diversity of different *Ae. tauschii* accessions, select superior F_2 segregates, and make these stable by the maize doubled protocol using the detached tiller approach. Results of these DH synthetic/synthetic F_2 resistant selections for spot blotch were reported in the *Annual Wheat Newsletter*, Vol. 45, 1999.

The above DH spot blotch germ plasm was tested in the summer of 1999 in Toluca for head scab, and a few lines were identified that possessed superior Type 11 (spread) resistance (Table 9). Because stripe rust also is prevalent at this site, the selected lines also were screened for the stress, and all lines reported (Table 9) possess good stripe rust resistance. The lines also possess leaf and stem rust resistance based upon screening in Obregon, another location in Mexico. The DH derivatives are considerably early to flower, reach physiological maturity earlier, and are significantly shorter than their tall synthetic parents.

Table 9. Double haploids from synthetic hexaploid/synthetic hexaploid F_2 *Helminthosporium sativum*-resistant selections that also possess scab resistance (Type II) in Toluca, Mexico. For the two-digit scoring system for *H. sativum* resistance, the first digit = height of infection (5 = up to mid-plant and 9 = up to flag leaf) and the second digit indicates disease severity on infected leaves (1 = low and 9 = total leaf destroyed).

Pedigree	Days to flowering	Days to physiological maturity	Plant height (cm)	*H. sativum* foliage score at 96 days	Grain finish	Scab Type II (%)
Gan/*Ae. tauschii* (236) *//Doy 1/*Ae. tauschii* (447)/3/Maize						
CASS97B00040S	68	96	115	2-2	1	15.8
Gan/*Ae. tauschii* (236)//Ceta/*Ae. tauschii* (895)/3/Maize						
CASS97B00041S	68	96	110	2-2	2	14.2
Scoop 1/*Ae. tauschii* (434)//Ceta/*Ae. tauschii* (895)/3/Maize						
CASS97B00046S	70	98	110	3-3	1	11.0
Doy 1/*Ae. tauschii* (447)//Ceta/*Ae. tauschii* (895)/3/Maize						
CASS97B00054S	70	98	115	3-3	2	15.7
68.111/Rgn-u//Ward/3/Fgo/4/Rabi/5/*Ae. tauschii* (629)/6/Ceta/*Ae. tauschii* (895)/7/Maize						
CASS97B00058S	70	98	115	3-3	1	13.0
Ciano 79	58	96	85	9-9	4	—
Frontana (Resistant)						6.0
Sumai (Resistant)						15.2
Flycatcher (Susceptible)						42.5

* *Ae. tauschii* accession number in CIMMYT wheat wide crosses working collection.

Such lines with pyramided *Ae. tauschii* accessional diversity are advantageous for incorporation in wheat breeding, because diverse genes may be incorporated simultaneously, thereby enhancing breeding efficiency. In addition, our approach also is fostering the use of those synthetics that possess multiple disease resistances. Such germ plasm is being identified readily, and we anticipate that it also will make a significant contribution in wheat improvement by providing rapid outputs either by individual usage of the synthetics or by the above-described pyramiding route option.

The contribution of the D genome to efficiency of doubled haploid production in wheat.

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Bread wheat haploids are being produced by us routinely via the wheat/maize crossing protocol for use in wheat cytogenetics, wide crosses, wheat breeding, and genetic analyses, with extension of the application into genetic engineering and molecular mapping. The mean frequency percentage data at this stage for embryo recovery, plantlet differentiation, and

colchicine doubling range between 20–25 %, 80–90 %, and 80–95 %, respectively, over long-term experiments involving various bread wheat cultivars crossed with various maize sources. We can infer that haploid production for spring bread wheats is 100 % effective.

However, similar success has not been realized for the durum wheats where genotypic specificity is prevalent. The absence of the D genome in durum wheats is reportedly a factor apart from the durum genomic variation. These inferences also have been noticed by other researchers. We report here rather extensive data obtained on the durum genotypic diversity for haploid production across several cultivars. Furthermore, we elucidate the contribution of *Ae. tauschii* to these same durums as measured by the haploid production frequencies in their synthetic hexaploids *T. turgidum/Ae. tauschii* (Table 10). Data categories reported are florets pollinated, seed set, embryos excised, and embryo formation (percentage). Embryo differentiation is not reported but ranged from 50–70 % (much less than 80–90 % obtained for bread wheats).

Durum cultivars are generally poor in haploid production and the significant D-genome contribution to haploidy is observed readily. Table 10 elucidates this trend; each group is separated to compare the durum parent (top line and bold) with its synthetic (second line) hexaploid derivative e.g., **Croc 1** (line 1) and 'Croc 1/*Ae. tauschii* (210)' (line two).

Table 10. Crossability of durum wheat cultivars with *Zea mays* for production of polyhaploids recorded over embryo recovery percentage frequencies. The *Ae. tauschii* accession numbers in CIMMYT Wheat Wide Crosses working collection are in parentheses.

Durum wheat cultivars	Florets pollinated	Seed set	Embryos excised	Embryo formation (%)
Croc 1	168	54	0	0
Croc 1/*Ae. tauschii* (210)	126	118	15	11.9
Arlin 1	168	19	1	0.6
Arlin 1/*Ae. tauschii* (665)	142	24	5	3.5
Rok/Kml	150	98	9	6.0
Rok/Kml/*Ae. tauschii* (214)	126	74	14	11.1
Altar 84	170	59	2	2.4
Altar 84/*Ae. tauschii* (224)	122	114	52	42.6
Dverd 2	154	10	1	0.7
Dverd 2/*Ae. tauschii* (214)	120	51	7	5.8
Laru	164	39	2	1.2
Laru/*Ae. tauschii* (309)	122	93	9	7.4
68.111/Rgb-u//Ward/3/Fgo/4/Rabi	144	124	5	3.5
68.111/Rgb-u//Ward/3/Fgo/4/Rabi/5/*Ae. tauschii* (191)	134	66	6	4.5
6973/Ward.7463//74110	186	134	0	3.2
6973/Ward.7463//74110/3/*Ae. tauschii* (665)	140	69	10	7.1
Cpi/Gediz/3/Goo//Jo/Cra	168	41	2	1.2
Cpi/Gediz/3/Goo//Jo/Cra/4/*Ae. tauschii* (637)	142	91	33	23.2
D67.2/P66.270	182	88	10	5.5
D67.2/P66.270//*Ae. tauschii* (211)	120	118	50	41.7
Cerceta	168	47	0	0.0
Cerceta/*Ae. tauschii* (742)	136	116	31	22.8
Sterna	150	85	4	2.7
Sterna/*Ae. tauschii* (446)	120	87	13	10.8
Rabi//Gs/Cra	176	31	2	0.0
Rabi//Gs/Cra/3/*Ae. tauschii* (190)	120	40	3	2.5
Sora	152	50	6	4.0
Sora/*Ae. tauschii* (192)	128	49	10	7.8
Scaup	164	31	1	0.6
Scaup/*Ae. tauschii* (493)	140	89	4	2.9
Snipe/Yav79//Dack/Teal	148	79	1	0.7
Snipe/Yav79//Dack/Teal/3/*Ae. tauschii* (528)	136	52	5	3.7
TK SN1081	158	121	3	1.9
TK SN1081/Ae. tauschii (222)	118	51	13	11.0
Yav 2/Tez	156	83	9	1.3
Yav 2/Tez//*Ae. tauschii* (435)	122	62	8	6.6
Yarmuk	162	13	0	0.0
Yarmuk/*Ae. tauschii* (217)	120	58	19	15.8

Table 10 (continued). Crossability of durum wheat cultivars with *Zea mays* for production of polyhaploids recorded over embryo recovery percentage frequencies. The *Ae. tauschii* accession numbers in CIMMYT Wheat Wide Crosses working collection are in parentheses.

Durum wheat cultivars	Florets pollinated	Seed set	Embryos excised	Embryo formation (%)
Decoy 1	146	100	18	12.3
Decoy 1/*Ae. tauschii* (188)	114	110	38	33.3
Garza/Boy	156	115	9	5.8
Garza/Boy/*Ae. tauschii* (271)	140	69	18	12.9
Araos	164	12	2	1.2
Araos/*Ae. tauschii* (269)	148	59	5	3.4
Gan	158	100	2	1.3
Gan/*Ae. tauschii* (890)	138	40	20	14.5
Scoop 1	194	191	15	7.7
Scoop 1/*Ae. tauschii* (358)	120	86	25	20.8
Sty-us/Celta//Pals.3/Srn 5	142	53	0	0.0
Sty-us/Celta//Pals.3/Srn 5/4/*Ae. tauschii* (174)	132	74	9	6.8
Yav 3/Scot//Jo69/Cra/3/Yav79	168	31	0	2.4
Yav 3/Scot//Jo69/Cra/3/Yav79/4/*Ae. tauschii* (498)	128	57	7	5.5
Yar	124	38	6	7.3
Yar/*Ae. tauschii* (493)	132	110	23	17.4
68112/Ward	154	107	2	1.3
68112/Ward/*Ae. tauschii* (369)	134	21	2	1.5
Fgo/Usa2111	162	105	1	0.6
Fgo/Usa2111//*Ae. tauschii* (658)	116	76	19	16.4
Alg86/4/Fgo/Pales//Mexi 1/3/Ruff/Fgo/5/Ente	156	98	0	0.0
Alg86/4/Fgo/Pales//Mexi_1/3/Ruff/Fgo/5/Ente/6/*Ae. tauschii* (518)	88	46	17	19.3
Botno	174	102	3	1.7
Botno/*Ae. tauschii* (617)	156	67	6	3.9
Cit71/Cpi	144	34	2	0.0
Cit71/Cpi//*Ae. tauschii* (629)	66	21	5	7.6
Lck59.61	172	40	2	0.6
Lck59.61/*Ae. tauschii* (173)	130	79	12	9.2
Trinakria	158	11	1	1.3
Trinakria/*Ae. tauschii* (700)	126	118	48	38.1
Rascon 37	164	113	4	2.4
Rascon 37/*Ae. tauschii* (312)	148	89	5	3.4
Ajaia 9	142	71	8	5.6
Ajaia 9/*Ae. tauschii* (330)	136	63	15	11.0
Scot/Mexi 1	186	28	0	0.0
Scot/Mexi 1//*Ae. tauschii* (314)	134	39	7	5.2
Falcin 1	140	103	4	4.3
Falcin 1/*Ae. tauschii* (414)	128	114	15	11.7
Shag 22	112	53	0	0.0
Shag 22/*Ae. tauschii* (227)	144	98	7	4.9
Kapude 1	112	100	1	0.9
Kapude 1/*Ae. tauschii* (341)	138	100	5	3.6
Chen 7	118	29	0	0.0
Chen 7/*Ae. tauschii* (429)	108	89	20	18.5
Aconchi 89	180	0	0	0.0
Aconchi 89/*Ae. tauschii* (290)	128	43	6	4.7
Alcatraz	152	16	6	2.6
Alcatraz/*Ae. tauschii* (398)	136	100	27	19.9
Local Red	128	39	4	1.6
Local Red/*Ae. tauschii* (449)	92	30	4	4.4