

## **GENRES CT98-104\* : Evaluation of barley genetic resources for virus resistances (BYDV, BaMMV and BaYMV)**

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### **Introduction**

As part of the European project 'Evaluation and conservation of barley genetic resources to improve their accessibility to breeders in Europe' (GENRES CT98-104; 1999-2002), many barley accessions, mainly from the International Barley Core Collection (BCC; Knüpffer and Hintum, 2003) were checked for their resistance to viruses. A synthesis of three years of observations of reaction to *Barley yellow dwarf virus* (BYDV) and the mosaic complex *Barley mild mosaic virus* (BaMMV) and *Barley yellow mosaic virus* (BaYMV-1 and -2) is presented here.

### **Material and methods**

The material tested came from five genebanks, as described in table 1.

Table 1. Number of accessions tested and number of observations for different collections (standards not included).

Prefix	Genebank collection	BaMMV / BaYMV-1 / BaYMV-2		BYDV	
		Accessions	Observations	Accessions	Observations
BCC	Barley Core Collection	394	3082	387	777
BGRC	Braunschweig collection	84	201	46	46
CGN	Dutch collection	398	774	67	67
GBX	Gembloux collection	147	969	147	428
HOR	Gatersleben collection	247	691	142	144
	Total	1270	5717	789	1462

\* More information on the web site <http://barley.ipk-gatersleben.de>

From Biodiversity to Genomics: Breeding Strategies for Small Grain Cereals in the Third Millennium. Proceedings Eucarpia Cereal Section; Salsomaggiore, Italy. Fiorenzuola d'Arda: Experimental Institute for Cereal Research; 2003: 48-50.

**BYDV:** Evaluation of the BYDV tolerance was carried out as field tests or gauze house trials respectively for partners (1) and (2), with artificial BYDV-PAV inoculations using viruliferous *Rhopalosiphum padi*.

Symptom expression, plant height and yield traits were recorded to estimate the reaction of the accessions to the virus infection in comparison to uninfected control plants and to tolerant ('Post', 'Vixen', 'Perry' and 'NS. 90502/11') and susceptible ('Rubina', 'Erfa', 'Nixe', 'Majestic' and 'Aquilon') standard varieties.

**BaMMV and BaYMV:** Resistance reaction to the mosaic complex (BaMMV, BaYMV-1 and -2) was evaluated in naturally infested fields at 11 locations (partners (1) to (7)); tests in a climatic chamber were also performed for BaMMV, under mechanical inoculation (partner (2)). Symptom expression was recorded in late winter and early spring and compared to resistant ('Tokyo' - *rym5*, 'Carola' - *rym4*, and 'Hiberna' - *rym10*) and susceptible standards ('Uschi' and 'Tiffany').

### Scoring

**BYDV:** Symptom expression was scored using a 1 to 9 scale (1 = no symptoms; 9 = very strong symptoms).

**BaMMV and BaYMV:** Resistant reaction was assessed with score 1 and the susceptible reaction with score 9 (pattern of a qualitative resistance).

ELISA was carried out by partners (1) and (2).

### Results

**BYDV:** Altogether 809 genebank accessions were evaluated for their reaction to BYDV-infection (Table 2). 16 (2 %) of them were significantly lower infected than the susceptible standard 'Rubina' and 43 (5%) than the susceptible cultivar 'Erfa'. We could not detect any genotype which was more tolerant than the tolerant standards 'Vixen' or 'Post' (Dunnett-test).

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Table 2. Synthesis of the BYDV tolerance tests

Partner	Test location	Tests	Accessions tested
(1)	Gembloux, B	1183	791
(2)	Aschersleben, D	347	274
Accessions tested (total)			<b>809</b>
Tolerant accessions (better than Rubina)			<b>16 (2%)</b>
Tolerant accessions (better than Erfa)			<b>43 (5%)</b>

*BaMMV and BaYMV*: Table 3 summarizes the results of the barley mosaic resistance tests. In the field 207 (23 %) accessions were resistant to the whole virus complex and 271 (21 %) to BaMMV and BaYMV-1. In the climatic chamber 113 (57 %) genotypes showed resistance to the artificial BaMMV-inoculation. More than 90 % of the resistant barleys are originating from South-East Asia (China, Japan, Korea).

Table 3. Synthesis of the BaMMV, BaYMV-1 and -2 resistance tests

Partner	Test location	BaMMV+BaYMV-1			BaMMV+BaYMV-1 and -2			BaMMV		
		Obs.	Accessions		Obs.	Accessions		Obs.	Accessions	
			tested	potentially		tested	potentially		tested	potentially
(1)	Gembloux, B	1822	1166	311	-	-	-	-	-	-
(1)	Marneffe, B	-	-	-	1878	856	256	-	-	-
(2)	Aschersleben, D	321	276	120	159	151	89	264	197	135
(2)	Schladen, D	-	-	-	107	107	41	-	-	-
(3)	Aspachhof, D	642	473	152	-	-	-	-	-	-
(4)	Wetze, D	48	48	41	-	-	-	-	-	-
(5)	Lenglern, DK	-	-	-	344	315	105	-	-	-
(6)	Buire, F	159	159	73	-	-	-	-	-	-
(7)	Irlbach, D	93	93	60	-	-	-	-	-	-
	Buensen, D	77	77	52	-	-	-	-	-	-
	Hockelheim, D	-	-	-	63	63	44	-	-	-
Accessions tested		<b>1270</b>			<b>913</b>			<b>197</b>		
Resistant accessions (a)		<b>271 (21%)</b>			<b>207 (23%)</b>			<b>113 (57%)</b>		
Accessions tested		<b>869</b>								
Resistant accessions (a)		<b>110 + 82 (need confirmation)</b>								
Accessions tested		<b>197</b>								
Resistant accessions (a)		<b>65 + 31 (need confirmation)</b>								

(a) Mean score < 3.5

The data from these experiments have been integrated into the European Barley Database at <http://barley.ipk-gatersleben.de/genres>, where they will be publicly available after 01.07.2003.

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## **Conclusions**

At the moment, only one accession has been revealed to be tolerant to BYDV and resistant to the three studied mosaic viruses. Other accessions need to be tested again. The work of evaluation of European barley genetic resources has to be continued, since it is a multi-local and multi-annual task, which requires good collaboration between partners (genebanks and teams performing evaluation trials).

## **References**

Knüpffer, H., and van Hintum Th.J.L., 2003. Summarised diversity – the Barley Core Collection. In: R. von Bothmer, Th.J.L. van Hintum, H. Knüpffer and K. Sato (eds), Diversity in Barley (*Hordeum vulgare*), pp. 259-267. Elsevier Science B.V., Amsterdam, The Netherlands.