Lehr- und Forschungszentrum für Landwirtschaft
Raumberg-Gumpenstein

62. Tagung der Vereinigung der Pflanzenzüchter und Saatgutkaufleute Österreichs 2011, 109 – 110
ISBN: 978-3-902559-74-6

Testing of pre-harvest sprouting of wheat and triticale at the breeding station Uhretice, Selgen Corp., Czech Republic

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Abstract

Germination of grains at the spike before harvest is called pre-harvest sprouting (PHS). Periods of rainfall and high humidity after grain maturity and before harvest can contribute to PHS, which can be seen of as a premature germination. Germination can begin when a grain absorbs moisture. Visible indications of PHS include grain swelling, germ discoloration, seed coat splitting and root and shoot emergence. Sprouting is influenced by the weather during ripening and pre-harvest time. Among varieties significant differences in regard to resistance to pre-harvest sprouting can be observed. Resistance to sprouting at the breeding station Uhretice is selected only on visual evaluation. Other methods can be used to evaluate grain dormancy, the influence of awns and wax layer, the effect of temperature and dry conditions before harvest or falling number test can be used to measure alpha-amylase activity.

Keywords

Falling number, pre-harvest sprouting, quality, *Triticosecale*, *Triticum aestivum*, weather

Introduction

Pre-harvest sprouting (PHS) results in reduced end-use quality. PHS occurs when wet or rainy conditions delay the harvest. Cool and moist conditions after grain maturity lead to increased risks of PHS (JIANG and XIAO 2005, THOMASON et al. 2009). Physiological mature grains start to germinate in the field. The more wet and dry cycles the grain experiences the more likely dormancy is broken and the grain germinates at the spike. Water must penetrate the seed coat and move into the seed before it can germinate. Results of pre-harvest sprouting are the decrease of test weight and the degradation of starch and protein. Reduction of kernel quality together with yield losses cause financial losses to farmers and food processors (CHAPMAN 2011). Timely harvest is one of the most important things if quality wheat is to be produced (FOSTER 2011). Testing for resistance to sprouting is a standard selection method in wheat and triticale breeding.

Material and methods

Five spikes from each test line are harvested at physiological grain maturity from field trial plots. The spikes are tied into small bouquets with wire and labels marked with numbers. The spikes are soaked in water for 3 h to absorb water. Afterwards the spikes are placed on a steel crosshatch in a way that no spike touches another spike (*Figure 1*).

The spikes are continuously irrigated with water (*Figure 2*). The time period between irrigation depends on weather conditions but it is regulated in a way that constant wet conditions are provided. After 7 and 14 d the degree of sprouting is scored on a 1 to 9 scale (9=extensive sprouting on the spike, 1=no sprouting, *Figure 3*). Spikes with fungal infections are discarded.

Figure 1: **Spikes on the steel crosshatch**

Figure 2: **Irrigation of spikes**

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Figure 3: **Scoring of pre-harvest sprouting on a 1 to 9 scale (1=no sprouting, 9=extensive sprouting) in increments of two units (scores 1, 3, 5, 7 and 9 from left to right)**

Table 1: **Preharvest sprouting scores and falling number (FN) of winter triticale varieties (2006-2009)**

Year	Evaluation	Kinerit	Nazaret	Beneto	Kolor	Presto
2006	7 d	7	6	7	7	6
	14 d	5	3	6	7	2
	Mean	6	5	7	7	4
	FN	62	62	62	62	62
2007	7 d	8	7	7	8	8
	14 d	7	6	6	7	8
	Mean	8	6	7	8	8
	FN	162	62	65	62	62
2008	7 d	9	6	7	7	6
	14 d	8	4	7	6	5
	Mean	9	5	7	7	6
	FN	78	62	69	62	62
2009	7 d	8	7	8	8	-
	14 d	6	5	5	6	-
	Mean	7	6	7	7	-
	FN	94	69	69	62	-

Results and discussion

Sprouting is influenced by both the genotype and environment. Among the varieties which we tested from 2006 to 20011 significant differences of resistance to sprouting were observed. Our evaluation of sprouting resistance was based only on visual evaluation. Connections with grain dormancy, influence of awns and wax layer, effects of temperature and dry conditions before harvest were not considered. Every year falling number was determined and we had not found statistical deviations between the sprouting and the falling number test. Testing for resistance to sprouting was used as standard selection method in the creation of new breeding lines and selection of parent varieties, e.g. wheat varieties Bohemia, Sultan, Elly and Moldau, and triticale varieties Kinerit and Nazaret.

References

JIANG GL, XIAO S, 2005: Factorial cross analysis of pre-harvest sprouting resistance in white wheat. Field Crop Res 91:63-69.

CHAPMAN B, 2011: Economic impact of pre-harvest sprouting, seed dormancy and germination from a famer perspective. Proc 12th Int Symp Pre-harvest sprouting in cereals, 24-27 Jul, Red Deer, Alberta, Canada, p. 11.

FOSTER S, 2011: Understanding dormancy in cereals and its direct effect on seed quality. Proc 12th Int Symp Pre-harvest sprouting in cereals, 24-27 Jul, Red Deer, Alberta, Canada, p. 13.

THOMASON WE, HUGHES KR, GRIFFEY CA, PARRISH DJ, BARBEAU WE, 2009: Understanding pre-harvest sprouting of wheat. Virginia Cooperative Extension Publication 424-060. Coll Agric Life Sci, Virginia Polytech Inst State Univ, Blacksburg, VA.

Table 2: **Preharvest sprouting scores and falling number (FN) of winter wheat breeding lines (2008-2011)**

Quality class	Breeding line	Pedigree	2008			2009			2010			2011		
			7 d	14 d	FN	7 d	14 d	FN	7 d	14 d	FN	7 d	14 d	FN
E	SG-S1393	Hana/Zdar//2×Alidos	9	8	277	9	8	414	9	6	528	9	9	344
A	SG-U541	Hana/Mercia	8	6	322	9	8	400	7	4	520	7	5	260
A	SG-U8077	540i/6192//540i/Kontrast	9	6	408	9	7	430	7	4	470	7	4	252
A	SG-S1029	Svitava/Acclaim	9	8	282	9	9	475	9	6	490	8	6	305
A	SG-U9159	3101/Caprimus	8	7	302	9	9	386	9	6	446	9	9	360
A	SG-S115	Svitava/Acclaim	7	7	422	9	8	508	9	6	411	8	7	373
A	SG-RUB70	RU23/Alveor	8	7	250	9	8	338	8	5	354	8	5	260
A	SG-S227	Saskia/Ing5418	8	7	370	9	9	471	7	4	354	8	5	251
A	SG-S1165	Ebi/CWW95/26	9	6	362	9	8	371	8	4	510	8	6	289
B	SG-U8069	Kontrast/6192//2×Thesee	8	6	360	9	7	315	8	6	472	9	7	270
B	SG-RU24	Hubertus/153a	7	6	457	9	9	422	8	5	421	9	6	252
B	SG-S1038	Saskia/Svitava//Charger	9	7	312	9	9	393	9	5	425	9	6	191
B	SG-S1337	Svitava/Sepstra	9	7	375	9	9	392	7	4	405	8	6	265
B	SG-S1875	Samanta/Estica	8	6	413	9	9	420	8	6	370	8	7	380
C	SG-U7125	Ceb8609/510b-92	9	9	191	9	7	270	9	6	473	9	9	260
C	SG-S1800	Hana/Estica	9	8	202	9	8	372	8	6	465	9	8	291