consumer preferences and the demands of particular environment or niche. The new tools of biotechnology not only have the potential for increasing the effectiveness and efficiency of wheat breeding programs and but also provide insights into the genetic control of key traits to be used for genetic manipulation. The coming years will undoubtedly witness an increasing application of biotechnology for the genetic improvement of wheat trait-specific products and with better genome recovery.

References.

Bariana, HS, Brown GN, Bansal UK, Miah M, Standen GE, and Lu M. (2007). Breeding triple rust resistant wheat cultivars for Australia using conventional and marker–assisted selection technologies. Aus J Agric Res 58(6):576-58.7.

Dekkers JCM and Hospital F. 2002. The use of molecular genetics in the improvement of agricultural populations. Nat Rev Genet 3:22–32.

Sharma RK aRowel JB. 1985. Evaluation of chemicals for rust control in the cereal rust. In: Diseases, Distribution, Epidemology and Control (Roelfs AP and Bushnell WR Eds). Academic Press, Orlando, FL.

nd Mishra SK. 1999. Wheat breeding in India: Past Achievements, current status and future prospects. Ann Agric Res 20:137-143.

Singh H, Sharp PJ, Wellings CR, and Johnston S. 1998. Molecular tagging of stripe rust resistance gene *Yr8*. Ann Wheat Newslet 43:136-137.

ITEMS FROM ITALY

THE UNIVERSITY OF BOLOGNA – COLLEGE OF AGRICULTURE
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CONSIGLIO PER LA RICERCA E LA SPERIMENTAZIONE IN AGRICOLTURA (CRA-QCE)
Rome, Italy.

AGENZIA PER LA SPERIMENTAZIONE TECNOLOGICA E LA RICERCA AGROAMBIENTALE (ASTRA)
Faenza, Italy.

CENTRO RICERCHE PRODUZIONI VEGETALI (CRPV)
Imola, Italy.

Response of 31 durum wheat cultivars to cereal soilborne mosaic virus in 2012.

C. Rubies-Autonell (University of Bologna), A. Sarti (ASTRA, Faenza), R. Canestrale (CRPV, Imola), and V. Vallega (CRA–QCE, Rome).

Thirty-one durum wheat cultivars were grown during the 2011–12 season in a field with natural inoculum source of cereal soil-borne mosaic virus (CSBMV) at Cadriano, near Bologna, and evaluated for resistance on the basis of symptom severity, DAS-ELISA value, and agronomic performance. The cultivars, planted on 24 October 2011, were grown in 10-m^2, solid-seeded plots distributed in the field according to a randomized block design with three replicates. Symptom severity was evaluated on four dates (9, 16, 20, and 27 March) using a 0–4 scale. DAS-ELISA was performed on extracts from a bulk of the basal half of the second and third youngest leaves of 10 randomly chosen plants/plot collected on one date only (19 March, 2012). The trial included 10 cultivars THAT had not been tested before.

CSBMV pressure was relatively high, as testified by the high mean symptom scores (≥ 3.0) recorded for eight of the 31 cultivars assayed (Table 1). Low mean symptom scores (≤1.0) accompanied by low ELISA values were recorded for the cultivars Dylan, Ramirez, Biensur, Tirex, Serafo Nick, and Marco Aurelio. The latter two had not been tested for CSBMV resistance before. Five of the other new entries, i.e., Colombo, Core, Cesare, Trapezio, and Massimo Meridio, showed relatively mild symptom scores (1.0–2.0) and relatively low ELISA values, and three (Miradoux, Mimmo, and Odisseo) proved susceptible.

Table 1. Response to ereal soil-borne mosaic virus of 31 durum wheat cultivars grown near Bologna, Italy, in 2011–12. Items with the same letter(s) are statistically similar. Symptom severity was rated on a 0–4 scale and are the mean of four dates.

Cultivar	Mean symptom severity score	ELISA value	Grain yield (t/ha)	Plant height (cm)	Kernel weight (g)	Test weight (kg/hl)	Days-to-heading (from April 1)
Anco Marzio	2.46 cd	0.394 df	5.21 ej	91.3 ad	36.7 dg	72.4 ae	33.7 hk
Achille	3.65 a	1.634 ac	3.51 jl	66.0 i	31.1 hk	71.6 af	37.0 bc
Biensur	0.90 hk	0.012 f	7.64 ab	80.7 fg	34.0 ej	73.2 ad	36.0 cf
Cesare	1.61 eg	0.573 cf	3.85 hl	94.0 ac	38.7 ce	67.3 fh	35.0 dh
Claudio	2.95 ac	1.783 a	3.75 il	76.7 gh	34.1 ej	72.2 af	36.7 bd
Colombo	1.24 fj	0.008 f	6.13 bg	80.3 fg	37.9 dg	73.7 ad	37.0 bc
Core	1.53 eh	0.006 f	7.47 ac	93.0 ac	39.6 bd	74.9 ab	31.3 ln
Duilio	1.63 eg	0.356 df	6.10 bg	94.3 ac	38.3 cf	72.1 af	31.3 ln
Dylan	0.55 k	0.008 f	5.48 di	92.3 ac	30.7 ik	66.0 gh	33.0 il
Iride	1.93 df	0.002 f	5.27 ej	83.0 dg	33.2 gj	67.7 eh	33.0 il
Ismur	3.40 ab	1.799 a	4.58 fk	64.0 i	30.1 jk	72.3 af	36.0 cf
Kanakis	2.81 bc	1.202 ad	5.23 ej	91.0 ad	37.3 dg	72.9 ad	35.7 cg
Karur	2.83 bc	1.193 ad	5.47 di	82.7 eg	36.8 dg	70.8 bg	38.0 b
Levante	1.54 eh	0.010 f	8.48 a	94.7 ac	35.5 dh	76.1 a	33.0 il
Liberdur	3.32 ab	0.678 bf	4.56 fk	66.3 i	35.7 dh	71.9 af	36.3 be
Marco Aurelio	0.98 gk	0.322 df	7.62 ab	87.7 cf	44.4 a	73.5 ad	31.0 mn
Massimo Meridio	1.67 eg	0.003 f	6.01 bg	91.3 ad	43.7 ab	71.9 af	33.0 il
Mimmo	3.14 ac	1.158 ae	3.18 kl	80.7 fg	38.3 cf	64.8 h	34.0 gj
Miradoux	2.98 ac	0.593 cf	4.03 hl	75.7 gh	42.7 ac	70.9 bg	39.7 a
Normanno	1.41 ei	0.640 bf	4.91 fk	90.3 ae	33.2 gj	68.8 dh	31.3 ln
Odisseo	3.28 ab	0.466 df	5.50 di	80.7 fg	38.0 dg	73.3 ad	33.3 hk
Ramirez	0.78 ik	0.007 f	6.27 bf	92.3 ac	33.2 gj	75.4 ab	35.7 cg
Saragolla	1.42 ei	0.042 ef	5.72 ch	88.3 bf	34.5 ej	67.5 eh	32.3 jm
Sculptur	3.08 ac	1.195 ad	5.47 di	71.0 hi	35.0 di	72.3 af	34.0 gj
Serafo Nick	0.68 jk	0.017 f	7.22 ad	96.7 ab	37.3 dg	74.4 ac	33.0 il
Simeto	3.05 ac	1.263 ad	4.07 hl	71.7 hi	35.5 dh	67.4 eh	33.3 hk
Svevo	1.98 de	0.007 f	6.42 bf	97.3 a	38.3 cf	72.8 ad	30.3 n
Tirex	0.92 hk	0.010 f	6.93 ae	95.3 ac	33.5 fj	75.2 ab	32.0 kn
Trapezio	1.63 eg	0.004 f	8.39 a	93.3 ac	38.0 dg	74.5 ab	34.3 fi
Yelodur	1.86 df	0.422 df	4.32 gl	75.7 gh	36.3 dg	68.7 dh	36.7 bd
Grazia	3.06 ac	1.724 ab	2.57 l	72.0 hi	27.7 k	69.3 ch	34.7 ei

Mean ELISA value and mean symptom severity score were correlated significantly (0.809**), and both resistance parameters were significantly correlated (P 001) with grain yield, plant height, and heading date, but not with kernel and test weight (Table 2, p. 36). A regression analysis estimated quite accurately the agronomic CSBMV effects corresponding to different symptom severity scores; in the 2011–12 season, for instance, a mean symptom score of 3.5 was associated with a grain yield loss of about 49%, a plant height reduction of 27%, and a heading delay of about 4 days (Table 3). As in previous experiments, results indicated that even mild symptoms cause appreciable grain yield losses.

Table 2. Simple correlation coefficients between mean symptom severity, mean ELISA value, and various agronomic characters for 31 durum wheat cultivars grown in a field with cereal soil-borne mosaic virus near Cadriano (Bologna), Italy, during 2011–12. Items with a ** are significantly correlated; all others are nonsignificant.

	ELISA value	Grain yield	Plant height	Heading date	Kernel weight	Test weight
Symptom severity	0.809**	–0.673**	–0.740**	0.437**	–0.139	–0.208
ELISA value	—	–0.732**	–0.710**	0.433**	–0.376*	–0.272

Table 3. Estimated effects of cereal soil-borne mosaic virus on grain yield, plant height, and heading date for different symptom severity scores (Cadriano (Bologna), Italy, 2011–12).

	Grain yield loss		Plant height reduction		
Disease score	t/ha	%	cm	%	Heading delay (days)
0.5	0.54	6.9	3.9	3.9	0.5
1.5	1.62	20.8	11.8	11.8	1.6
2.5	2.69	34.7	19.7	19.6	2.6
3.5	3.77	48.6	27.6	27.4	3.7

Agro-biological effects of cereal soil-borne mosaic virus over 10 seasons.

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Different sets of durum wheat cultivars were evaluated for resistance to cereal soil-borne mosaic virus (CSBMV) at two fields with the virus situated near Minerbio and Cadriano (Bologna), in 10 seasons between 1996 and 2010. Five of the 15 trials programmed for this period could not be carried out due to the lack of adequate funds and/or sufficiently uniform fields. The cultivars were evaluated for CSBMV resistance on the basis of symptom severity, DAS-ELISA readings, and agronomic performance, i.e., grain yield, plant height, kernel weight, test weight, and heading date. Each trial was comprised of 30–33 cultivars, grown in 10-m^2, solid-seeded plots distributed in the field according to a randomized block design with three replicates. A total of 124 durum wheat cultivars were assayed. In each season, symptom severity was evaluated on three or more dates using a 0–4 scale where 0–1.0 = no or slight symptoms, 1.1–2.0 = mild mottling and stunting, 2.1–3.0 = mottling and stunting, and 3.1–4.0 = severe mottling and stunting with virus-killed plants. Symptom severity score and grain yield were highly and significantly correlated in all seasons, thus offering the opportunity to estimate the effect of various levels of CSBMV symptom severity on grain yield under diverse conditions using simple linear regressions. On average, symptom severity scores of 3.5, 2.5, 1.5, and 0.5 were associated with grain yield losses of 53, 38, 23, and 8%, respectively (Table 4). Symptom scores also were significantly correlated with the other four agro-biological characters investigated, but not in all seasons. By and large, symptom scores of 3.5 were associated with plant height, kernel weight, and test weight reductions of about 25, 20, and 10%, respectively, and with a heading delay of about 3 days.

Table 4. Estimated effects of cereal soil-borne mosaic virus on grain yield for different symptom severity scores in ten seasons (Minerbio 1996–97 and Cadriano 2001–10).

	Symptom severity score			
Season	0.5	1.5	2.5	3.5
1995–96	7.0	21.1	35.2	49.3
1996–97	10.4	31.2	52.0	72.7
2000–01	8.4	25.1	41.9	58.7
2001–02	6.7	20.1	33.5	46.9
2002–03	7.6	22.9	38.1	53.4
2003–04	7.2	21.5	35.9	50.2
2004–05	5.9	17.8	29.6	41.4
2006–07	9.6	28.7	47.8	66.9
2008–09	5.2	15.7	26.1	36.5
2009–10	7.7	23.2	38.6	54.0
Mean	7.6	22.7	37.9	53.0
Minimum	5.2	15.7	26.1	36.5
Maximum	10.4	31.2	52.0	72.7

Response to CSBMV of 133 durum wheat cultivars assayed from 1996 to 2011.

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A total of 133 durum wheat cultivars were grown in different trials over eleven seasons (from 1996 to 2011) at two fields near Bologna with cereal soil-borne mosaic virus (CSBMV). The cultivars were evaluated for resistance to CSBMV on the basis of grain yield (except in 2010–11), symptom severity, and DAS-ELISA readings. Each trial was comprised of

Table 5. Response to cereal soil-borne mosaic virus of 133 durum wheat cultivars assayed in trials near Bologna (Minerbio 1996–97 and Cadriano 2001–11), Italy, and the number of years in which each cultivar was tested.

Resistant				Moderatately resistant			
Cultivar	Years	Cultivar	Years	Cultivar	Years	Cultivar	Years
Alemanno	2	Lloyd	3	Ariosto	1	Latinur	4
Ares	4	Louxor	1	Arnacoris	3	Neolatino	4
Asdrubal	1	Meridiano	8	Artemide	1	Normanno	6
Baio	1	Nefer	1	Avispa	3	Orfeo	1
Biensur	3	Neodur	8	Brindur	1	Peleo	**1**
Campodoro	1	Parsifal	2	Canyon	1	Portofino	2
Ceedur	1	Pharaon	2	Catervo	1	Pr22d89	3
Colorado	5	Pietrafitta	2	Chiara	1	Preco	1
Dario	1	Provenzal	5	Cosmodur	2	Rusticano	1
Dylan	7	Ramirez	1	Duilio	11	San Carlo	5
Giusto	1	Saragolla	4	Fiore	2	Sfinge	1
Hathor	1	Solex	7	Flavio	2	Svevo	3
Kanakis	1	Tiziana	3	Gianni	5	Tirex	3
Levante	6	Valerio	1	Grecale	2	Torrese	1
Ignazio	1	Valsalso	1	Imhotep	3	Virgilio	1
				Iride	10	Vitomax	3
				Isildur	2	Vitron	2
				K26	1	Yelodur	1
Moderatately susceptible				**Susceptible**			
Cultivar	**Years**	**Cultivar**	**Years**	**Cultivar**	**Years**	**Cultivar**	**Years**
Appio	2	Norba	1	Achille	4	Karur	3
Aureo	1	Ofanto	2	Agridur	1	Liberdur	3
Claudio	9	Perseo	1	Anco Marzio	5	Marco	2
Colosseo	4	Plinio	1	Balsamo	2	Orobel	7
Creso	10	Portobello	1	Bronte	1	Peres	1
Dorato	1	Principe	1	Cannavaro	1	Platani	2
Duetto	2	Quadrato	4	Cannizzo	3	Portorico	5
Ermecolle	1	Sculptur	1	Capri	1	Pr22d40	1
Exeldur	2	Sorrento	1	Carioca	1	Prometeo	2
Gardena	2	Torrebianca	5	Casanova	2	Severo	2
Giotto	3	Tresor	2	Ciccio	5	Simeto	11
Giove	1	Vendetta	2	Ciclope	1	Sorriso	1
Italo	2	Verdi	3	Cirillo	3	Trionfo	2
Ixos	3	Virgilio	2	Concadoro	1	Tripudio	2
Minosse	2	Zenit	2	Derrick	2	Vesuvio	3
				Giemme	2	Vetrodur	3
				Granizo	1	Vettore	2
				Grazia	8	Vinci	1
				Ismur	1		

30–33 cultivars. The data collected for each cultivar and for each of the three parameters in each season from 1995 to 2005 were indexed as a percent of the highest value observed among all the cultivars assayed in that season and then averaged to minimize the confounding effects of differences in disease pressure between years. For various reasons, including the lack of agronomic data for the 2010–11 season, the cultivars assayed in the subsequent trials (2007 to 2011) could not be classified according to the same criteria. On the other hand, because the new entries were grown along with cultivars already assayed for CSBMV resistance in other seasons, there was ample opportunity to adequately classify their response to CSBMV by the use of numerous direct comparisons and, thus, produce a synoptic table comprising all the 133 cultivars assayed (Table 5, p. 37). The CSBMV responses presented in the table are obviously most dependable for cultivars assayed in numerous trials (up to 10 or 11 in the case of Duilio, Iride, Creso, and Simeto), whereas those based on the results of one trial only are merely indicative. We note that although nearly half of the 133 cultivars listed carry a major gene for CSBMV resistance located on the short arm of chromosome 2B, none were immune to CSBMV infection and only 16 consistently showed high levels of resistance.

ITEMS FROM MEXICO

NATIONAL INSTITUTE FOR FORESTRY, AGRICULTURE, AND LIVESTOCK RESEARCH (INIFAP–CIRNO)
Campo Experimental Valle del Yaqui, Apdo. Postal 155, km 12 Norman E. Borlaug, entre 800 y 900, Valle del Yaqui, Cd. Obregón, Sonora, México CP 85000.

CEVY Oro C2008: Yield and quality performance in experimental and semicommercial plots and status of area grown with this durum wheat cultivar in southern Sonora, Mexico.

Guillermo Fuentes-Dávila, Pedro Figueroa-López, Gabriela Chávez-Villalba, José Luis Félix-Fuentes, Miguel Alfonso Camacho-Casas, and Alberto Borbón-Gracia.

Abstract. Commercial durum wheat cultivar CEVY Oro C2008, developed for the wheat-producing areas of northwest Mexico, is spring type and resistant to leaf rust, with an experimental average grain yield of 5.6 t/ha, test weight of 83.0 kg/hl, 13.5% protein, and 28.1 points of the Minolta b value. CEVY Oro C2008 averaged 7.1, 7.76, and 7.2 t/ha in 2008–09, 2009–10, and 2010–11, respectively, with a maximum yield potential of 8.7 t/ha, in commercial fields of cooperating wheat producers from southern Sonora, and an average of 29.08 points of the Minolta b value. After its release, this cultivar was cultivated in 3,233 ha in southern Sonora during 2009–10, 6,161 ha during 2010–11, 931 ha during 2011–12, and in 2012–13 it was cultivated only in 185 ha. Cultivar CIRNO C2008, which has a high yield potential, was cultivated in 3,256, 87,105, 154,915, and 196,295 ha during those four seasons. Despite research efforts to diversify the sources of resistance to leaf rust and to improve quality, wheat production and comercialization are still based on grain yield, despite the risks that monocultivar culture represents in a region where leaf rust is endemic with the appearance of new races of the causal agent.

Introduction. Worldwide production of durum wheat in 2009 was 686.6 x 10^6 tons (FAO 2011a). China was the main producer, with 115.1 t, followed by India with 80.6 t. Mexico produced 4.1 x 10^6 tons from which 1.1 x 10^6 were exported (FAO 2011b). Of the area grown with wheat in Mexico, 63.9% (457,541 ha) corresponded to the states of Sonora, North Baja California, and Sinaloa, during the fall–winter 2008–09 crop season, with an estimated value of US$646 x 10^6 (SIAP 2011) (Exchange rate 1:12, May 2013). During the 2010–11 crop season, 288,766 ha were grown with wheat in southern Sonora, 70% corresponded to durum wheat predominating cultivars CIRNO C2008 and Átil C2000, and bread wheat cultivar Tacupeto F2001 (OEIDRUS 2011). In northwest Mexico, spring wheat is grown during the fall–winter season under irrigation. Durum wheat is mostly cultivated in the state of Sonora; since the 2001–02 crop season, this type of wheat has occuppied more than 70% of the area grown with wheat (Camacho et al. 2004). The preference for durum wheat by farmers in northwest Mexico was greatly influenced by the implementation of federal quarantine No. 16 against Karnal bunt of wheat (SARH 1987), because durum wheat is more tolerant to this disease than bread wheat. Durum wheat also has greater yield potential, better value in the international market, and, at that time, the durum