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Screening for resistance to leaf stripe (*Pyrenophora graminea*) in barley

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Abstract
Resistance against leaf stripe (*Pyrenophora graminea*) have been described in the literature, but only little is known about the resistance in modern varieties. Investigations have been started in co-operation with Danish breeders with the objective to ensure availability of healthy seed for pesticide-free and organic growing of cereals. The results so far show great variation in susceptibility to leaf stripe. Most of the tested varieties or lines were susceptible, but some varieties had a moderate level of resistance and a few were highly resistant. The test have been made with different populations collected from Denmark but only little is known about the virulence pattern in leaf stripe

Introduction

The high proportion of seed treatment in industrialised agriculture has kept leaf stripe (*Pyrenophora graminea*) in barley at a very low level for many years. But the disease still occurs (Nielsen & Scheel, 1997), and we know that the disease can multiply under the right climatic conditions if barley is grown for only a few years without seed treatment. The only effective alternative for the moment to chemical seed treatment is use of host resistance. Several genes giving resistance to leaf stripe is known and especially "vada resistance" have previously been found in several Danish varieties (Knudsen, 1986; Schou and Haahr, 1987; Schou *et al.* 1994). However there is no knowledge of the distribution of resistance in modern Danish varieties. This was the background for starting a new investigation directed towards a screening for resistance in existing and new varieties (Nielsen & Christiansen, 2000). Hopefully new sources of resistance could also be introduced in the Danish breeding programmes. The project is a co-operation between Danish breeders, Research Centre Risø, the Agricultural University, the Danish Agricultural Advisory Service and the Danish Institute of Agricultural Sciences with the objective to ensure availability of healthy seed with no or minimal use of seed treatments.

Materials and methods

The screening for resistance to leaf stripe is a field test with inoculation from infected spreader rows. The first year test rows of 3 m are sown between spreader rows with infected plants. The test rows are harvested and used for next years field test in a randomised complete block design with 4 replicates and plot size of 3 m and 150 plants. From 2002 an alfa-design is used for the test. Number of plants and diseased plants are assessed and pct. leaf stripe is calculated for each variety or line. The plants in the spreader rows are supplement with new material as soon as new infected seeds are received from practice.

Results

Approximately 150 different varieties/lines have now been tested since 1997. The infection level varies over the years, which makes it difficult to compare results directly. In 1999, 22 % of 94 tested varieties/lines had less than 1 % attack (maximum 17,7 % attack, table 1) and in 2002, 32 % of 101 tested varieties had less than 1 % attack (maximum 37,1 % attack, table 1). In 2000 and 2001 the level of attack were relatively low which makes interpretation difficult. In general varieties like Alabama, Hanka, Scarlett, Ricarda and Golf seems to be resistant. The old variety Vada is included as resistant reference together with the very susceptible varieties Alexis, Jersey and the line CI 6944 (table 1)

Table 1. % Attack of leaf stripe in barley varieties in field tests 1998-2002. Approximately 130 varieties and lines were tested but only the most resistant is shown here. Alexis, Jersey and CI6944 are included as susceptible references.

Name	Number	Ancestors	2002	2001	2000	1999	1998
Chantal		Chariot x Krona	0	0			
Vada		Svalöf Gull x H.laevigatum	0	0	0		
Alabama	LP 711.94	(Ml-i x 2.51784) x Krona	0,3	0	0		
Hanka	SEMU 51153	Hadm.59473 x Hadm. 96677-87	0,2	0	0,2		
Scarlett	Breun 38801	Amazona (Breun ST 2730e x Kym)	0,4	0	0,2	0	0
Ricarda	NSL 93-2414	Nomad x Chariot	0,2	0,3	0	0	
Linus	SW 8732	WW 7749 X Ariel	0	0	0,4	0,6	0,1
Optima	4530 e	St 1147 x St UN 13	0,4	0,2	0,2	0,3	0
Odin	CSBA 4374-11	Tankard x Chieftain	0,3	0,4	0		
Evelyn	SE 401-92	Grandprix x Koru	0,7	0	0	1	0
Mentor	SW 8487	(Kara MM) x Ariel 3	0,6	0	0	1,1	0
Nizza	Br 5204 e	Fergie x (St 3852 f x St 3887 d)	0,9	0	0,2		
Charon	ABED 50085	Abed 9025 x Abed 1132	0,3	0	0,4	0,8	
Bond	SJ 1046	Maud x Henni	1,1	0	0	0,8	
Pongo	SW 8931	PL 1578-87 x 88008	0,2	0,6	0,2	1	0,4
Annabell	Nord 92 K001	Henni x Krona	0,3	0,2	0,4	1,1	
Golf	RPB 822.77	Luke x (Lud x Armelle)	0,5	0	0	1,7	
Brazil	MH-YP 7-3-4	Trebon x Cooper	0,6				
Bartok	NRPB 88-3063	Flute x (Joline x Apex)	0	0,3	0,9	1,9	0
Orthega	LP 29294	(Ceb 7931 x Pompadour) x (577223 x Golf)	0,7	1	0,2	1	0,2
Gesine	NORD 95 1122	(11 57/91 x Bitrana) x Krona	0,6	0	0	2	
Br 4739e532		(Nomad x Alexis) x Breun St. 3549b5	0,9	0,3	1	0,8	0,5
Otira	SJ 96/12	Bartok x Sj 930331	0,9	0,2	0,3	2,7	0,2
Dialog	SJ 5085	Otira x (Ferment x Mentor)	1,1	2	0,2		
Alexis	Breun St.2715a	Breun St 1662 d X Triumph	19,8	2,5	3,8	10,3	5,8
Jersey	Cb. 9538	Apex x Alexis	31,8	3,5			
CI6944			37,1	0,3	2,9	17,7	4,4

Discussion

Routine seed treatment with effective fungicide has for many years contributed to the very high health standard of cereal seeds. But because of the high success with the conventional seed treatment only little efforts have for the moment been put into breeding for resistance to leaf stripe. Mainly because of a need for production of healthy seeds in organic or low input agriculture more focus is now put upon regulation or controlling seed borne diseases. It is important to find effective control measures that can give stable disease control and the aim is to minimize multiplication of leaf stripe and to ensure that the infection level is below acceptable standards. In this respect use of resistance is an important part of the control strategy where different measures are combined to give an over all good disease control (Nielsen *et al.,* 1998; Nielsen *et al.,* 2000).

Most of the new Danish barley varieties have now been tested under field conditions for resistance against leaf stripe. The results so far show that most of the varieties grown in Denmark are susceptible to leaf stripe, but also that a few varieties are resistant. There seems to be a good basis for introducing resistance against leaf stripe in breeding programmes. However, only little is known on the genetic background and more information is needed on the population structure of leaf stripe.

Litteratur

Knudsen, J. C. N. 1986. Resistance to barley leaf stripe. Z. Pflanzenzüchtg. 96, 161-168.

Nielsen, B. J., Christiansen, S. 2000. Resistance against seed borne diseases in Danish wheat and barley varieties. Proceedings from the Third Annual Meeting in the Danish Cereal Network, Danish Institute of Agricultural Sciences: 8-10.

Nielsen, B. J. og Scheel, C. S. 1997 Production of quality cereal seed in Denmark. Prooceedings of the ISTA Pre-Congress Seminar on Seed Pathology, ISTA, Zürich, 11-17

Nielsen, B. J., Borgen, A., Nielsen, G. C. & Scheel, C. 1998. Strategies for controlling seed borne diseases in cereals and possibilities for reducing fungicide seed treatments. The 1998 Brighton Conference - Pest and Diseases, vol. 3: 893-900.

Nielsen, B. J., Borgen, A., Kristensen, L. 2000. Control of seed borne diseases in production of organic cereals. The BCPC Brighton Conference - Pest & Diseases 2000 (1), 171-176.

Skou, J. P. og Haahr, V. 1987. Screening for and inheritance of resistance to barley leaf stripe (Drechslera graminea). Risø Report 554, 96 p.

Skou, J. P., Nielsen, B. J. og Haahr, V. 1994. Evaluation and importance of genetic resistance to leaf stripe in Western European barleys. Acta Agric. Scand., Sect. B, Soil Plant Science 44, 98-106.