

IV Diseases in red fescue

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During spring 2018 and 2019, 63 fields with red fescue distributed across Falster, Zealand and Funen were monitored for attacks of leaf diseases. The focus was to assess for leaf blotch diseases like *Ascochyta* leaf spot, causing different degrees of senescence in the crops. The attacks were frequent with attack typically in the range of 1-10%. The attack in 2019 was more severe than in 2018. The attack in 2nd and 3rd year crops was more severe than in 1st year crops. DNA analysis of the fungi populations on the leaf samples verified a wide range of fungi present in the fields. Application of fungicides has so far not proved to reduce attacks effectively.

Red fescue is grown on large areas every year, especially in the Eastern part of Denmark. The total area with red fescue typically varies between 15,000 and 20,000 ha per year. Traditionally, we have considered red fescue one of our healthiest herbage grass crops, which is rarely affected by serious disease attacks, and this has therefore also rarely responded positively to fungicide treatments. In recent years, however, positive yield responses from fungicide application were seen in some cases where a significant attack of leaf spot diseases was present.

In order to gain insight into how many fields are affected by leaf spot diseases, AU-Flakkebjerg investigated how commonly and severely fields were affected by leaf disease during two growing seasons. In addition, specific experiments were carried out to investigate whether one or two fungicide treatments in the spring can reduce the attacks of leaf spot and improve yield. The activity was funded by “Frøafgiftsfonden”.

Diseases of importance

Apart from powdery mildew and rust diseases, *Ascochyta* leaf spot was the main focus of the investigation. The *Ascochyta* fungus is characterised by production of black spores (pycnidia), which typically form when the leaves wither. By microscopy of infected leaves, two cellular spores can be seen, which are spread from the spore housings.

During two growing seasons (2018 and 2019), monitoring was conducted and levels of leaf diseases in red fescue fields were assessed. The fields were chosen in collaboration with consultants from the seed companies. In addition to information on locality it was also recorded which varieties were cultivated and whether the fields were 1st, 2nd or 3rd year fields. In 2018, 30 fields were surveyed and 33 in 2019, divided into 3 regions with typically 10 fields per region (West Zealand, South Zealand + Falster, Funen + Tåsinge and Langeland). The data collected showed great variation in the incidence of attacks. For all the fields visited, an assessment was made of the attack rate at 10-20 spots at a cross-section of the field. In both seasons the fields were visited twice, the first time in April and the second time in June.

In general, the attacks in 2019 were significantly more severe than in 2018 (Table 1). Approximately 40% of all fields had more than 10% attack in 2019; the corresponding figure for 2018 was 13% of the fields. The attacks were most prevalent in South Zealand and Falster in 2018 and most prevalent in West Zealand in 2019. Data are summarised in Table 1 and Figure 1.

The monitoring included 8 1st year fields, 43 2nd year fields and 12 3rd year fields. Attack rates were on average 1%, 6% and 10% attacks, respectively. Thus, there was a tendency to stronger attacks in 2nd and 3rd year fields, indicating that the infection built up over time. The monitoring was carried out in more than 20 different varieties, and it was not possible to extract a clear picture of whether there was any variation of susceptibility depending on the actual cultivar.

Neither 2018 nor 2019 showed a clear development in the disease attacks from April to June. The 2018 season was extremely dry and conditions were generally not good for disease development. The 2019 season was more normal weather-wise, but no development was observed in the attacks in the season either going from April to June.

Table 1. Main data from monitoring attacks of leaf spot in red fescue fields assessed during two seasons. The numbers are frequency of fields attacked in the different categories.

Degree of attack in the field	Frequency of fields in the different categories	
	2018	2019
More than 10% leaf area attack	13	39
1-10% attack	60	58
< 1% attack	27	3
Number of fields	30	33

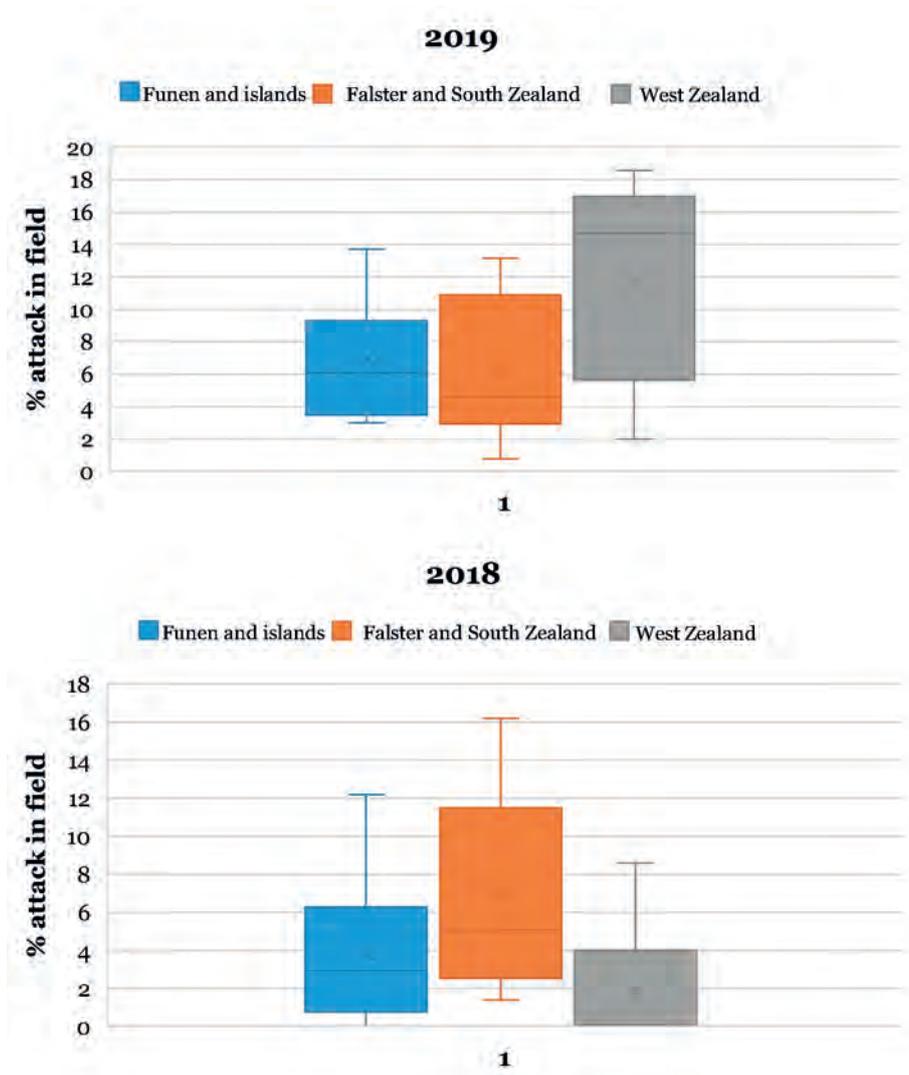


Figure 1. Percentage of leaf area attacked in red fescue fields monitored during 2018 and 2019.

***Ascochyta* disease is difficult to determine**

From the literature, it is known that the *Ascochyta* fungus can also attack other grasses, i.a. Kentucky bluegrass (*Poa pratensis*). From the United States, it is described that the fungus survives on dead plant material or traces of trimming or cutting. The pycnidia are drought resistant, and the spores spread in humid weather conditions, including "splash" from rain. But even in the United States, it is not clear which factors are the most important for epidemic attacks.

The symptoms of *Ascochyta* in the field are seen as dry leaves that can easily be mistaken for attack by other diseases or for drought stress. As part of the project, plant specimens with infestations were sampled during the monitoring. The samples were subsequently investigated in the laboratory to provide a better understanding of the diseases that appear and dominate in the studied fields.

Even after microscopy, it was not possible to distinguish clearly whether the leaf spot attacks were in all cases caused by *Ascochyta*, or whether other leaf spot fungi, e.g. infestation of fungi belonging to the *Helminthosporium* spp. group, were involved. As other leaf fungal species can easily be mistaken for *Ascochyta*, DNA was extracted from infected leaves and DNA libraries were prepared for DNA barcoding and sequenced. By comparing DNA sequences to existing DNA libraries, it was possible to get an overview of the fungi populations found on the "diseased leaves". The method provided information on the family and genus of the leaf fungal species. Only in few cases was it possible to track information to specific taxonomic species. The analysis covered all fungi on the leaves, not just those which we regarded as plant pathogens.

In total 41 samples from the two seasons were analysed using this technique. Many genera of fungi could be found from the leaf samples. Most dominant in the samples were *Oculimacula* (closely related to eyespot in cereals), *Neosascochyta* (= *Ascochyta*), *Cladosporium*, *Alternaria*, *Stagonospora*, *Microdochium* and *Puccinia* as well as various yeast fungi (Figure 2).

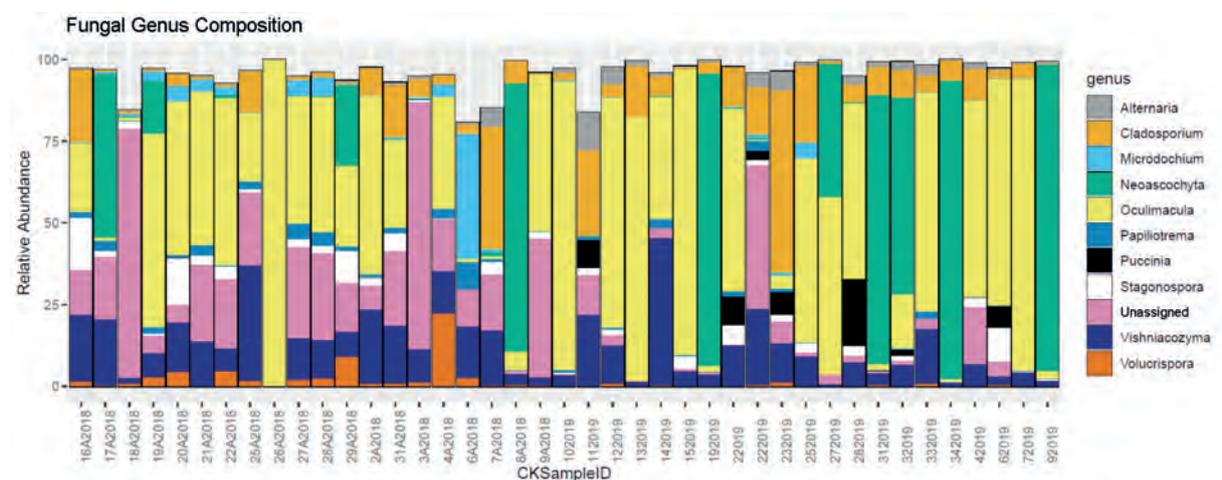


Figure 2. Distribution of dominant fungal genera in 41 samples harvested from 2 seasons assessed following DNA extraction and sequencing: *Oculimacula*, *Neosascochyta*, *Cladosporium*, *Stagonospora* along with some yeast fungi, plus other more rare genera.

Field trials with fungicides

In both growing seasons, trials were conducted to investigate if fungicides could control the attack. The trials were located in selected fields where leaf spot infestation was detected in early spring. In the experiments, broad-spectrum solutions including pyraclostrobin + boscalid (Bell) + pyraclostrobin (Comet Pro) were sprayed at two different times, at early spring and during stretch growth. After spraying, disease attacks were assessed in the trials, but it was not possible to see a clear visual reduction of the attacks in the treated plots compared to untreated plots, nor were significant additional yields obtained after treatment (Table 2). Monitoring for leaf spot diseases in red fescue will continue in 2020.



Spores from pycnidia spores of *Ascochyta* leaf spot can be seen in microscopy. (Photo: Ghita C. Nielsen).



Attack of *Ascochyta* leaf spot in red fescue. Necrotic leaves with dark lesions. (Photo: Lise Nistrup Jørgensen).



Field with 15% disease attack. (Photo: Hans-Peter Madsen).



Field with 1% disease attack. (Photo: Hans-Peter Madsen).

Table 2. Yield responses in 4 trials carried out in red fescue and sprayed during 2018 and 2019 (kg seeds/ha).

Fungicide treatments		2018		2019		
GS 33-37	GS 51-55	18398-1	18398-2	19398-1	19398-2	Average
Untreated		2223	1953	1380	1856	1853
Bell + Comet Pro 0.75 + 0.5		2297	1988	1312	1755	1838
Bell + Comet Pro 0.375 + 0.25		2219	1898	1413	1781	1828
Bell + Comet Pro 0.375 + 0.25	Bell + Comet Pro 0.375 + 0.25	2234	1932	1335	1828	1832
	Bell + Comet Pro 0.375 + 0.25	2258	1953	1425	1894	1883
Propulse SE 250 0.5	Bell + Comet Pro 0.375 + 0.25	2208	1904	1375	1947	1858
Comet Pro 0.63		2291	1963	1323	1741	1855
	Comet Pro 0.63	2269	1930	1447	1845	1873
Propulse SE 250 0.5	Comet Pro 0.63	2398	2070	1351	1897	1917
		NS	NS	NS	107	NS

NS: Not significant