficient (Hosford et al., 1987). *Ptr* is typical of drier areas, because under such conditions it develops better than other leaf diseases (Fernandez et al., 1996; Gilbert et al., 1998; Fernandez et al., 2016). In this investigation *Ptr* had consistently the greatest percentage occurrence at all locations. It appeared every year with exceptions of General Toshevo and Burgas in 2012 and 2014, when the higher rainfall in May coincided with lower temperatures.

Mn is the most widespread snow mold fungus. It is regarded as a serious pathogen mainly in cold to temperate regions (Iriki et al., 2001). During wet spring and summer it can cause stem rot and leaf blotch. In the studied period it was the second most prevalent species, predominantly found in the years with higher rainfall in spring (2014 and 2012), especially in Radnevo and General Toshevo.

Pat occurs throughout the cereal growing areas and is most severe in the high rainfall areas. During the studied period it was third important pathogen on durum wheat. *Pat* had the greatest appearance level at Burgas in 2014.

Ztr is most aggressive under cool conditions with temperatures between 15° to 20°C (Salgado & Paul, 2016). Moisture is required for all stages of *Ztr* infection: germination, penetration, mycelial development and formation of pycnidia (Shaw, 1990). *Ztr* was not recorded in 2012. It was represented by 4 and 8% in 2013 and 2014, respectively. A substantial number of leaf specimens with *Ztr* was found in Radnevo in 2014, where the largest rainfall was measured in May. A comparison between bread and durum wheat cultivars estimating the vertical distribution of leaf spotting pathogens showed that *Ztr* was very frequent on bread wheat (Rodeva et al., 2014). On durum wheat it was not recorded in 2012 and only 6 leaves exhibiting symptoms of *Ztr* were found in 2013.

Ch emerged as a widespread and serious leaf disease in Argentina under moist conditions (Perelló et al., 2003, Perelló, 2010). In Bulgaria it is a new problem of durum wheat as foliar pathogen (Nedyalkova et al., 2014). During the study *Ch* was mostly found at General Toshevo in 2012 and 2014. This pathogen showed preference for some cultivars as Predel and Severina.

In the last years a significant increase in the frequency of *Alternaria* spp. on wheat leaves was observed in Argentina. The pathogens were identified as belonging mostly to *A. triticina* and the *A. infectoria* species group (Perelló, 2010). In this investigation *Alternaria* isolates were obtained from Predel and Saturn 1 grown at General Toshevo and Radnevo in years with higher temperature in the period April – June (2012 and 2013).

Lately, the emergence of a new fungal species, pathogenic for durum and common wheat has been established in Bulgaria, which has not been reported in our country or elsewhere. The fungal morphology and disease symptoms were similar to Septoria leaf spotting. The pathogen was identified as *Phaeophleospora* species. During the studied period *Pps* was found only at Burgas in 2014 when the spring months were cool and rainy.

For *Pan* frequent precipitation events after head emergence and temperature between 20° to 27°C favor leaf blotch development and subsequent development of glume blotch (Salgado & Paul, 2016; Fernandez et al., 2016). *Cs* emerged as serious concern for cultivation of wheat in warmer and humid regions of the world (Acharya et al., 2011). The optimal temperature for infection and disease development is 28°C. *Pan* and *Cs* were not detected at all during the period of the investigation probably because there were no environmental conditions that promoted the development of these pathogens.

Not all differences observed in the species composition and frequency of occurrence of leaf spotting fungi could be explained only by changes of monthly air temperature and rainfall patterns. Fluctuation in temperature and humidity at the hourly, daily, seasonal or annual scales could also inluence the pathogen development (El Jarroudi et al., 2017). There are variations and interactions among air temperature, precipitation, and many other factors as soil temperature, relative humidy, altered atmospheric composition, the topography, direction of prevailing winds or air streams and distance from large water masses. Disease patterns may also be affected by the use of crop cultivars with different susceptibility.

Conclusions

The results of this research showed that the occurrence and species composition of leaf spotting fungi were affected by a complex of factors including varietal characteristics, locations, years and agrometeorological conditions. The local environment in a year had the strongest influence on pathogen incidence and the prevalence of species in the population. Among the climatic factors the most important role played the temperature, mainly in the spring months, as well as precipitation especially in May. *Ptr* was the most prevalent pathogen at all locations. It appeared to be less demanding of environment. *Mn* dominated in the years with cool and humid spring. *Pat* was third important pathogen on durum wheat during the studied period. Further investigation of the specific agrometeorological conditions for pathogen occurrence and reproduction as well as early diagnosis of disease caused by them is required.

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