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ITEMS FROM ITALY

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Molecular characterization of Italian soilborne cereal mosaic virus isolates.

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A mosaic disease of winter wheat was first described in the USA by McKinney in 1925 and subsequently in many other wheat-growing countries. Until recently, the disease was associated worldwide to wheat soil-borne mosaic virus (WSBMV). Results of sequence analysis by German and Chinese researchers, however, have prompted the International Committee on Taxonomy of Viruses to approve a taxonomic proposal to divide American, European, and Chinese isolates into different species within the genus *Furovirus*. The novel species have been denominated wheat soil-borne mosaic virus, cereal soilborne mosaic virus (CSBMV), and wheat Chinese mosaic virus (WCMV). On the basis of the new classification, the wheat mosaic disease is believed to be generally caused by WSBMV in United States, Brazil, and Canada; by CSBMV in Europe; and by WCMV in Asia. Twenty-four wheat samples showing typical Furovirus symptoms were collected from farmers in fields northern, central, and southern Italy to study their degree of genetic diversity. SsRNA was extracted, and the nucleotide sequence of a viral coat protein gene was determined for each sample. Nucleotide and amino-acid sequences alignment between the sequences obtained and the published RNA2 CP sequences of CSBMV, WSBMV, and WCMV isolates was generated applying the Clustal V method, and phylogenetic distance trees were constructed. Branching orders identified three major phylogenetic groups. In the first group, all the Italian isolates clustered closely together along with French, English, and German isolates (SBCMV species), whereas the second group included the American isolates, and the third ascribed the Asian isolates. Sequence data analysis revealed a high degree of genetic identity among Italian isolates (96.6 to 100.0 %) and between Italian isolates and SBCMV accessions from the United Kingdom, France, and Germany (88.7 to 99.6 %). Sequence divergences from 29.6 to 45.9 % were observed between Italian SBCMV isolates and SBWMV or CWMV isolates. Amino-acid sequence analysis of CP cistron revealed few nonspecific exchanges as well as a high degree of sequence identity (97.7 to 100%) among CSBMV isolates from Italy and other European countries. Amino-acid sequence similarity between Italian and Asian or American isolates ranged from 71.0 to 81.2 %. Eventhough all the Italian isolates so far analyzed belong to the novel CSBMV species, the presence of SBWMV in this country cannot be excluded.

Reaction of 34 durum wheat cultivars to cereal soilborne mosaic virus.

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Cereal soilborne mosaic virus (CSBMV) in Italy was first detected in the Po Valley in 1960 and is now known be widespread throughout most of the country, particularly in the northern and central regions. Thirty-four durum wheat cultivars were grown during 2006–07 in a field with SBCMV at Cadriano, near Bologna, and evaluated for resistance to CSBMV on the basis of symptom severity, DAS-ELISA readings, and agronomic performance. Seventeen of these cultivars (marked with asterisks in Table 1, p. 72) had never been tested for CSBMV resistance. The cultivars, planted 6 November, 2006, were grown in 10-m^2, solid-seeded plots distributed in the field according to a randomized block design

Table 1. Mean symptom severity, mean ELISA value, and agronomic performance of 34 cultivars of durum wheat grown in a field with cereal soilborne mosaic virus near Bologna, Italy, during the 2006–07 season. Cultivars marked with asterisks (*) have never been tested for CSBMV resistance previously.

Cultivar	Mean symptom severity (0–4)	Mean ELISA value	Heading (Number of days from 1 April)	Plant height (cm)	1,000-kernel weight (g)	Test weight (g)	Grain yield (13% humidity)
Achille *	3.3 a	1.516 af	38.7 ac	61.7 op	32.6 fh	71.1 ad	1.24 ij
Anco Marzio	3.0 ab	1.631 ad	32.7 gl	70.0 kn	33.3 eh	67.8 bj	1.42 hj
Ariosto *	0.8 lp	1.444 af	35.0 dh	87.0 ae	40.6 ab	70.2 af	2.43 ch
Asdrubal *	1.2 hm	0.612 hj	28.0 no	88.7 ac	34.7 dg	72.8 a	4.47 a
Capri *	3.1 ab	1.653 ad	39.0 ab	72.3 in	31.1 gi	68.2 ai	1.62 gj
Casanova *	1.8 eh	1.777 ab	31.3 in	80.7 ci	39.5 ac	67.9 bi	2.36 dh
Catervo *	1.4 gm	1.368 bf	35.0 dh	78.3 ek	36.2 bf	64.4 hj	1.84 fj
Chiara *	1.4 gm	1.406 af	34.7 di	73.3 hn	37.9 bd	67.6 bj	2.91 cf
Claudio	2.5 bd	1.736 ac	34.0 ej	85.0 bf	36.6 bf	72.6 a	2.45 ch
Creso	1.6 ej	1.114 eg	36.3 bf	74.7 gn	39.2 ad	70.6 ae	2.39 dh
Dario *	0.3 oq	0.389 ik	30.7 jo	94.0 a	35.4 cg	69.8 af	2.75 cf
Duilio	1.0 in	1.226 df	34.0 ej	81.7 ch	40.6 ab	69.7 af	3.29 bd
Dylan	0.4 nq	0.305 jk	34.7 di	92.7 ab	37.4 be	71.5 ac	4.18 ab
Grazia	3.2 a	1.685 ad	37.0 ae	66.7 no	29.2 hi	69.5 af	1.07 j
Hathor *	0.1 pq	0.086 k	38.7 ac	71.3 jn	38.3 ad	67.1 cj	1.89 fj
Iride	0.7 mq	1.045 fh	29.0 mo	81.0 ci	35.0 cg	68.9 ah	3.47 bc
Isildur *	3.0 ab	1.732 ac	40.0 a	56.7 p	27.2 i	66.5 dj	1.57 gj
K26 *	1.5 fl	1.551 ae	35.7 bg	72.3 in	36.3 bf	68.9 ah	1.86 fj
Latinur *	1.7 ei	1.433 af	34.0 ej	69.3 lo	39.2 ad	67.3 bj	2.78 cf
Levante	1.2 hm	1.036 fh	34.0 ej	87.3 ad	34.8 dg	69.4 af	3.18 be
Meridiano	1.1 hm	1.095 eg	31.7 hm	85.7 af	35.3 cg	70.5 ae	4.15 ab
Neodur	0.9 ko	1.607 ad	35.3 cg	82.0 ch	38.5 ad	71.7 ac	3.33 bd
Neolatino *	1.1 hm	1.382 bf	29.3 lo	83.3 cg	38.6 ad	71.9 ab	3.28 bd
Normanno	1.3 hm	1.245 cf	34.0 ej	81.3 ch	39.3 ad	69.1 ag	2.57 cg
Orfeo *	1.5 ek	0.757 gi	36.3 bf	78.3 ek	42.7 a	63.3 j	1.21 ij
Orobel	3.0 ab	1.728 ac	39.0 ab	76.7 fm	32.3 fh	65.5 fj	1.4 hj
Pr22d40	3.3 a	1.779 ab	38.0 ad	58.3 p	29.6 hi	68.1 ai	1.55 gj
Pr22d89 *	2.2 ce	1.699 ad	34.7 di	75.3 gn	34.9 cg	71.7 ac	2.30 dh
Saragolla *	0.0 q	0.187 jk	30.3 ko	79.7 dj	34.9 cg	69.7 af	4.78 a
Sfinge *	1.2 hm	1.295 bf	27.7 o	78.0 el	37.9 bd	66.2 ej	3.12 ce
Simeto	2.8 ac	1.892 a	33.3 fk	68.3 mo	37.7 be	64.6 gj	1.97 fj
Solex	1.0 jn	1.060 fg	33.3 fk	81.7 ch	39.5 ac	70.1 af	2.70 cf
Vendetta	2.1 df	1.617 ad	32.7 gl	74.3 gn	37.1 be	63.7 ij	2.13 ei
Virgilio	2.0 dg	1.571 ae	33.3 fk	82.7 cg	36.0 bf	67.4 bj	2.35 dh
MEAN	1.7	1.284	34.2	77.4	36.2	68.7	2.53

with three replicates. Symptom severity was evaluated on two dates using a 0–4 scale. DAS-ELISA was performed on extracts from a bulk of the apical half of the second and third youngest leaves of ten randomly chosen plants/plot collected 21 February and 12 March, 2007. The cultivar Saragolla remained symptomless throughout the entire season, showed the second lowest mean ELISA value and produced the highest grain yields. The cultivars Dylan, Dario, and Hathor also had very low mean ELISA values (≤ 0.389) and very low symptom scores (≤ 0.4); the latter two cultivars, however, produced decidedly low yields as did other relatively CSBMV-resistant wheats (i.e., Orfeo, Catervo, and K26), possibly due to adverse factors different from CSBMV. In the cultivars Meridiano and Neodur, mild symptoms and high grain yields were accompanied by high ELISA values, which was not expected because foliar extracts from these two cultivars had given ELISA values close to zero, even under severe disease pressure, in nine previous experiments carried out at a different site near Bologna. Cultivars Duilio and Iride, showing mild symptoms and previously classified as moderately resistant, also showed unexpectedly high ELISA values. The correlation between mean ELISA value and

Table 2. Estimated mean effects of cereal soil-borne mosaic virus on 34 durum wheat cultivars with different disease severity grown in a field near Bologna, Italy, during 2006–07.

Disease severity score	Number of cultivars	Grain yield loss		Plant height reduction		Kernel weight reduction		Heading delay days
		t/ha	%	cm	%	g	%	
0.00–1.00	9	3.20	14	83.5	5	37.8	5	2.1
1.01–2.00	14	2.75	26	79.6	10	37.7	5	1.6
2.01–3.00	7	1.89	49	72.3	18	34.2	14	3.8
3.01–3.30	4	1.37	63	64.8	26	30.6	23	6.8

Table 3. DAS-ELISA values for durum wheat cultivars to wheat spindle streak mosaic virus in central Italy.

Cultivar	Mean ELISA 1999 (44 cvs)	Mean ELISA 2004 (44 cvs)	Mean ELISA 2007 (20 cvs)	ELISA index 1999 (%)	ELISA index 2004 (%)	ELISA index 2007 (%)	ELISA index Mean (%)
Arcobaleno	0.046 df	0.106 ac		6	23		14.6
Avispa		0.118 ac		26			25.6
Baio	0.420 af	0.148 ac		58	32		44.9
Bronte	0.351 af			48			48.2
Cannizzo		0.159 ac			34		34.5
Canyon		0.295 ac	0.021 c		64	1	32.6
Cappelli			0.959 ac			49	48.8
Ceedur	0.270 af			37			37.0
Ciccio	0.729 a	0.443 ab	1.967 a	100	96	100	98.7
Cirillo	0.594 ab			82			81.6
Claudio	0.004 f	0.000 c	0.018 c	1	0	1	0.5
Colorado	0.114 bf	0.031 bc		16	7		11.2
Colosseo	0.418 af	0.362 ac	1.348 ab	57	79	69	68.2
Creso	0.110 bf	0.190 ac	0.598 bc	15	41	30	28.9
Derrick		0.277 ac			60		60.2
Duilio	0.272 af	0.116 ac	0.979 ac	37	25	50	37.4
Dupri	0.039 df			5			5.4
Dylan			1.116 ac			57	56.7
Elios	0.210 bf			29			28.8
Flaminio	0.272 af			37			37.4
Fortore	0.221 bf			30			30.3
Gargano	0.348 af	0.188 ac		48	41		44.3
Gianni	0.114 bf	0.393 ac		16	85		50.5
Giemme	0.267 af			37			36.7
Giotto		0.359 ac			78		77.9
Grazia	0.344 af	0.279 ac	0.023 c	47	61	1	36.3
Ionio = Ares	0.471 af	0.247 ac		65	54		59.1
Iride	0.000 f	0.185 ac	0.677 bc	0	40	34	24.9
Italo	0.010 f			1			1.3
Ixos	0.227 bf			31			31.2
Karalis			1.357 ab			69	69.0
Lesina		0.193 ac			42		41.9
Lloyd	0.526 ad			72			72.1
Marco		0.162 ac			35		35.3

mean symptom score was highly significant (0.772**), and the same was found for the relationships between mean symptom score and heading date (0.504**), plant height (-0.704**), 1,000-kernel weight (-0.614**), and grain yield (-0.719). Regression analysis indicated that the effects of CSBMV on grain yield, kernel weight, plant height, and heading date (Table 2) were ruinous on the most susceptible cultivars and quite substantial also for the resistant ones.

Reaction of 72 durum wheat cultivars to wheat spindle streak mosaic virus in central Italy.

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In Italy, wheat spindle streak mosaic was first detected in a field near Rome in 1985. Subsequently, WSSMV has been identified, either alone or in mixed infection with CSBMV, in approximately 20 other sites throughout the northern and central and regions of the country. Field trials in 1998–99, 2003–04, and 2006–07 at the Experimental Farm of the Cereals Research Institute near Rome in a field with natural inoculum sources of both WSSMV and CSBMV evaluated the reaction to WSSMV using DAS-ELISA of 72 durum wheat cultivars marketed in Italy. Nine of these cultivars were grown over three seasons, 17 over two seasons, and 46 in one season only. The cultivars were grown in 10-m^2, solid-seeded plots, distributed in the field according to a randomized

block design with either two (1999) or three replicates (2004 and 2007). Virus concentration was determined on extracts from a bulk of the apical half of the second and third youngest leaves of ten randomly chosen plants/plot collected 18 March, 1999, 16 March, 2003, and 27 February, 2007. Simple correlation coefficients between ELISA values in different seasons were relatively low (r = 0.482* for 22 cultivars tested both in 1999 and 2004; r = 0.710* for the 10 tested both in 1999 and 2007; and r = 0.482 n.s. for the 12 tested both in 2004 and 2007). The DAS-ELISA readings obtained for each cultivar in different years are presented in Table 3 (pp. 74-75), where they are given also as percentage of the highest reading obtained in each season (ELISA index).

Among the nine cultivars assayed for three seasons, the lowest mean ELISA index was observed for Claudio (0.5%), which seems, at present, the best choice for soils with WSSMV in Italy. Among the 17 cultivars tested for two seasons, the lowest mean ELISA index were observed for Colorado (11.2%), Rusticano (11.4%), and Provenzal (11.9%). Cultivars Tiziana (0.1%), Italo (1.3%), Ofanto (4.4%), and Dupri (5.4%), assayed for only one season, also had relatively low ELISA values. Colorado, Provenzal, Tiziana, and Dupri appear of particular interest because they have shown a high degree of resistance towards CSBMV in Italy. Given the consistently high ELISA values recorded for Ciccio throughout three seasons (mean ELISA index = 98.7%), this cultivar will be used as the susceptible control in future assays.

Table 3 (continued). DAS-ELISA values for durum wheat cultivars to wheat spindle streak mosaic virus in central Italy.

	Mean ELISA			ELISA index			
Cultivar	1999 (44 cvs)	2004 (44 cvs)	2007 (20 cvs)	1999 (%)	2004 (%)	2007 (%)	Mean (%)
Meridiano		0.261 ac	0.810 ac		57	41	48.9
Mongibello	0.295 af			40			40.4
Nefer	0.150 bf	0.275 ac		21	60		40.1
Neodur	0.523 ad	0.166 ac		72	36		54.0
Nerone	0.544 ac			75			74.6
Normanno			1.193 ac			61	60.7
Ofanto	0.032 ef			4			4.4
Orobel		0.243 ac	0.689 bc		53	35	43.9
Platani		0.262 ac			57		56.9
Parsifal	0.409 af			56			56.1
Pietrafitta		0.146 ac			32		31.7
Platani	0.285 af			39			39.1
Poggio	0.406 af			56			55.7
Portorico		0.275 ac			60		59.7
Preco		0.204 ac			44		44.3
Provenzal	0.054 df	0.075 ac		7	16		11.9
Quadrato		0.165 ac			36		35.8
Rusticano	0.037 df	0.081 ac		5	18		11.4
Saadi'	0.444 af			61			61.0
San Carlo	0.000 f		0.690 bc	0		35	17.5
Saragolla			1.913 a			97	97.3
Settedue		0.168 ac			36		36.5
Simeto	0.053 def	0.379 ac	0.683 bc	7	82	35	41.5
Solex	0.091 cf	0.154 ac		12	33		22.9
Svevo	0.039 df	0.124 ac	0.674 bc	5	27	34	22.2
Tiziana		0.001 c			0		0.1
Torrebianca		0.310 ac			67		67.4
Tresor	0.134 bf			18			18.4
Valbelice	0.509 ae	0.208 ac		70	45		57.5
Valnova	0.478 af	0.278 ac		66	60		63.1
Valsalso		0.353 ac			77		76.7
Varano	0.522 ae			72			71.6
Vendetta			1.333 ab			68	67.8
Verdi		0.331 ac			72		72.0
Vesuvio		0.264 ac			57		57.4
Vetrodur		0.128 ac			28		27.7
Vinci			0.464 bc			24	23.6
Vitromax		0.460 a			100		100.0
MEAN	0.265		0.217		0.876		
Minimum	0.000		0.000		0.018		
Maximum	0.729		0.460		1.967		

Inheritance of resistance to cereal soil-borne mosaic virus in a durum wheat population of lines derived from the cross 'Meridiano / Claudio'.

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According to the literature, in hexaploid wheat resistance to CSBMV is controlled by a few major genes. In field trials carried out for many years in Italy, most of the cultivars of hexaploid and durum wheat marketed in this country exhibited a consistent array of intermediate reactions to the virus, suggesting that, in these wheats, resistance to CSBMV is governed by numerous genes. A population consisting of 184 RILs (at the F_7 generation) obtained by Produttori Sementi Bologna Spa, Italy, from a cross between the durum wheat cultivars Meridiano (classed as either resistant or moderately resistant to CSBMV in various seasons) and Claudio (repeatedly classed as moderately susceptible) was grown during the 2006–07 season in a field near Cadriano (Bologna) with natural inoculum sources of CSBMV and evaluated for resistance on the basis of both symptomatology (on a 0–4 scale) and virus concentration (by ELISA). Disease pressure at the experimental site was severe, as testified by the relatively high percentage of lines (6%) with symptom severity scores equal or above 3.5. The results obtained showed that in the 'Meridiano / Claudio' cross, resistance to CSBMV is controlled by no less than four genes and that genotypes expressing more extreme reactions than either parent may be recovered (Tables 4 and 5). Our results also strongly suggested the presence of a further gene that, regardless of the symptomatology and virus concentration displayed on the first observation date, has a marked impact on the subsequent reaction to CSBMV of each line, i.e., a plus or minus effect of about 0.250 in terms of ELISA value and of about 0.2 in terms of symptom severity expression. The 'Meridiano / Claudio' population will be evaluated again for CSBMV-resistance in the same field during the 2007–08 season. Presently, the population is being profiled with SSR and DArT markers. Analysis of phenotypic and molecular data will allow us to identify the QTL involved in the control of CSBMV resistance.

Table 4. Symptom severity score frequency (%) distribution at three sampling dates for 184 lines from a 'Meridiano / Claudio' population.

Symtom severity interval	14 Feb	21 Feb	2 Apr
0.00–0.10	17.4	16.8	21.2
0.11–0.20	3.8	7.6	7.6
0.21–0.30	9.2	7.6	3.8
0.31–0.40	3.8	4.3	2.7
0.41–0.50	0.0	2.2	4.3
0.51–0.60	4.3	0.0	1.1
0.61–0.70	1.6	2.7	2.7
0.71–0.80	1.1	1.6	2.7
0.81–0.90	3.3	3.3	1.1
0.91–1.00	3.3	1.6	2.7
1.01–1.10	0.0	0.0	0.0
1.11–1.20	1.6	2.7	0.5
1.21–1.30	2.2	1.1	0.5
1.31–1.40	3.8	0.5	0.0
1.41–1.50	1.1	1.6	0.5
1.51–1.60	0.0	0.0	0.0
1.61–1.70	3.3	2.2	1.1
1.71–1.80	3.3	2.7	0.5
1.81–1.90	1.6	1.1	0.5
1.91–2.00	1.6	1.6	1.1
2.01–2.10	0.0	0.0	0.5
2.11–2.20	2.2	2.2	0.0
2.21–2.30	6.5	2.2	0.0
2.31–2.40	3.8	3.3	2.2
2.41–2.50	4.3	2.2	1.1
2.51–2.60	0.0	0.0	0.0
2.61–2.70	6.0	4.3	2.7
2.71–2.80	3.3	7.6	2.7
2.81–2.90	3.8	6.5	3.8
2.91–3.00	3.3	5.4	7.1
3.01–3.10	0.0	0.0	0.0
3.11–3.20	0.0	3.3	3.8
3.21–3.30	0.5	0.5	6.5
3.31–3.40	0.0	1.1	5.4
3.41–3.50	0.0	0.0	3.3
3.51–3.60	0.0	0.0	0.0
3.61–3.70	0.0	0.0	2.2
3.71–3.80	0.0	0.0	2.2
3.81–3.90	0.0	0.0	0.5
3.91–4.00	0.0	0.0	1.1

Table 5. ELISA value frequency (%) distribution at two sampling dates for 184 lines from the 'Meridiano / Claudio' population.

ELISA value intervals	14 Feb	12 Mar
0.000–0.050	0.0	0.0
0.051–0.100	1.1	1.6
0.101–0.150	1.6	1.1
0.151–0.200	1.1	1.1
0.201–0.250	1.1	0.0
0.251–0.300	1.6	0.5
0.301–0.350	0.5	0.0
0.351–0.400	1.1	1.6
0.401–0.450	3.3	0.5
0.451–0.500	4.3	1.1
0.501–0.550	2.7	2.2
0.551–0.600	2.2	1.6
0.601–0.650	3.8	2.7
0.651–0.700	0.5	1.1
0.701–0.750	3.8	0.0
0.751–0.800	3.3	2.7
0.801–0.850	4.3	3.3
0.851–0.900	1.6	2.7
0.901–0.950	2.7	3.3
0.951–1.000	5.4	2.2
1.001–1.050	2.2	1.1
1.051–1.100	3.3	2.2
1.101–1.150	2.7	1.1
1.151–1.200	3.8	1.6
1.201–1.250	4.3	1.6
1.251–1.300	6.5	1.1
1.301–1.350	5.4	4.3
1.351–1.400	4.3	2.2
1.401–1.450	3.8	3.8
1.451–1.500	3.3	1.1
1.501–1.550	2.2	1.6
1.551–1.600	3.8	2.2
1.601–1.650	3.8	2.7
1.651–1.700	2.7	4.3
1.701–1.750	0.0	6.0
1.751–1.800	1.1	6.5
1.801–1.850	0.0	8.2
1.851–1.900	0.0	10.3
1.901–1.950	0.5	6.0
1.951–2.000	0.0	2.7

Application of DMI fungicides against Fusarium head blight at two growth stages in bread and durum wheats.

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Fusarium head blight is one of the most important wheat disease in Italy and causes partial or total premature ear necrosis or emptiness of the mature ears and, in the presence of severe attacks, grain losses from 30% to 70%. Disease incidence and severity can be reduced by adopting correct agronomic practices, including the use of healthy seed, treating seed with fungicides against *Fusarium* species, and applying fungicides at the beginning of anthesis. In Italy, many tend to anticipate the application of fungicides to the stage of complete inflorescence emergence. We examined the effectiveness of fungicide active ingredients against FHB applied at two different growth stages, i.e., at complete inflorescence emergence (Zadoks' Growth Stage (GS) 58-59) and at the beginning of anthesis (GS 60-61) on five bread and five durum wheat cultivars. The fungicides tested were bromuconazole (Granit®) at 250g/ha, prochloraz (Sportak®45 EW) at 585g/ha, and tebuconazole (Horizon®) at 250g/ha. All three fungicides are registered in Italy for FHB control. Product activity was evaluated at the milk stage (GS 77) by comparing disease incidence (percentage of infected heads) and severity (infected area of the heads) in fields located in the region of Emilia-Romagna (northern Italy). Results showed that at the sites considered FHB disease was mainly caused by *F. graminearum* and *F. culmorum*. Bromuconazole, prochloraz, and tebuconazole proved efficient in reducing disease incidence and severity in all the cultivars examined. Their application at GS 60-61 stage, when the sensitivity of the plant to the disease is highest, furnished a better control than application at GS 58-59 in most of the wheat cultivars investigated.

Effects of three DMI fungicides on Fusarium head blight in durum wheat cultivars and their influence on DON content in kernels.

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In Italy, the main causative agents of FHB, a disease complex caused by *Fusarium* and *Microdochium* genera, are *F. graminearum*, *F. culmorum*, *F. avenaceum,* and *F. poae*. FHB-infected kernels may be harmful to human and other mammals because of an associated mycotoxin accumulation. *Fusarium graminearum* and *F. culmorum*, in fact, produce deoxynivalenol (DON), a mycotoxin having neurotoxic and immunotoxic effects. The purpose of our study was to evaluate the effect of three commercial fungicides registered in Italy for FHB control, bromuconazole (Granit®) at 250g/ha, prochloraz (Sportak®45 EW) at 585g/ha, and tebuconazole (Horizon®) at 250g/ha, on the development of FHB and the percentage of Fusaria-infected kernels and on the accumulation of DON. The trial was carried out on three durum wheat cultivars (Gianni, Neodur, and Orobel) commonly cultivated in the Emilia-Romagna region (northern of Italy) inoculated with a $2.5x10^4$ conidia/ml mixture of toxigenic isolates of *F. culmorum* and *F. graminearum*. A single application of either bromuconazole, prochloraz, or tebuconazole applied at the beginning of anthesis (Zadoks' Growth Stage 60-61) reduced either incidence and severity of FHB by about 60% compared with the untreated control. Application of these fungicides, moreover, was found to decrease the percentage of kernels infected by *F. graminearum* and *F. culmorum* by about 60% and to reduce the quantity of DON by about 53% in kernels, 55% in semolina, and 66% in the bran.

Fungal population in wheat cultivars with different degrees of susceptibility to cereal soil-borne mosaic virus.

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Cereal soil-borne mosaic virus is widespread in Italy, especially in the northern and central regions, where it is known to cause grain yield reductions of up to 70% on the most susceptible cultivars of hexaploid wheat and durum wheat. Following reports indicating that the spread of FHB is greater in plants infected by barley yellow dwarf virus (BYDV) than in BYDV-free ones, we investigated the possibility of an analogous correlation between CSBMV and fungi having antag-

onistic and/or toxigenic activity. Four cultivars of bread wheat (Artico, Trofeo, Agadir, and Isengrain) and four of durum wheat (Neodur, Provenzal, Claudio, and Orobel), exhibiting a wide range of reactions to CSBMV, were grown in a in field near Cadriano (northern Italy) with natural inoculum sources of this virus. Mycoflora composition was investigated (CFU/g) in the rhizosphere soil and, towards the end of the wheat growth cycle, also in roots, stems, and seeds. Fusaria species were identified molecularly. The fungi isolated from the soil were mostly saprophytes. *Penicillium* was found mainly in May, whereas *Fusaria* were most abundant in July; the antagonistic *Trichoderma* was not detected. *Fusaria* were detected in the seeds of all cultivars and were most abundant in durum wheat cultivars Orobel (17%), susceptible to CSBMV, and Provenzal (12%), resistant to the virus. Several *Fusarium* species were identified: *F. culmorum* prevailed in durum wheat and *F. poae* in bread wheat. Preliminary data suggest that there is no correlation between fungal colonization and susceptibility to CSBMV of the withering plants. Further studies are in progress.

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