ITEMS FROM ITALY

THE UNIVERSITY OF BOLOGNA – COLLEGE OF AGRICULTURE
Dipartimento di Scienze e Tecnologie Agroambientali (DiSTA), Via Fanin 40, 40127 Bologna, Italy.

CONSIGLIO PER LA RICERCA E LA SPERIMENTAZIONE IN AGRICOLTURA (CRA-QCE)
Via Cassia 176, 00191 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 soil-borne mosaic virus in 2013.

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

Thirty-one durum wheat cultivars were grown during the 2012–13 season in a field with a 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 25 October, 2012, 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 two dates (21 March and 4 April) 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 (4 April, 2013). The trial included five cultivars that had not been tested before.

Cereal soil-borne mosaic virus pressure was relatively high, as testified by the high mean symptom scores (≥ 3.0) recorded for eleven of the 31 cultivars assayed (Table 1, p. 22). Low mean symptom scores (≤1.0), accompanied by low ELISA values, were recorded only for the cultivars Cesare, Dylan, Levante, Serafo Nick, and Monastir. The latter had not been tested for CSBMV before.

Mean ELISA value and mean symptom severity score were correlated significantly (0.861**). Symptom severity score was significantly correlated (P = 0.001) with all the agronomic characters investigated (Table 2, p. 22). A regression analysis estimated quite accurately the agronomic CSBMV effects corresponding to different symptom severity scores in the 2012–13 season. For instance, a mean symptom score of 3.5 was associated with grain yield, plant height, 1,000-kernel weight, and test weight reductions of about 62%, 33%, 23%, and 2%, respectively, as well as with a heading delay of about 6 days (Table 3, p. 23). As in previous experiments, results indicated that even mild symptoms cause appreciable grain yield losses.

Table 1. Response to cereal soil-borne mosaic virus of 31 durum wheat cultivars grown near Bologna, Italy, in 2012–13. Items with the same letter(s) are statistically similar. Symptom severity was rated on a 0–4 scale and are the mean of two 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 1 April)	
Achille	3.67	a	1.584	a	3.86	jk	68.3	kl	41.2	ik	79.6	af	42.3	bc
Achille	3.67	a	1.584	a	3.86	jk	68.3	kl	41.2	ik	79.6	af	42.3	bc
Anco Marzio	3.71	a	1.070	af	3.67	jk	78.0	hj	38.8	jk	79.1	af	41.0	cf
Athoris	1.67	cf	0.580	fk	7.96	ad	89.7	bf	53.9	cd	81.9	a	37.3	i
Cesare	0.75	gi	0.443	hl	8.22	ab	93.0	ad	50.5	df	80.4	ac	40.0	eh
Claudio	3.25	a	1.258	ad	2.61	kl	59.0	m	44.0	gj	79.0	af	42.0	bc
Colombo	2.04	cd	0.439	hl	6.64	dg	83.0	fh	50.8	df	79.9	ad	41.7	bd
Core	1.67	cf	0.410	il	6.51	dh	89.7	bf	53.1	cd	77.9	bf	33.0	l
Cuspide	3.50	a	0.966	bh	3.45	jl	71.7	jl	40.5	ik	77.2	cf	41.0	cf
Duilio	2.00	cd	0.682	ej	6.18	eh	84.3	eh	51.1	de	78.0	bf	34.0	jl
Dylan	0.50	hi	0.473	hl	8.14	ac	95.0	ad	49.6	df	79.3	af	39.3	gh
Emilio Lepido	2.34	bc	0.756	dj	5.68	fh	78.0	hj	47.6	eg	76.4	f	34.7	jk
Grazia	3.42	a	1.429	ac	2.28	l	68.0	kl	42.6	gj	77.8	bf	41.3	ce
Iride	1.46	cg	0.780	dj	7.07	bf	80.7	gi	47.0	eg	80.1	ad	34.0	jl
Kanakis	3.46	a	0.910	ci	2.68	kl	68.3	kl	37.2	k	76.5	ef	40.0	eh
Levante	0.94	fi	0.492	gl	7.86	ad	96.0	ac	49.8	df	80.3	ac	39.0	gh
Liberdur	3.71	a	1.363	ac	4.15	ij	72.0	jl	41.1	ik	78.5	bf	43.0	b
Magellano	3.58	a	1.351	ac	3.75	jk	64.3	lm	41.7	hk	78.9	af	44.3	a
Marco Aurelio	1.46	cg	0.247	jl	6.78	bf	94.3	ad	57.7	ac	78.4	bf	37.3	i
Massimo Meridio	1.08	eh	0.325	jl	6.71	cg	96.7	ab	59.0	ab	78.6	bf	37.3	i
Miradoux	2.96	ab	1.459	ab	2.84	jl	73.7	ik	42.8	gj	77.0	df	45.0	a
Monastir	0.17	i	0.034	l	8.85	a	95.0	ad	54.7	bd	78.8	af	36.7	i
Odisseo	3.54	a	1.170	ae	3.68	jk	70.7	jl	43.8	gj	78.3	bf	40.3	dg
Ramirez	1.09	eh	0.605	fk	6.86	bf	91.0	ae	42.5	gj	80.1	ad	38.7	h
Saragolla	1.92	ce	0.745	dj	6.71	cg	83.0	fh	47.7	eg	78.8	af	35.0	j
Sculptur	3.38	a	0.950	bi	5.23	hi	65.3	lm	45.7	fi	78.2	bf	39.7	fh
Serafo Nick	0.92	fi	0.512	gl	7.61	ae	99.0	a	60.3	a	80.5	ab	37.3	i
Simeto	3.08	ab	1.421	ac	4.11	ij	66.7	kl	54.7	bd	77.7	bf	39.0	gh
Svevo	2.09	cd	1.038	bg	5.35	gi	87.0	dg	47.5	eg	77.6	bf	33.3	kl
Tirex	1.25	dh	0.654	ek	7.23	be	88.3	cg	49.5	df	80.4	ac	33.7	jl
Trapezio	1.25	dh	0.111	kl	8.18	ab	98.7	a	47.5	eg	79.8	ae	39.7	fh
Yelodur	1.58	cg	0.580	fk	7.07	bf	87.0	dg	46.8	eh	77.9	bf	39.3	gh

Table 2. Simple correlation coefficients between mean symptom severity, 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 2012–13. ns = not significant.

	ELISA value		Grain yield		Plant height		Kernel weight		Test weight		Heading date	
Symptom severity	–0.861	**	–0.928	**	–0.912	**	–0.704	**	–0.474	**	0.545	**
ELISA value	—		–0.871	**	–0.866	**	–0.636	**	–0.348	ns	0.514	**

Table 3. Estimated effects of cereal soil-borne mosaic virus on grain yield, plant height, kernel weight, test weight, and heading date for different symptom severity scores (Cadriano (Bologna), Italy, 2012–13).

Disease score (scale 0–4)	Grain yield loss		Plant height reduction		1,00-kernel weight reduction		Test weight reduction		Heading date delay (days)
	t/ha	%	cm	%	g	%	kg/hl	%	
0.5	0.82	8.8	4.8	4.7	1.9	3.3	0.3	0.3	0.8
1.5	2.46	26.4	14.5	14.1	5.6	10.0	0.8	1.0	2.4
2.5	4.10	44.1	24.2	23.5	9.3	16.7	1.4	1.7	4.0
3.5	5.74	61.7	33.8	32.9	13.1	23.4	1.9	2.4	5.6

Effects of cereal soil-borne mosaic virus over 12 seasons.

V. Vallega (CRA-QCE), C. Rubies-Autonell (DSA), A. Sarti (ASTRA), and R. Canestrale (CRPV).

Various sets of durum wheat cultivars were evaluated for resistance to cereal soil-borne mosaic virus (CSBMV) on the basis of symptom severity, DAS–ELISA readings and agronomic performance at two fields with the virus situated near Minerbio and Cadriano (Bologna) in 12 seasons between 1996 and 2013. A total of 146 durum wheat cultivars were assayed in these trials. Five of the 18 trials programmed for this period (three of which were at Ozzano, also near Bologna) could not be carried out due to the lack of adequate funds and/or sufficiently uniform fields. Moreover, in the 2010–11 season, only symptom severity and ELISA data were collected. Each trial was comprised of 30–34 cultivars, grown in 10-m^2, solid-seeded plots distributed in the field according to a randomized block design with three replicates. 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. The symptom score data collected on various dates in each season were averaged for computations and presentation. Mean symptom scores above 3.0 were recorded for at least one cultivar in all trials.

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 about 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 mean 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 twelve seasons, (Minerbio 1996–97 and Cadriano 2001–13).

Season	Symptom severity score			
	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
2011–12	6.9	20.8	34.7	48.6
2012–13	8.8	26.4	44.1	61.7
Mean	7.6	22.9	38.1	53.4
Minimum	5.2	15.7	26.1	36.5
Maximum	10.4	31.2	52.0	72.7

Response to cereal soil-borne mosaic virus of 148 durum wheat cultivars assayed from 1996 to 2013.

V. Vallega (CRA-QCE), C. Rubies-Autonell (DSA), A. Sarti (ASTRA) and R. Canestrale (CRPV).

A total of 148 durum wheat cultivars were grown in different trials over 13 seasons (from 1996 to 2013) at two fields with cereal soil-borne mosaic virus (CSBMV) near Minerbio and Cadriano (Bologna). The cultivars were evaluated for resistance to CSBMV on the basis of agronomic performance (except in the 2010–11 season), symptom severity, and

DAS–ELISA readings. Five of the 18 trials programmed over the 1996–2013 period could not be carried out due to the lack of adequate funds and/or sufficiently uniform fields. Each trial was comprised of 30–34 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 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 148 cultivars assayed (Table 5 below, continued on p. 25). In this respect, cultivars Duilio, Dylan, Claudio, Creso, Grazia, Iride, Levante, Meridiano, Neodur, and Simeto were tested in eight or more seasons.

Based on the experience accumulated, the CSBMV responses (Table 5, pp. 24-25) should be considered merely indicative for cultivars assayed in only one season, and highly dependable for cultivars assayed in three or more seasons. We note that although nearly half of the 148 cultivars listed carry a major gene for CSBMV resistance, located on the short arm of chromosome 2B, only 29 were classified as resistant, and none proved immune to CSBMV infection.

Table 5. Response to cereal soil-borne mosaic virus of 148 durum wheat cultivars assayed in 13 trials near Bologna (Minerbio 1996–97 and Cadriano 2001–13), Italy, and the number of years in which each cultivar was tested.

Cultivar	Years	Cultivar	Years	Cultivar	Years	Cultivar	Years
Resistant				**Moderately resistant**			
Alemanno	2	Meridiano	8	Ariosto	1	Latinur	4
Ares	4	Monastir	1	Arnacoris	3	Marco Aurelio	2
Asdrubal	1	Nefer	1	Artemide	1	Massimo Meridio	2
Baio	1	Neodur	8	Athoris	1	Neolatino	4
Biensur	4	Parsifal	2	Avispa	3	Normanno	7
Campodoro	1	Pharaon	2	Brindur	1	Orfeo	1
Ceedur	1	Pietrafitta	2	Canyon	1	Peleo	1
Colorado	5	Provenzal	5	Catervo	1	Portofino	2
Dario	1	Ramirez	3	Cesare	2	Pr22d89	3
Dylan	9	Saragolla	6	Chiara	1	Preco	1
Giusto	1	Serafo Nick	2	Colombo	2	Rusticano	1
Hathor	1	Solex	7	Core	2	San Carlo	5
Levante	8	Tiziana	3	Cosmodur	2	Sfinge	1
Lloyd	3	Valerio	1	Duilio	13	Svevo	5
Louxor	1			Fiore	2	Tirex	5
				Flavio	2	Torrese	1
				Gianni	5	Trapezio	2
				Grecale	2	Valsalso	1
				Ignazio	1	Virgilio	1
				Imhotep	3	Vitomax	3
				Iride	12	Vitron	2
				Isildur	2	Yelodur	3
				K26	1		

Table 5. Response to cereal soil-borne mosaic virus of 148 durum wheat cultivars assayed in 13 trials near Bologna (Minerbio 1996–97 and Cadriano 2001–13), Italy, and the number of years in which each cultivar was tested.

Cultivar	Years	Cultivar	Years	Cultivar	Years	Cultivar	Years
Moderately susceptible				Susceptible			
Appio	2	Minosse	2	Achille	6	Karur	4
Aureo	1	Miradoux	2	Agridur	1	Liberdur	5
Claudio	11	Norba	1	Anco Marzio	7	Magellano	1
Colosseo	4	Ofanto	2	Balsamo	2	Marco	2
Creso	10	Perseo	1	Bronte	1	Odisseo	2
Dorato	1	Plinio	1	Cannavaro	1	Orobel	7
Duetto	2	Portobello	1	Cannizzo	3	Peres	1
Emilio Lepido	1	Principe	1	Capri	1	Platani	2
Ermecolle	1	Quadrato	4	Carioca	1	Portorico	5
Exeldur	2	Sorrento	1	Casanova	2	Pr22d40	1
Gardena	2	Torrebianca	5	Ciccio	5	Prometeo	2
Giotto	3	Tresor	2	Ciclope	1	Sculptur	3
Giove	1	Vendetta	2	Cirillo	3	Severo	2
Italo	2	Verdi	3	Concadoro	1	Simeto	13
Ixos	3	Virgilio	2	Cuspide	1	Sorriso	1
Mimmo	1	Zenit	2	Derrick	2	Trionfo	2
				Giemme	2	Tripudio	2
				Granizo	1	Vesuvio	3
				Grazia	10	Vetrodur	3
				Ismur	2	Vettore	2
				Kanakis	3	Vinci	1

Effects of late sowing on durum wheat cultivars grown in a field infected with cereal soil-borne mosaic virus.

F. Quaranta, A. Belocchi, M. Fornara, and V. Vallega (CRA–QCE).

Wheat soil-borne mosaic virus (WSBMV), vectored by the soil-dwelling protist *Polymyxa graminis* Led., was first identified in the USA and thereafter reported in most of the wheat-growing areas of the world including Italy. In 2005, following the results of sequence analyses, the soil-borne wheat mosaic virus isolates prevalent in North America, Europe, and Far East Asia have been subdivided into three distinct furovirus species denominated wheat soil-borne wheat mosaic virus, cereal soil-borne mosaic virus (CSBMV), and Chinese wheat mosaic virus (CWMV), respectively. We note, however, that the results of recombination studies and other considerations suggest that these three furoviruses, transmitted by the same vector, exhibiting an identical particle morphology and inducing the same symptomatology, could be regarded as strains of WSBMV.

Late sowing has been proposed as a means of controlling WSBMV, yet the agronomic effects of purposefully delaying the seeding of wheats grown in fields infected by WSBMV, CSBMV, or CWMV have not been actually investigated so far. To study such effects, the responses of five durum wheat cultivars resistant to CSBMV (Dylan, Levante, Meridiano, Neodur, and Saragolla) and of five susceptible ones (Achille, Anco Marzio, Cirillo, Grazia, and Simeto) were investigated during the 2012–13 season in a field with natural inoculum sources of CSBMV situated near Rome (Italy) on three sowing dates: 25 October (early), 16 November (optimal), and 13 December (late).

The cultivar were grown in 10-m^2 plots distributed in the field according to a modified split-plot design with three replicates. To reduce border effects, three rows of the cultivar Tirex (moderately resistant to CSBMV) were seeded around the blocks at the time of each sowing. Symptom severity was scored on various dates using a 0–4 scale, where 0.0–1.0 = resistant, slight, or no symptoms; 1.1–2.0 = mildly resistant, mild mottling, and stunting; 2.1–3.0 = mildly susceptible, mottling, and stunting; and 3.1–4.0 = susceptible, severe mottling and stunting, with virus-killed plants. Only the symptom scores recorded on 4 April, 2013. Weediness was recorded as the percent of the soil surface covered by undesired plants. To normalize data for ANOVA, symptom score and weediness data were subjected to square root and arcsine transformation, respectively. Grain yield, plant height, day-to-head (from 1 April), test weight, 1,000-kernel weight, and number of fertile tillers/m^2 were measured according to the standard procedures. Kernel number/spike and kernel number/m^2 were calculated from the data recorded for grain yield, 1,000-kernel weight, and spike number/m^2.

Plots received 30 kg/ha of N and 77 kg/ha of P_2O_5 (as diammonium phosphate) before seeding and 50 kg/ha (1 March) and 40 kg/ha (14 April) of N (as ammonium nitrate). Weeds were controlled with glyphosate, applied 5 October, 2012, and by harrowing prior to each sowing. We note that according to the results obtained in numerous trials carried out in Italy, resistant and moderately resistant durum wheat cultivars suffer, on average, grain yield losses of about 8 % and 23 %, respectively when grown under conditions favorable for CSBMV infection.

Cereal soil-borne mosaic virus disease pressure was severe in the early sowing, and decreased in the optimal and late sowing, as testified by the mean disease scores recorded for the susceptible cultivars in the first (mean score = 3.0) , second (2.5), and last sowing (2.2). As might be expected, the performance of the resistant cultivars was best in the optimal sowing for practically all the characters examined. Indeed, only the mean 1,000-kernel weight of the resistant cultivars proved highest in the latest sowing. Conversely, the performance of the susceptible cultivars improved substantially from the first to the last sowing date in regard to all the characters examined (Table 6).

Table 6. Mean performance at early. optimal. and late sowing dates for five cereal soil-borne mosaic virus (CSBMV)-resistant and five CSBMV-susceptible durum wheat cultivars grown in an CSBMV-infected field near Rome (Italy) during 2012–13. For each parameter. values with the same letters are not significantly different at P ≤0.05 (Duncan Multiple Range Test).

Sowing time	Cultivars	Grain yield (t/ha)		Plant height (cm)		Test weight (kg/hl)		1.000-kernel weight (g)		Spikes/m^2 (n)		Kernels/spike (n)		Kernels/m^2 (n)	
Early (25 October)		0.92	b	71	b	72.2	b	33.2	c	168	b	13	b	2,728	b
Optimal (16 November)		2.27	a	78	a	78.1	a	40.0	b	235	a	24	a	5,614	a
Late (13 December)		2.37	a	78	a	77.5	a	42.2	a	239	a	24	a	5,621	a
	Resistant	2.42	a	79	a	76.9	a	39.7	a	255	a	24	a	5,960	a
	Susceptible	1.28	b	72	b	75.0	b	37.1	b	173	a	17	b	3,348	b
Early	Resistant	1.48	d	79	ab	73.3		33.1	e	246	ab	18	d	4,403	cd
	Susceptible	0.36	e	64	c	71.1		33.2	e	89	d	8	e	1,053	e
Optimal	Resistant	3.04	a	81	a	79.1		41.9	b	269	a	28	a	7,264	a
	Susceptible	1.51	d	76	b	77.1		38.0	d	201	c	20	cd	3,964	d
Late	Resistant	2.75	b	78	ab	78.1		44.2	a	248	ab	25	ab	6,214	b
	Susceptible	1.99	c	78	ab	76.9		40.1	c	229	bc	22	bc	5,028	c

At the optimal sowing date, the mean grain yield recorded for the susceptible cultivars (1.51 t/ha) was about 50% of that recorded for the resistant cultivars (3.04 t/ha). Susceptible cultivars produced far fewer spikes/m^2 and grains/spike than the resistant cultivars as a consequence of CSBMV infection, but their mean 1,000-kernel weight was affected little. We note that at the optimal sowing the performance of the susceptible cultivars was significantly inferior to that of the resistant cultivars for all the characters investigated, including weediness (34% versus 9%).

Early sowing allowed plants of the resistant cultivars to tiller profusely, but induced them to head too early, thus determing high spike-sterility rates and low grain yields (1.48 t/ha). The mean grain yield recorded for the susceptible cultivars in the early sowing (0.36 t/ha) was substantially lower, representing only about 24% of that recorded for the resistant cultivars. Susceptible cultivars suffered severe die-back and produced far less spikes (89/m^2) than the resistant cultivars (246/m^2). We note that symptom scores close to 4.0 were assigned to five of the plots sown with susceptible cultivars, and that such plots produced grain barely sufficient to perform test weight and 1,000-kernel weight measurements. Mean weediness was substantially higher for the susceptible cultivars (65%) than for the resistant cultivars (16%).

Late sowing lead to a shorter growth cycle and, as a consequence, resistant cultivars produced less spikes and less grain/spike compared with the optimal sowing, yet also decidedly heavier grains and a moderately high mean grain yields (2.75 t/ha). The mean grain yield recorded for the susceptible cultivars in the late sowing (1.99 t/ha) was significantly higher than that recorded for such cultivars in the early (0.36 t/ha) and the optimal (1.51 t/ha) sowing, yet markedly lower than that recorded for the resistant cultivars in both the late and optimal sowings. Indeed, the mean grain yield recorded for the susceptible cultivars in the late sowing was 72% of that recorded for the resistant cultivars in that same sowing, and 65% of that recorded for the resistant cultivars in the optimal sowing. The mean grain yield data was recorded for the resistant and susceptible cultivars in the three sowings (Fig. 1).

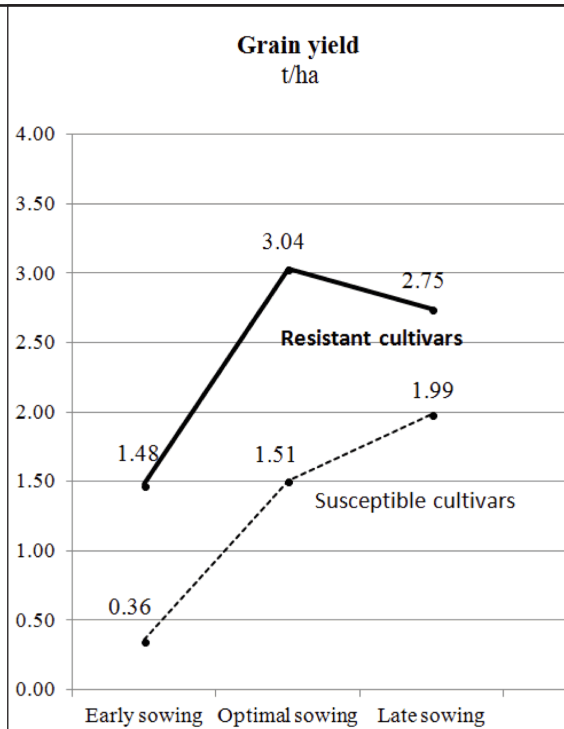

Fig. 1. Mean grain yield (t/ha) at early (25 October), optimal (16 November), and late (13 December) sowing dates for five cereal soil-born mosaic virus (CSBMV)-resistant and five CSBMV-susceptible durum wheat cultivars grown in an CSBMV-infected field near Rome (Italy) during the 2012–13 crop season.

We note that the highest grain yield recorded among susceptible cultivars in the late sowing (2.58 t/ha for the cultivar Anco Marzio) was lower than the lowest grain yield recorded among the resistant cultivars in the optimal sowing (2.78 t/ha for the cultivar Neodur). Also, it is important to note that the mean grain yield recorded in the optimal sowing (2.28 t/ha) for the 10 durum wheat cultivars investigated in this study was very similar and statistically not different from that recorded in the late sowing date (2.37 t/ha). Mean weediness in the late sowing was significantly higher for the susceptible cultivars than for the resistant (21% and 12%, respectively).

The data collected in 2012–13 suggest that purposefully delaying the sowing date of CSBMV-susceptible durum wheat cultivars in CSBMV-infected soils is advantageous only if resistant cultivars are not available. The data suggest that in those cases where the CSBMV response of the cultivars to be seeded is unknown, the mean grain yield expected as a result of purposefully delayed sowings is comparable to that which might be expected following optimal sowing; but evidently entails the risk of excessively delayed seedings as a result of unfavourable climatic conditions.