Research Bulletin No. 14 April 1970

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CENTRO INTERNACIONAL DE MEJORAMIENTO DE MAIZ Y TRIGO
INTERNATIONAL MAIZE AND WHEAT IMPROVEMENT CENTER
MEXICO

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A SURVEY ON STEM RUST RESISTANCE IN THE USDA WORLD DURUM COLLECTION[1] AND IN CIMMYT DURUM BREEDING LINES

S. Rajaram, Basri Devecioglu, Norman E. Borlaug, Keith W. Finlay, George Varughese, Enrique Rodríguez [2]

In the past, several studies have been reported on the pathological and inheritance aspects of resistance in Durums and other tetraploid wheats against *Puccinia graminis tritici* (Clark & Smith, 1928; Smith, 1957; Kenaschuk *et al*, 1959; Heerman, 1960; Ataullah, 1963; Gough & Williams, 1963; Gough *et al*, 1964; Williams & Gough, 1965; Rondon *et al*, 1966 and Ataullah, 1967). All these studies have suffered from the lack of a definite genetic nomenclature of resistance genes. With the exception of Gaza type (Sr11), Khapli type (Sr7 + Sr13 + Sr14) and *Triticum timopheevi* type (SrTt) resistance, very little information is available in terms of precise genes.

Utilizing the stem rust races with known pathogenicity genes, 349 varieties of durums have been screened. These varieties were selected from over 3,000 of the USDA World Durum Collection on basis of their field reaction when grown in the Yaqui Valley, Mexico, during the 1968-69 season. One hundred and fifty-eight varieties and advanced lines from the CIMMYT Durum Breeding program were also included. The studies were designed to analyze the sources of resistance in Durums and to correlate them with those genes which have already been described such as Sr11.

Four strains of stem rust races with different pathogenicity spectrum were utilized. The races were classified according to the system proposed by Black *et al* (1953) for *Phytophthora infestans* and Watson and Luig (1963, 1966) for *Puccinia graminis tritici* and their reaction on different differentials is provided in Table 1. The race 15-2, 3, 4, 7 attacks the gene Sr11, Sr9b, SrTt, and the resistance of Yuma. Both the races 12-1, 3, 5, 6 and 113-1, 3, 5, 6 do not attack Gaza type (Sr11), *Triticum timopheevi* type (SrTt) and Yuma type resistance, while 151-1, 2, 3, 5 attacks Sr11, but does not attack SrTt and Yuma type resistance. These 4 races were used to group the individual entries in different genetic categories.

The seedling reactions of 349 varieties of the World Durum Collection when inoculated with the 4 races were obtained in a glasshouse. The results have been used to form the varieties into 6 groups, representing different genotypes. In group I, (Table 2) there are 21 varieties which were found to be highly resistant to all 4 races. Twenty of them come from Turkey, and one from Cyprus. In Table 2 and Fig. 1 it can be

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noted that the distribution of this gene is localized to the geographical areas of Mersin, Adana and Hatay provinces of Turkey. Cyprus is also very near to this area.

The varieties mainly from Ethiopia and a few from Turkey, Egypt, Canada and North Dakota, U.S.A., based on their similar phenotypic infection types have been placed in group II (Table 3). This group seems quite different from the first one, because all the varieties gave "2" to "2=" types of infection to 15-2, 3, 4, 7 compared to "0", 0;, ;1, and X — infection types produced in the first group. However, Group II varieties also were resistant to all the 4 races. The varieties from Canada and North Dakota may have additional resistance gene or genes.

There are 31 varieties which were found to be susceptible to 15-2, 3, 4, 7 and resistant to the other 3 races and it is suggested that they may be similar in their type of resistance, they have therefore, been placed in group III (Table 4). All have the patterns of Yuma type resistance, however, a few may also combine with Sr11.

Group IV (Table 5) contains varieties from Mediterranean areas with the one exception from Australia. All these varieties appear to have Sr11.

In Group V (Table 6) there are varieties which were found to be resistant to only 113-1, 3, 5, 6 and susceptible to the other 3 races. The gene conferring resistance is not identical to the genes which have been described above, including Sr11. In Group VI (Table 7) a different pattern of infection types on 7 varieties are included, where only resistance to 15-2, 3, 4, 7 is indicated. This type of behavior is found with Golden Ball.

There were 172 varieties (Table 8) susceptible to all the races and 58 varieties which were unclassified (Table 9). Attempts are being made to find whether any of the 349 varieties have some horizontal (adult plant) resistance, because all of them were resistant in the field in the Yaqui Valley of Mexico.

One hundred and fifty-eight varieties and advanced lines from the CIMMYT Durum breeding program were grouped in the same way as in the World Collection, although the classification was not as clear. Thirty-one varieties (Group IA, Table 10) were found resistant to all 4 races, but it seems that resistance is under control of several genes, because there are variabilities in infection types.

There are 23 varieties in Group IIA (Table 11), which is probably similar to Group II of World Durum Collection, because the patterns are similar.

Fig. 1

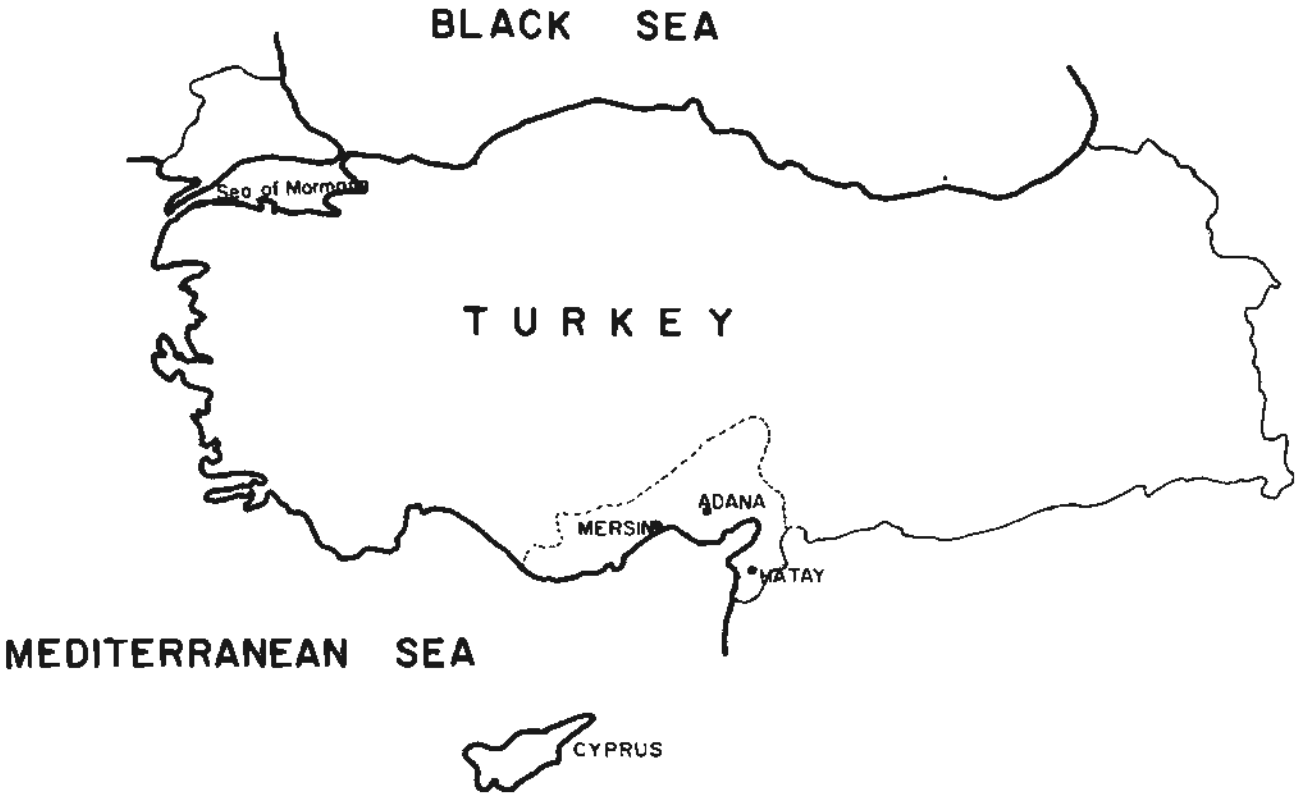
BLACK SEA
Sea of Marmara
TURKEY
ADANA
MERSIN
HATAY
MEDITERRANEAN SEA
CYPRUS

TABLE 1 Infection Types Produced On 12 Standard Differentials, CIMMYT Wheat Cultivars, and Genetic Stocks With 4 Races of Stem Rust.

Varieties	Culture No. 221-1 * 15-2,3,4,7	Culture No. 158 * 12-1,3,5,6	Culture No. 12-1 * 113-1,3,5,6	Culture No. 64 * 151-1,2,3,5
Little Club	4	4	4	4
Marquis	4	4	3-n	3n
Reliance	4	4	3+	3+
Kota	4	4	3+	2
Arnautka	4	4	3+	4
Mindum	4	;	X	X
Spelmar	4	;	X	X
Kubanka	4	;1	X	X
Acme	4	3+	3+	3+
Einkorn	4	3+	3+	3+
Vernal	4	;	2-	2
Khapli	2	0	2-	2
Pitic 62	2	3+	3	4
Sonora 64	1 1+	;	1	4
Norteño	1 2-	0	;1	2 3
Noroeste	1	0	1	2 3
Inia 67	2	0	;1	3
Tobari 66	2	0	0;	3+

TABLE 1 (Cont.)

Varieties	Culture No. 221-1	Culture No. 158	Culture No. 12-1	Culture No. 64
	15-2*, 3, 4, 7	12-1*, 3, 5, 6	113-1*, 3, 5, 6	151-1*, 2, 3, 5
Nadadores	1	0	;1	4
Siete Cerros	1	0	;	4
Bajio	2	0	;	3
Jaral	0	3	2 3	3+
Selkirk (Sr 6 + Additional gene)	0	3+	4	1+
Yuma	3+	0	1	;1
Chris	;1	0	X+	3+
Crim	;	0	2	3+
Waldron	2	0	2	2
McMurachy (Sr 6)	1	4	4	4
Yalta (Sr 11)	4	0	2-	4
Gamenya (Sr 9b)	3	4	3+	4
Mengavi (Sr Tt)	4	0	;	0
Mentana (Sr 8)	2	4	4	4
Celebration	0;	0	3+	3+

* 1 = Sr 6, 2 = Sr 11, 3 = Sr9b, 4 = Sr Tt (Resistance of T. timopheevi), 5 = Sr 8, 6 = Resistance of Selkirk, 7 = Resistance of Yuma.

TABLE 2 GROUP 1. Varieties of Durum Wheat From the World Collection, Resistant (Infection Types 0, 0;, ;1, X=) to Races 15-2, 3, 4, 7; 12-1, 3, 5, 6, ; 113-1, 3, 5, 6, and 151-1, 2, 3, 5 of Stem Rust

Source	Collection No.	Name	15-2, 3, 4, 7	12-1, 3, 5, 6	113-1, 3, 5, 6,	151-1, 2, 3, 5
Turkey - Hatay	PI 165227		;	0	0	;
Turkey - Mersin	PI 166440	Siha	;	0	0	0
Turkey - Adana	PI 166446	Siha	;	0	0	0
Turkey - Adana	PI 166449		;	0	0	0
Turkey - Adana	PI 166462		;	0	0	0
Turkey - Aydm	PI 166497		;	0	0;	0
Turkey - Hatay	PI 166977		;	0	0	;
Turkey - Adana	PI 167237	Karakilcik	0	0	0	;1
Turkey - Adana	PI 167312		X=	0	0	;1
Turkey - Ankara	PI 167676	Karakilcik	;	0	0	0
Turkey - Adana	PI 167779		;	0	0	0

TABLE 2 (Cont.)

Source	Collection No.	Name	15-2, 3, 4, 7	12-1, 3, 5, 8	113-1, 3, 5, 8,	151-1, 2, 3, 5
Turkey - Adana	PI 170991		0;	0	0	0
Turkey - Urfa-Düc.	PI 177871		;1	0	0	0
Turkey - Adana	PI 177877		X*	0	0	0
Turkey - Adana	PI 177880		0	0	0	0
Turkey - Adana	PI 177964	Siha	0	0	0	0
Turkey - Adana	PI 178042		;	0	0	0
Turkey - Urfa-Düc.	PI 178048		0	0	0	0
Turkey - Adana	PI 178156	Siha	;1	0	0	0
Turkey -	PI 211693		;	0	0	0
Cyprus	PI 210973		;1	0	0	0

TABLE 3 GROUP II Varieties of Durum Wheat From the World Collection Resistant to All the Races (Infection Types 2⁻, 2⁼, 2⁻, 2, ;)

Source	Collection No.	15-2, 3,4,7	12-1, 3,5,6	113-1, 3,5,6	151-1, 2,3,5
Turkey - Urfa	PI 119328	2⁻	2⁼	2⁻	2⁻
Egypt	PI 60718	2⁼	2⁼	;	2⁼
Egypt	PI 60731	2⁼	2⁼	;1	2⁻
Ethiopia	PI 58785	2⁼	1	;	;1
Ethiopia	PI 58786	2⁼	2⁼	;	2⁼
Ethiopia	PI 58788	2⁼	2⁼	2⁻	2⁼
Ethiopia	PI 58787	2⁼	2⁼	12⁻	2⁼
Ethiopia	PI 60610	2⁼	2	2⁻	2
Ethiopia	PI 133181	;2⁼	2⁻	2⁻	2
Ethiopia	PI 133186	2⁼	2⁼	2⁼	2⁼
Ethiopia	PI 193629	2⁼	2⁻	;	;1
Ethiopia	PI 193637	;2⁼	2⁻	;	2⁼
Ethiopia	PI 193856	;2⁼	2	;	2⁼
Ethiopia	PI 193859	;2⁼	2⁼	2⁼	;
Ethiopia	PI 193920	;2⁼	2⁼	;	0;
Ethiopia	PI 194037	2⁼	;	2⁼	2⁼
Ethiopia	PI 195072	2⁼	2⁻	2	2⁼

TABLE 3 GROUP II (Cont.)

Source	Collection No.	15-2, 3,4,7	12-1, 3,5,6	113-1, 3,5,6	151-1, 2,3,5
Ethiopia	PI 195708	2=	2=	2	2
Ethiopia	PI 195711	;2=	2-	2-	2-
Ethiopia	PI 195712	2=	2-	2-	2=
Ethiopia	PI 195715	2=	2=	2	2=
Ethiopia	PI 196086	2	2=	1	2=
Ethiopia	PI 196098	2	12	2	2=
Ethiopia	PI 196102	2=	12	2-	2=
Ethiopia	PI 199993	2=	2=	2=	2=
Ethiopia	PI 199995	;2=	2	1	22+
Ethiopia	PI 226573	2=	2-	1	2=
Ethiopia	PI 226578	2=	2=	23=	2=
Ethiopia	PI 273975	2=	2=	2	2=
Canada	CI 12920	2=	0;	0;	2
USA-N. Dakota	CI 13247	2=	1	1	;1
USA-N. Dakota	CI 13334	2=	0	0	;
USA-N. Dakota	CI 13335	2=	2=	0	;
USA-N. Dakota	CI 13336	2=	0	0	;
USA-N. Dakota	CI 13337	2=	0	1	;
Canada	CI 13338	2=	0	0	;

TABLE 4 GROUP III Varieties of Durum Wheat From the World Collection, Susceptible With Race 15-2, 3, 4, 7, But Resistant to Other Three Races (Infection Types 0, ;, 0;, ;1, 1, 2=, 2, ", X=)

Source	Collection No.	Name	15-2, 3, 4, 7	12-1, 3, 5, 6	113-1, 3, 5, 6	151-1, 2, 3, 5
Turkey	PI 166978		4	0	;1	;1
Turkey - Hatay	PI 167007		4	1	;1	;1
Turkey - Ankara	PI 167671	Alibayir	4	0	0	0
Turkey - Diyarbakir	PI 177874		3+	0;	;1	0
Turkey - Bursa	PI 178846	Kokana	3+	0	0	0
Cyprus	PI 210951		3	1	;1	0
Jordan	PI 223158		3	0	;1	;
Jordan	PI 223160		3	0	;	0
Jordan	PI 223161		3	0	0	0
Israel	PI 227945		3	0	;	;
Cyprus	PI 237629		3	0	1	0
Cyprus	PI 237632		4	0	0	;
Tunisia	CI 3142		4	0	0	0
Tunisia	CI 6818 PI 55533		3	0	;1	2

TABLE 4 GROUP III (Cont.)

Source	Collection No.	Name	15-2, 3,4,7	12-1, 3,5,8	113-1, 3,5,6	151-1, 2,3,5
Egypt	PI 60723		4	0	;	;1
Tunisia	PI 189775		4	0	0	0
Ethiopia	PI 58786		2+3	0	;	2=
Ethiopia	PI 193862		4	2-	2-	2-
Ethiopia	PI 193922		3	0	;	1
Portugal	PI 185412		3	;1	2-	2
Spain	PI 191235		4	;1	;1	;1
Portugal	PI 191564		4	0	;	0
Portugal	PI 191619		4	0	0	0
Portugal	PI 192620		3	0	0	0;
Portugal	PI 192683		3=	2-	2-	2-
USA-N. Dakota	CI 3322		3	0;	0;	;1
USA-N. Dakota	CI 13102		4	0;	0	;
USA-N. Dakota	CI 13165		3	0	0	;
Argentina	PI 185299		4	0	;1	;1
Argentina	PI 185300		3	0	0;	0
Argentina	PI 189832		3=	0	;	;1

TABLE 5 GROUP IV Varieties of Durum Wheat
From the World Collection
Susceptible to Races 15-2, 3, 4, 7 and 151-1, 2, 3, 5,
But Resistant to Races 12-1, 3, 5, 6 and 113-1, 3, 5, 6.

Source	Collection No.	Name	15-2, 3, 4, 7	12-1, 3, 5, 6	113-1, 3, 5, 6	151-1, 2, 3, 5
Turkey	PI 166977	Harrani	4	;	0	3
Turkey - Ankara	PI 167751		4	0	0	3
Turkey - Yozzat	PI 178058		3	0	0	3+
Algeria	CI 3856		3+	0	1	3
Tunisia	CI 3983		3+	0	0	3+
Tunisia	CI 6819 PI 55534		4	0	0	4
Tunisia	CI 6826 PI 55541		4	0	0	4
Tunisia	CI 6827 PI 55542		4	0	1	4
Tunisia	PI 189772		4	;	1	3+
Portugal	PI 191622		4	0	0	3
Portugal	PI 192116		4	1	2	3
Italy	PI 157951		3	1	2	3+
Italy	PI 191471		4	0	0	3+
Australia	PI 125128		4	0	0	3

TABLE 6 GROUP V Varieties of Durum Wheat From the World Collection Susceptible With Races 15-2, 3, 4, 7; 12-1, 3, 5, 6 and 151-1, 2, 3, 5; But Resistant to Race 113-1, 3, 5, 6.

Source	Collection No.	Name	15-2, 3,4,7	12-1, 3,5,6	113-1, 3,5,6	151-1, 2,3,5
Turkey - Ankara	PI 167667		4	3^+	0	3^+
Turkey - Ankara	PI 167668	Karakilcik	4	3^+	0	3^+
India	PI 143782		3	3^+	0;	3^+
Syria	PI 182669		4	3^+	0	3^+
Cyprus	PI 210944		3^+	4	0	2 3
Tunisia	CI 3139		4	3	;1	4
Egypt	PI 60743		3^+	3	0	3
Portugal	PI 191737		4	3	2	3
Portugal	PI 191743		3^-	3^+	0	3
U.S.A. North Dakota	CI 11541		3	3^+	0	3

TABLE 7 GROUP VI Varieties of Durum Wheat From the World Collection, Resistant to Race 15-2, 3, 4, 7, But Susceptible With Races 12-1, 3, 5, 6; 113-1, 3, 5, 6 and 151-1, 2, 3, 5.

Source	Collection No.	Name				
			15-2, 3, 4, 7	12-1, 3, 5, 6	113-, 3, 5, 6	151-1, 2, 3, 5
Turkey	PI 211691		1	4	4	3^{+}
Cyprus	PI 210962		;1	3^{+}	4	4
Portugal	PI 134890		2	3	3^{+}	4
Portugal	PI 134923		2^{-}	3^{+}	3^{+}	4
Spain	PI 191193		2	3^{+}	3^{+}	4
Portugal	PI 270132		2	3^{+}	3^{+}	3^{+}
Chile	PI 231305		2^{g}	3^{+}	4	3

TABLE 8 Varieties of Durum Wheat From the World Collection, Susceptible to Races 15-2, 3, 4, 7; 12-1, 3, 5, 6; 113-1, 3, 5, 6 and 151-1, 2, 3, 5.

Russia	CI 1337, CI 1350, CI 1354, CI 1431, CI 1440, CI 1447, CI 7196, CI 7400, CI 7410, CI 7412, CI 7413, CI 7414, CI 7422
Turkey	PI 165227, PI 166444, PI 166461, PI 166478, PI 166488, PI 166528, PI 166533, PI 166536, PI 166537, PI 166692, PI 166696, PI 166715, PI 166903, PI 167269, PI 167436, PI 167438, PI 167442, PI 167444, PI 167572, PI 167578, PI 167585, PI 167596, PI 167628, PI 167652, PI 167659, PI 172562, PI 173420, PI 177981, PI 178024, PI 178032, PI 178051, PI 178071, PI 178109, PI 178132, PI 178681, PI 176682, PI 211677, PI 211688, PI 211690, PI 211700, PI 211703
Afghanistan	PI 127106
Lebanon	PI 182671
Syria	PI 182710
Cyprus	PI 210948, PI 210957, PI 210961, PI 210985, PI 210986, PI 237627, PI 237631,
Jordan	PI 223154, PI 223155, PI 223162, PI 223163,
Iran	PI 225307,
Algeria	CI 1471, CI 1483, CI 3842, CI 4025
Tunisia	CI 3138, CI 3186, CI 3187, CI 3200, CI 3203, CI 3242, CI 3244, CI 3246, CI 3984, CI 4597, CI 6814, CI 6820, CI 6825, CI 6826, CI 6830, CI 6871, PI 189773, PI 198774
Egypt	CI 7498, CI 7502, PI 60742
Morocco	PI 61863
Ethiopia	PI 59284, PI 133182, PI 195710, PI 195716, PI 195724, PI 195725, PI 196084, PI 196087,

TABLE 8 (ctd.)

Portugal	CI 7068, PI 134910, PI 134922, PI 134924, PI 184527, PI 184537, PI 185192, PI 185194, PI 185408, PI 185751, PI 185759, PI 191502, PI 191518, PI 191741, PI 191742, PI 191770, PI 191778, PI 191849, PI 191931 PI 191953, PI 191958, PI 192036, PI 192061, PI 192107, PI 192488, PI 192635, PI 192653, PI 192731, PI 192841 PI 269241, PI 270133, PI 270136,
Spain	PI 190933, PI 190983, PI 190992, PI 191011, PI 191102, PI 191145, PI 191192, PI 191194, PI 191223, PI 191239
Italy	PI 94717, PI 157921, PI 157952, PI 157957, PI 157981, PI 157982, PI 271895, PI 271896, PI 157953
U.S.A. (North Dakota)	CI 3320, CI 13245
S. Africa	CI 5059, CI 5060
Argentina	PI 185301
Austria	PI 209272
Chile	PI 231311
Hungary	PI 272539, PI 272541, PI 272542, PI 272545,
Poland	PI 274674, PI 274677, PI 274678, PI 274679, PI 274682, PI 274683
Israel	CI 12818

TABLE 9 Varieties of Durum Wheat From the World Collection Which Were Not Classified In the Present Study

Russia	CI 7448, CI 1444, CI 1446, CI 7404
Turkey	PI 166445, PI 166458, PI 211687, PI 211695, PI 166468, PI 173483, PI 166906
Syria	PI 182728
Lebanon	PI 182738
Cyprus	PI 210956, PI 210964, PI 237630, PI 210963, PI 210967
Jordan	PI 223166
Tunisia	CI 6874, PI 189776, CI 3142
Egypt	PI 60734, PI 60737
Morocco	PI 195901, PI 195905
Ethiopia	PI 194040, PI 194043, PI 194044, PI 195707, PI 197476,
Spain	CI 3642, PI 136589
Portugal	PI 134907, PI 134920, PI 184535, PI 185772, PI 191602, PI 191871, PI 192126, PI 192839, PI 192591, PI 192848
France	PI 174699
Italy	PI 271897, PI 271898
U.S.A. (North Dakota)	CI 3323, CI 11880
Uruguay	CI 5492
S. Africa	CI 6129
Chile	PI 230365, PI 230366, PI 231309, PI 231310
Hungary	PI 272536, PI 272544, PI 272553
Poland	PI 274881

TABLE 10 GROUP I A Varieties of CIMMYT Wheat
Crossing Block and Screening Nursery
Resistant to All the Races

Variety	Pedigree	Origin MV-69	15-2, 3, 4, 7	12-1, 3, 5, 6	113-1, 3, 5, 6	151-1, 2, 3, 5
AL "S" (GL-130 x G10-115)	26844-29Y-4M-0Y	CB081	;1	;	;1	;1
Volunteer	Sel. in bulk	CB085	2⁻	0	0	0;
[(RA-Tc^4) Stw 63]AA 'S'	27601-21M-300Y	CB087	0	0	;	0
Volunteer		CB088	0	0	0	;1
Giorgio V.2.448		CB0102	2	;1	;1	2
Dwarf-Durum S.15		CB0104	2	2	2	2⁻
(BY$_E^2$-Tc)^2 (Z-B x W)	22232-3M-3Y-1M-0Y	SN0104	2⁻	0	;1	0;
B Bal x (BY$_E^2$-Tc)	22550-3M-3Y-3M-0Y	SN0105	0;	0	0;	12
[(BY$_E^2$-Tc x Stw 63)(Z-B x W)][(Pi-TM$_E$-Tc^2) (Z-B x W)]	23055-56M-5Y-1M-0Y	SN0106	0;	0	;1	2
(YE 54-N10-B x BY) x Tc^5	21276-3Y-1Y-1Y	SN0111	2⁻	0	0	0;

TABLE 10 GROUP 1 A (Cont.)

Variety	Pedigree	Origin MV-89	15-2, 3,4,7	12-1, 3,5,6	113-1, 3.5,6	151-1, 2,3,5
(Pl-TM x Tc^2) (Z-B x W) = (Anhinga)	22234-52M-3Y-1M	SN0113	;	0	;1	0
[(TM_E-Tc^2) (Z-B x W)] [(BY-180-LUK(G-2-220Y GL-130)]	26842-21Y-3M-0Y	SN0114	;	0	0	;1
[(TM_E-Tc^2) (Z-B x W)] (BY_E-Tc^4)	25612-5M-3Y-3M-0Y	SN0121	2	0	;1	;1
B. Bal x BY_E^2-Tc	25550-10M-5Y-1M-2Y-2M-0Y	SN0123	;2	0	;1	;1
Chapala - 67		CB02	2	1	2	X
[(T-gl_E-TC^3)LAK] ($Bell_E$-Tc)	21555-22Y-1Y-2Y	CB011	2	0	;	0
(BY_E^2-TC) (Z-B x W)	21566-44Y-6Y-1Y-1M-0Y	CB026	-	;1	2	1
Albatross	021570-9M-6R-1M	CB027	2	1	2	2 3
(BY_E^2-Tc^2)^2 (Z - B x W)	22232-9M-2Y-1M-0Y	CB036	12	0	;1	;1

TABLE 10. GROUP 1 A (Cont.)

Variety	Pedigree	Origin MV-69	15-2, 3, 4, 7	12-1, 3, 5, 6	113-1, 3, 5, 6	151-1, 2, 3, 5
$(BY_E^2 - Tc^2)^2$ (Z - B x W)	22232-9M-2Y-100Y-0M	CB037	2=	;	;1	;1
Anhinga "S"	22234-9M-2Y-0M	CB039	2	2	2 3	2
Anhinga "S"	22234-47M-5Y-1M-0Y	CB041	2	;1	;1	2
T. dur. Noradanja $[(TM_E - Tc^2)$ (Z - B x W)]	23044-4M-2Y-3M-0Y	CB051	2=	0;	;	;
$[(BY_E^2 - Tc$ x Stw 63)(2-B x W)] $[(TM_E - Tc^2)$ (Z - B x W)]	23055-56M-1Y-1M-0Y	CB060	0	;	X	1
Stw 63 $[(TM_E - Tc^2)(Z - B x W)]$	23628-5M-3R-100Y-0M	CB064	seg. 2, 4	;1	;1	X
T. pol. 185309 $(T.pol_E - Tc^2)$ $[(TM_E - Tc^2)$ (Z - B x W)]	25628-6M-100Y-0M	CB074	2	0;	0	;
T. pol. 185309 $(T.pol_E - Tc^2)$ $[(TM_E - Tc^2)$ (Z - B x W)]	25628-6M 100Y-100M	CB075	2=	1	;1	;
$[(TM_E - Tc^2)$ (Z- B x W)] $[(BY_E^2 - Tc)$ (TAC- Tc^2)]	25809-1M-1Y-2M-0Y	CB079	0	0	;0	0

TABLE 10 GROUP 1 A (Cont.)

Variety	Pedigree	Origin MV-69	15-2, 3, 4, 7	12-1, 3, 5, 6	113-1, 3, 5, 6	151-1, 2, 3, 5
CHAP [(BYE^2-Tc)(TAC$_E$-Tc^2)]	25665-6M-2Y-1M-0Y	CB060	0	;	;1	;1
[(BYE^2-Tc x Swt 63)(Z - B x W)] [(TM$_E$-Tc^2)(Z - B x W)]	23055-33M-4Y-2M-1Y-1M-0Y	SN0124	;1	0	;1	2
Chapala 67		SN0129	1	0	X	;1

TABLE 11 GROUP II A Varieties From CIMMYT Crossing Block and Screening Nursery Susceptible With the Race 15-2, 3, 4, 7, But Resistant to Other Three Races (Infection Types 0, ;, 0;, ;1, 1, 2", 2", X")

Variety	Pedigree	Origin MV-89	15-2, 3, 4, 7	12-1, 3, 5, 6	113-1, 3, 5, 6	151-1, 2, 3, 5
Booby "S"	21263-5Y-1Y-2Y-1M-1Y-100M	CB08	3+	0	;	;1
Booby "S"	21263-5Y-1Y-2Y-1M-2Y-100M	CB09	4	0	2	X
Booby "S"	21263-5Y-1Y-2Y-3M-2Y-102M	CB013	4	0	0	;2
Booby "S"	21263-5Y-1Y-2Y-4M-1Y-100M	CB014	3	0	;	2
Booby "S"	21263-5Y-1Y-2Y-4M-2Y-100M	CB015	3	0	;	2
Booby "S"	21263-5Y-1Y-2Y-5M-2Y-100M	CB017	3	2	;1	;1
Booby "S"	21263-5Y-1Y-2Y-6M-1Y-100M	CB018	3	;	;1	12
(TME-Tc^2) (Z-BxW)	21584-100M-100Y-114Y	CB028	3	0	;1	X

TABLE 11 GROUP II A (Cont.)

Variety	Pedigree	Origin MV-69	15-2, 3,4,7	12-1, 3,5,6	113-1, 3,5,6	151-1, 2,3,5
$(TM_E\text{-}Tc^2)$ (Ovi-65)	22235-23M -3Y-2M-100Y-100M	CB044	4	0	0	X
B. Bal $(BY_E^2\text{-}Tc)$	25550-3M -3Y-3M-0Y	CB045	4	0	0	;1
T. dur. Noradanja $[(TM_E\text{-}Tc^2)$ (Z- B x W)]	23044-5M -1Y-2M-100Y	CB050	4	0;	X	;
$[(BY_E^2\text{-}Tc$ x Stw 63)(Z - B x W)] $[(TM_E\text{-}Tc^2)$ (Z- B x W)]	23055-33M-1R-3M-0Y	CB054	4	0	0;	;
$[(BY_E^2\text{-}Tc$ x Stw 63)(Z - B X W)] $[(TM_E\text{-}Tc^2)$ (Z- B x W)]	23055-33M-1R-3M-100Y 0M	CB055	4	0	0	;1
$[(BY_E^2\text{-}Tc$ x Stw 63)(Z - B x W)] $[(TM_E\text{-}Tc^2)$ (Z- B x W)]	23055-56M-5Y-1M-0Y	CB061	4	;	12	2
Giorgio V.2.452		CB095	3	0	1	2
Gerondo V.2.469		CB099	3	0	0	2
Giorgio V.2.394		CB0100	3	0	1	2
Giorgio V.2.385		CB0101	3	;	;1	;

TABLE 11 GROUP II A (Cont.)

Variety	Pedigree	Origin MV-69	15-2, 3,4,7	12-1, 3,5,6	113-1, 3,5,6	151-1, 2,3;5
Gaza CI12616		CB0105	4	0	;1	0
Howrah CI4562	India	CB0108	3^{+}	;	;1	X
No. 808 PI101970		CB0111	4	;	;1	2
Mariza PI191356	Russia	CB0122	4	0	;1	;1
[(BY$_E^2$-Tc x Stw 63)(Z-B x W)]/[(TM$_E$-Tc^2)(Z-B x W)]	23055-33M-1R-3M-0Y	SN0103	4	0	X	X

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