

Glucosinolate content of harvested rapeseed in the state variety trials of Thuringia in relation to the seed quality grading and to the trial location

Uwe Jentsch, Katrin Günther, Torsten Graf, Jürgen Bargholz, Friedrich Schöne
Thuringian State Institute of Agriculture, D-07743 Jena, Naumburger Straße 98

ABSTRACT

In the German grading of seed varieties by the Federal Office for Seed Variety Approval (Bundessortenamt, BSA) the 00-quality is defined by four grades representing four glucosinolate content ranges, as $\mu\text{mol/g}$ seed at 9 % moisture: 0 – 5.9 (grade 1), 6.0 – 11.9 (grade 2), 12.0 – 17.9 (grade 3) and 18.0 – 25.0 (grade 4). Representative samples from a total of 212 rapeseed batches harvested in the Thuringian variety trials 1998 - 2009 were investigated for glucosinolates. The grade of each harvested batch was compared with the grade of the sown seed regarding the grading of the respective variety by the BSA. Per year 13 – 18 varieties were tested on up to 7 trial locations. The glucosinolate analyses were performed by the NIRS technique with validation of one fifth the samples by HPLC (EU method). For the glucosinolate content the majority of the samples from the rapeseed harvest corresponded with the grading of the respective 00 seed variety by the BSA. In the case of differentiation between the individual grades for grade 3 (12.0 – 17.9 μmol glucosinolates/g seed standardized at 9 % moisture) 147 comparisons from a total of 184 were found inner this grade, one seed was worse and 36 seeds were even better than this grade. Contrasting with that for grade 2 (6.0 – 11.9 μmol glucosinolates/g seed) with a total of 28 comparisons only 15 harvested rapeseed batches represented this grade whereas 13 ones realized a too high glucosinolate content and so they did not meet the quality promise of the respective variety of the sown seed. In the yearly tests the same variety spectrum on trial locations - nevertheless the tested varieties changed between the years - differed immensely in the glucosinolate content.

Key words: Rapeseed varieties — seed grading — glucosinolate content of harvested seed

INTRODUCTION

The acceptance of rapeseed feeds by farm animals depends on the glucosinolates and so the glucosinolate content of the seed for sowing represents a value-deciding criterion in the grading of seed varieties by the Federal Office for Seed Variety Approval (Bundessortenamt, BSA). The 00-quality is defined by four grades representing four glucosinolate content ranges, as $\mu\text{mol/g}$ seed at 9 % moisture: 0 – 5.9 (grade 1), 6.0 – 11.9 (grade 2), 12.0 – 17.9 (grade 3) and 18.0 – 25.0 (grade 4). Considering a self-commitment of German plant breeders the BSA approves on-ly varieties up to 18 μmol glucosinolates/g seed whereas the EU tolerates 25 μmol glucosinolates/g seed as maximum.

MATERIALS AND METHODS

Representative samples from a total of 212 rapeseed batches harvested in the Thuringian variety trials 1998 - 2009 were investigated for glucosinolates accompanied by dry matter analysis and standardization at 9 % moisture. The grade of each harvested batch was compared with the grade of the sown seed regarding the grading of the respective variety by the BSA. Per year 13 – 18 varieties were tested on up to 7 trial locations. The glucosinolate analyses were performed by the NIRS technique with validation of one fifth the samples by HPLC (EU method).

RESULTS AND DISCUSSION

For the glucosinolate content the majority of the samples from the rapeseed harvest corresponded with the grading of the respective 00 seed variety by the BSA. In the case of differentiation between the individual grades for grade 3 (12.0 – 17.9 μmol glucosinolates/g seed) 147 comparisons from a total of 184 were found inner this grade, one seed was worse and 36 seeds were even better than this grade. Contrasting with that for grade 2 (6.0 – 11.9 μmol glucosinolates/g seed) with a total of 28 comparisons only 15 harvested rapeseed batches represented this grade whereas 13 ones realized a too high glucosinolate content and so they did not meet the quality promise of the respective variety of the sown seed.

In the yearly tests the same variety spectrum on trial locations - nevertheless the tested varieties changed between the years - differed immensely in the glucosinolate content. Possible reasons for these station related differences were discussed by JENTSCH et al. .

REFERENCES

Jentsch, U; T. Graf, J. Bargholz, F. Schöne: Glucosinolatgehalt von Rapssorten im Landessortenversuch in Thüringen von 1998 bis 2004 in Beziehung zur Sorteneinstufung des Bundessortenamtes und zum Versuchsort. Proc. VDLUFA Conf. 2005

Table 1: Tested rapeseed varieties in the Thuringian variety trials with the grading by the Federal Office for Seed Variety Approval (Bundessortenamt, BSA) and checking this grading according to the analysed glucosinolate concentration (GSL) in the respective harvested rapeseed batches.

Year (No. locations testing)	Tested varieties in the		Analysis GSL in harvest, No.		
	of Grade	No.	Grade confirmed	Worse	Better
1998 (6)	2	4	1	3	-
	3	11	9	-	2
1999 (6)	2	4	2	2	-
	3	11	8	-	3
2000 (5)	2	4	2	2	-
	3	9	9	-	-
2001 (7)	2	3	1	2	-
	3	12	12	-	.
2002 (6)	2	2	1	1	-
	3	12	12	-	-
2003 (4)	2	1	1	-	-
	3	16	14	-	2
2004 (7)	2	1	1	-	-
	3	17	11	-	6
2005 (7)	2	1	1	-	-
	3	21	19	-	2
2006 (7)	2	2	2	-	-
	3	19	5	-	14
2007 (4)	2	2	1	1	-
	3	21	21	-	-
2008 (4)	2	2	2	-	-
	3	19	13	-	6
2009 (3)	2	2	-	2	-
	3	16	15	1	-
Σ 1998 – 2009	2	28	15	13	-
(4 – 7)	3	184	147	1	36

Table 2: Glucosinolate contents of rapeseed ($\mu\text{mol/g}$ at 9% moisture) in Thuringian variety trials 1998 - 2009 as mean and (min. – max. range). Analysis by NIRS, confirmation by HPLC in 20...25 samples per year. For the free table fields no testing in the respective stations and years.

Location Soil type	Burkers-dorf <i>Brown</i>	Dornburg <i>Loess</i>	Friemar <i>Loess</i>	Großen-stein <i>Loess</i>	Haufeld <i>Brown</i>	Hessberg <i>Brown</i>	Kirchengel <i>Loess</i>	Mean
1998	13.2 (8.7-16.8)	12.8 (9.5-16.8)	16.0 (11.5-23.3)	13.8 (11.5-23.3)	12.2 (9.6-15.3)		14.6 (10.0-21.0)	13.8
1999	13.2 (11.3-15.8)	14.3 (9.7-17.4)	12.8 (9.5-14.6)	13.0 (9.6-15.3)	10.2 (6.5-12.4)		13.6 (10.4-17.8)	12.8
2000	13.5 (9.8-19.2)	16.5 (13.1-20.2)	15.3 (11.0-25.3)	15.3 (10.3-24.5)	14.5 (11.1-20.8)			15.0
2001	14.5 (11.7-16.2)	15.7 (12.3-20.8)	15.5 (12.1-18.1)	13.0 (9.3-19.3)	10.1 (6.8-14.7)	11.5 (8.9-15.1)	12.9 (9.4-15.6)	13.3
2002	15.3 (11.1-18.7)		14.2 (9.7-18.1)	15.9 (12.9-17.9)	8.5 (6.2-11.2)	13.5 (7.8-16.3)	14.5 (12.2-17.8)	13.7
2003		15.5 (12.1-18.7)	9.5 (4.8-14.0)	13.5 (9.5-18.2)	17.7 (14.6-22.1)			14.0
2004	11.5 (5.8-14.7)	16.0 (12.6-19.4)	13.8 (7.0-17.7)	12.1 (7.8-14.8)	7.9 (5.1-13.4)	14.8 (8.5-19.5)	9.8 (3.0-13.8)	12.3
2005	13.3 (8.6-15.9)	15.8 (10.9-18.9)	16.3 (10.8-21.1)	13.6 (8.5-16.6)	12.2 (9.7-15.8)	12.7 (9.0-15.5)	15.1 (10.3-18.9)	14.1
2006	11.4 (7.1-14.5)	12.1 (7.2-14.5)	11.3 (6.7-13.5)	10.3 (6.8-12.8)	10.1 (7.4-11.7)	12.2 (7.6-15.4)	10.7 (6.6-14.1)	11.2
2007	13.9 (10.8-16.8)		15.6 (13.2-19.4)	14.3 (11.0-18.2)	13.0 (11.6-15.3)			14.2
2008	12.3 (9.2-17.2)		12.7 (9.5-17.2)	12.0 (8.7-15.8)		12.2 (9.6-15.4)		12.3
2009				15.8 (12.5-23.0)	11.8 (8.6-16.4)	14.6 (10.4-20.8)		14.1
Mean	13.2	14.8	13.9	13.5	11.6	13.1	13.0	13.4