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Registration of GEMS-0001 Maize Germplasm Resistant to Leaf Blade, Leaf Sheath, and Collar Feeding by European Corn Borer

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single cross, 'Bayo Victoria'/'Olathe', made in 1988. The cross was designed to combine disease resistance and local adaptation with semiupright plant architecture. Bayo Victoria is a midseason cultivar of indeterminate growth habit (type III) developed for the semiarid highlands of Mexico. Olathe (B23/5958-B-1) is a pinto bean with a semiupright indeterminate type II plant arquitecture (in the highlands of Mexico) released by the bean program at Colorado State University (Wood and Keenan, 1982). The F_1 plants were advanced in the field, and early generation selection was practiced in the F_2 population and then in the F_4 and F_6 families, following the pedigree method. Individual plants were selected on the basis of plant vigor, pod load, and disease resistance. The F_3, F_5, and F_7 families were advanced in a winter nursery at Los Mochis, Sinaloa, on the west coast of Mexico. F_4, F_6, and F_8 families were planted in rows at the Valle del Guadiana Experiment Station in Durango, Mexico, and selections were made between and within rows based on disease reaction, plant vigor, earliness, and commercial seed traits. The F_{10} breeding line PT91325 was entered into replicated trials in 1993.

Mestizo was tested extensively in 35 environments of the semiarid highlands of Mexico (trials conducted at locations above 1800 m above sea level) for yield and agronomic traits at varied locations from 1993 to 1997. In the semiarid highlands, Mestizo averaged 1399 kg ha^{-1} and outyielded Pinto Nacional, the main landrace in its seed class in the region, by 30%. At locations with irrigation, Mestizo averaged 2213 kg ha^{-1} with a highest yield of 3713 kg ha^{-1}.

Mestizo averaged 40 cm tall and exhibits a short vine type III indeterminate growth habit, with pod distribution in the lower half of the canopy. Mestizo has white flowers and blooms 40 d after planting. Mestizo is a short-season cultivar that matures 89 d after planting, with a range in maturity from 76 to 91 d, depending on season and altitude. Mestizo matures 7 d earlier than 'Villa', and earlier than most landraces in its commercial seed class.

In the semiarid Highlands of Mexico, Mestizo is resistant to all prevalent races of anthracnose [caused by *Colletotrichum lindemuthianum* (Sacc. & Magnus) Lambs.-Scrib.] except race 1472, a race found in localized areas in the Mexican highlands (Balardín et al., 1997; Gonzalez et al., 1998). It is resistant to rust [caused by *Uromyces appendiculatus* (Pers.:Pers.) Unger] in spite of the large number of physiological races detected in the region (Araya et al., 1996). Mestizo is tolerant to common bacterial blight [caused by *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye] and root rots [primarily caused by *Fusarium solani* (Mart.) Sacc. f. sp. *phaseoli* (Burkholder) W.C. Snyder & H.N. Hans. and *Rhizoctonia solani* Kühn].

Mestizo has a medium pinto seed size that averages 42 g 100 seed^{-1} (range is from 38–44 g 100 seed^{-1}). The seed has an elliptical nonuniform shape, with an average protein concentration on a dry weight basis of 21%, similar to most cultivars in its seed class. Breeder and Foundation seed of Pinto Mestizo is maintained at the Valle del Guadiana Experiment Station, and small samples for research purposes can be obtained from the corresponding author.

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References

Araya, C.M., J.R. Steadman, and J.A. Acosta-Gallegos. 1996. Pathogenic variability of *Uromyces appendiculatus* on dry edible beans in Mexico. Annu. Rept. Bean Improv. Coop. 39:150–151.

Balardín, R.S., A.M. Jarosz, and J.D. Kelly. 1997. Virulence and molecular diversity in *Colletotrichum lindemuthianum* from South, Central, and North America. Phytopathology 87:1184–1191.

Gonzalez, M., R. Rodríguez, M.E. Zavala, J.J. Jacobo, F. Hernández, J.A. Acosta-Gallegos, O. Martínez, and J.P. Simpson. 1998. Characterization of Mexican isolates of *Colletotrichum lindemuthianum* by using differential cultivars and molecular markers. Phytopathology 88:292–299.

Wood, D.R., and J.G. Keenan. 1982. Registration of 'Olathe' bean. Crop Sci. 22:1259–1260.

J.A. Acosta-Gallegos, R. Rosales-Serna, F. Ibarra-Pérez, P. Fernández-Hernández and A. Castillo-Rosales, Bean Program of INIFAP, Apartado Postal no. 10, Chapingo, Estado de Mexico C.P. 56230, Mexico, and James D. Kelly, Department of Crop and Soil Sciences, Michigan State University, E. Lansing, MI 48824. Registration by CSSA. Accepted 31 Jan. 2001. *Corresponding author (jamk@prodigy.net.mx).

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REGISTRATIONS OF GERMPLASM

Registration of GEMS-0001 Maize Germplasm Resistant to Leaf Blade, Leaf Sheath, and Collar Feeding by European Corn Borer

GEMS-0001 (Reg. no. GP-363, PI 614142) maize (*Zea mays* L.) germplasm, which is resistant to damage caused by the European corn borer [*Ostrinia nubilalis* (Hübner)], was released by the Agricultural Research Service, USDA, in July 2000. GEMS-0001 is derived from the cross Piura 144 (PI 503806) × B94. Breeding lines from PI 503806 × B94 were advanced by three generations of backcrossing to B94. Throughout the breeding program, donor plants were selected by evaluating their resistance to feeding by European corn borer larvae on leaf blades and on leaf sheaths and collars. Plants were artificially infested with larvae, and selected plants with reduced feeding were carried forward in the breeding effort. Seeds from the third-generation backcross were grown in Ames, IA, in 1999, and plants were full-sib mated to obtain a seed increase for release and distribution.

The recurrent parent, B94 (Russell et al., 1971), is an AES 800 maturity stiff-stalk synthetic inbred line selected for its high-yield performance in single-cross tests. GEMS-0001 flowered 5 d later than B94 at Ames, IA, in 1998, and 3 d later than B94 at Stoneville, MS, in 1999. The donor parent, PI 503806, is a tropical maize from northwestern Peru chosen for its resistance to leaf-blade feeding damage caused by first-generation European corn borer (Abel et al., 1995) and leaf-sheath and collar-feeding damage caused by the second generation of this insect (Abel et al., 1998). The resistance expressed in PI 503806 is not based on high levels of 2,4-hydroxy-7-

methoxy-2H-1,4-benzoxazin-3(4H)-one (DIMBOA), a cyclic hydroxamic acid, that is commonly associated with conventional leaf blade feeding resistance in maize (Abel et al., 1995).

In the 1998 Ames, IA, trials, experimental lines were tested for leaf-blade resistance by infesting whorls with 250 European corn borer larvae and rating the damage caused to the developing leaves by using a 1-to-9 rating scale (1 = no damage and 9 = severe damage) (Guthrie et al., 1960). Experimental lines were also tested at anthesis by infesting each plant with 250 European corn borer larvae and measuring the length of feeding tunnels 8 wk after artificial infestation. In a randomized complete block design with four replications, GEMS-0001 received a significantly lower leaf-blade feeding score (2.3) compared with the recurrent parent, B94 (4.3). Stalk tunneling was statistically less for GEMS-0001 with 19.0 cm of tunneling, compared with 38.1 cm for B94. The percentage of plants with 0 to 7.6, 7.7 to 22.9 and >23.0 cm of tunneling was 28.6, 46.0, and 25.4%, respectively, for GEMS-0001 with a range from 0.0 to 71.1 cm; and 0.0, 11.1, and 88.9%, respectively, for B94 with a range from 20.3 to 68.6 cm.

In a second trial at Stoneville, MS, during 1999, GEMS-0001 once again received a significantly lower leaf-blade feeding score (3.3), compared with the score (4.8) for B94. Stalk tunneling was statistically less for GEMS-0001 (21.1 cm of tunneling), with a range of scores from 2.5 to 53.3 cm. B94 received an average score of 47.8 cm, with a range from 22.9 to 76.2 cm. The percentage of plants with 0 to 7.6, 7.7 to 22.9, and >23.0 cm of tunneling was 8.1, 38.7, and 53.2%, respectively, for GEMS-0001, and 0.0, 4.8, and 95.2%, respectively, for B94.

In addition to resistance to European corn borer, GEMS-0001 was also selected for its superior yield in relation to other experimental lines in our resistance breeding program. One-hundred sixty parents in the second generation of backcrossing were tested for yield. Three plants from each second-generation backcross parent, including the parent of GEMS-0001, were selfed and crossed to a private non-stiff-stalk tester, LH 185, and the testcrosses were grown in a five-location yield trial in the U.S. Corn Belt. One testcross involving GEMS-0001 yielded well at 9756 kg ha^{-1} (13 539 L ha^{-1}) which was 95.3% of the highest yielding commercial check and 105.3% of the commercial check average. The other two testcrosses involving GEMS-0001 yielded 8941 kg ha^{-1} and 8728 kg ha^{-1} (12 408 and 12 112 L ha^{-1}, respectively).

GEMS-0001 can serve as an improved source of inbred lines and populations for Corn Belt dent maize and is not intended for use as a cultivar per se. Seed of GEMS-0001 will be distributed upon written request and agreement to make appropriate recognition of its source as a matter of open record when this germplasm contributes to the development of a new cultivar or germplasm. Requests for seed should be directed to Mr. Mark Millard, North Central Regional Plant Introduction Station, Iowa State University, Ames, IA 50011-1170.

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References

Russell, W.A., L.H. Penny, W.D. Guthrie, and F.F. Dicke. 1971. Registration of corn germplasm inbreds; (Reg. Nos. GP 1 to 5). Crop Sci. 11:140.

Abel, C.A., R.L. Wilson, and J.C. Robbins. 1995. Evaluation of Peruvian maize for resistance to European corn borer (Lepidoptera: Pyralidae) leaf feeding and ovipositional preference. J. Econ. Entomol. 88:1044–1048.

Abel, C.A. 1998. Introgressing a new source of host-plant resistance to European corn borer into two elite maize inbred lines. Ph.D. diss. Iowa State University, Ames, IA.

Guthrie, W.D., F.F. Dicke, and C.R. Neiswander. 1960. Leaf and sheath feeding resistance to the European corn borer in eight inbred lines of dent corn. Res. Bull. 860. Ohio Agric. Exp. Stn., Wooster, OH.

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Registration of 10 Synthetic Hexaploid Wheat and Six Bread Wheat Germplasms Resistant to Karnal Bunt

Ten spring-type synthetic hexaploid (SH) wheat germplasm lines and six spring-type bread wheat (*Triticum aestivum* L.) germplasm lines with resistance to karnal bunt [caused by *Neovossia indica* (Mitra) Mundkur, syn. *Tilletia indica* Mitra] were developed by the Wide Cross Program of the International Maize and Wheat Improvement Center (CIMMYT) in Mexico.

The SH lines were derived from *Triticum turgidum* L. s. lat./*Aegilops tauschii* Coss. Schmalh. (syn. *Aegilops squarrosa* auct.) crosses, and designated CIGM93.183, CIGM87.2765, CIGM87.2767, CIGM90.561, CIGM88.1239, CIGM88.1344, CIGM92.1727, CIGM90.845, CIGM90.846, and CIGM90.590 (Reg. no. GP-695 to GP-704, PI 613302 to PI 613311). The bread wheat lines are CIGM 90.257-1, CIGM 91.61-1, CIGM 90.462, CIGM 90.248-1, CIGM 90.250-2, CIGM 90.412 (Reg. no. GP-705 to GP-710, PI 613312 to PI 613317). Several of the 490 *Ae. tauschii* accessions in our working collection were identified as sources of karnal bunt resistance (Warham et al., 1986). These accessions were randomly hybridized with *T. turgidum* cultivars to yield SH wheats using protocols reported earlier (Mujeeb-Kazi et al., 1996). The bread wheat germplasm lines were derived from the karnal bunt resistant SH lines crossed with karnal bunt susceptible bread wheat cultivars Flycatcher, Kauz, Yaco, Borlaug 95, and Papago M86. Segregating generations of the crosses were advanced by pedigree method.

The mean agronomic performance of the germplasm lines across 5 yr of field tests is presented in Table 1. Karnal bunt evaluations were carried out at the Mexican Institute of Forestry, Agriculture, and Livestock (INIFAP), Campo Agricola Experimental Valle del Yaqui (CAEVY) Research Station, Sonora, Mexico, from 1993 to 1998 by the boot inoculation test (Warham, 1984). Ten spikes across two planting dates were inoculated per entry. The disease score was based on the number of infected and healthy kernels at maturity in each plot. Synthetic hexaploid and bread wheat germplasm line infections ranged from 0 up to 1.97%, compared with a 30% mean infection of WL711, the susceptible bread wheat check cultivar. The durum wheats in the pedigrees of the immune SH germplasms registered here (Table 1) had infection levels from 0.3 to 1.6%. These germplasms offer genetic diversity of the *Ae. tauschii* accessions, as well as the A and B genome diversity of the durum cultivars in the SH pedigrees.

Table 1. Characteristics of ten karnal bunt synthetic hexaploid wheat and six bread wheat germplasm lines resistant to *Neovossia indica* over five cycles of testing, ending in 1997–1998.

CIMMYT designation	Pedigree†	Days to Anthesis	Days to Physiological Maturity	Plant height	1000 grain weight	Disease score§
				cm	g	%
		Synthetic hexaploids				
CIGM93.183	Ceta/*Ae. tauschii* (174)†	100	148	95	61.3	0
CIGM87.2765	Altar 84/*Ae. tauschii* (188)	110	155	90	54.6	0
CIGM87.2767	Altar 84/*Ae. tauschii* (192)	103	148	95	58.0	0
CIGM90.561	Yuk/*Ae. tauschii* (217)	103	148	135	66.3	0
CIGM88.1239	Yav2/Tez//*Ae. tauschii* (249)	110	151	120	58.3	0
CIGM88.1344	Doy 1/*Ae. tauschii* (447)	103	151	125	64.6	0
CIGM92.1727	Doy 1/*Ae. tauschii* (458)	103	155	145	65.5	0
CIGM90.845	Sca/*Ae. tauschii* (518)	103	155	120	64.9	0
CIGM90.846	Yar/*Ae. tauschii* (518)	103	155	130	56.0	0
CIGM90.590	68.111/Rgb-u//Ward/3/Fgo/4/Rabi/5/*Ae. tauschii* (629)	103	151	145	63.7	0
	WL-711‡	82	131	70	35.8	30.0
	LSD 0.01	1.8	1.2	4.3	0.8	–
		Bread wheats				
CIGM90.257-1	Croc 1/*Ae. tauschii* (205)//Flycatcher	88	126	75	38.8	1.59
CIGM91.61-1	Croc 1/*Ae. tauschii* (224)//Kauz	79	123	95	46.8	0.69
CIGM90-462	Altar 84/*Ae. tauschii* (221)//Yaco	88	126	90	53.8	0.95
CIGM90.248.1	Croc 1/*Ae. tauschii* (205)//Kauz	92	126	80	42.0	0.77
CIGM90.250-2	Croc 1/*Ae. tauschii* (205)//Borlaug 95	79	126	85	51.8	0.86
CIGM90.412	Croc 1/*Ae. tauschii* (213)//Papago M86	79	123	100	50.0	1.97
	WL-711‡	82	131	70	35.8	30.0
	LSD (0.05)	2	2	2	0.7	1.6

† *Ae. tauschii* CIMMYT accession number in parenthesis.
‡ Susceptible bread wheat cultivar.
§ Mean of test over six years. Percent infected kernels.

Seed samples (3 g) of each germplasm line will be distributed upon written request by the Genetic Resources Bank, Wheat Program, CIMMYT, Mexico.

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References

Mujeeb-Kazi, A., V. Rosas, and S. Roldan. 1996. Conservation of the genetic variation of *Triticum tauschii* (Coss.) Schmalh. (*Aegilops squarrosa* auct. non L.) in synthetic hexaploid wheats (*T. turgidum* L.s.lat. × *T. tauschii*; 2n = 6x = 42, AABBDD) and its potential utilization for wheat improvement. Genet. Res. Crop Evol. 43:129–134.

Warham, E.J. 1984. A comparison of inoculation methods for karnal bunt (Neovossia indica). Phytopathology 74:856–857.

Warham, E.J., A. Mujeeb-Kazi, and V. Rosas. 1986. Karnal bunt (*Tilletia indica*) resistance of *Aegilops* species and their practical utilization for *Triticum aestivum* improvement. Can. J. Plant Pathol. 8:65–70.

A. Mujeeb-Kazi*, G. Fuentes-Davila, R.L. Villareal, A. Cortes, V. Rosas, and R. Delgado. International Maize and Wheat Improvement Center (CIMMYT), Apartado Postal 6-641, 06600 Mexico, D.F., Mexico. Registration by CSSA. Accepted 31 Mar. 2001. *Corresponding author (m.kazi@cgiar.org).

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Registration of Five Synthetic Hexaploid Wheat and Seven Bread Wheat Lines Resistant to Wheat Spot Blotch

Five spring-type synthetic hexaploid (SH) wheat germplasm lines and seven spring-type bread wheat (*Triticum aestivum* L.) germplasm lines possessing resistance to spot blotch [caused by *Cochliobolus sativus* (Ito & Kuribayashi) Drechs. ex Dastur, anamorph *Bipolaris sorokiniana* (Sacc.) Shoemaker] were developed by the Wide Cross Program of the International Maize and Wheat Improvement Center (CIMMYT) in Mexico. The SH lines were derived from *Triticum turgidum* L. s. lat./*Aegilops tauschii* (Coss.) Schmalh. (*Aegilops squarrosa* auct. non L.) crosses, and are designated CASS97B00040S, CASS97B00041S, CASS97B00046S, CASS97B00054S, and CASS97B00063S (Reg. no. GP-711 to GP-715, PI 613318 to PI 613322). The bread wheat lines are CIGM90.1291, CIGM97B0024S-3DH, CASS94Y00121S, CASS97B00016S-1DH, CASS97B00010S-1DH, CASS97B00030S-3DH, and CASS94Y00160S (Reg. no. GP-716 to GP-722, PI 613323 to PI 613329). The SH lines were developed by intercrossing several different *T. turgidum*/*Ae. tauschii* lines involving different *Ae. tauschii* accessions. From segregating F_2 populations, spot blotch resistant plants were selected and hybridized with *Zea mays* L. The resulting haploids (n = 3x = 21, ABD) were colchicine treated (Mujeeb-Kazi and Riera-Lizarazu, 1996) to yield homozygous doubled derivatives (2n = 6x = 42, AABBDD). The seven bread wheat germplasms were derived from various SH lines crossed with the spot blotch susceptible bread wheat cultivars Bacanora, Opata, and Yaco. Pedigrees, progressive disease scores and agronomic characteristics are presented in Table 1. *Cochliobolus sativus* epidemics occur naturally every year in Poza Rica, Mexico (lat 21°N, 60 m elevation), from November to March. The disease effects wheat crops across several environments from Latin America, Africa, Asia, and South East Asia, with Bangladesh being represented as a major disease location. Our Mexican screening site is the severest of all. The five SH and seven bread wheat germplasms were evaluated at this location, based on damage recorded progressively (65 to 96 d) on leaves (Saari and Prescott, 1975) and grain (Table 1). All lines possess superior *C. sativus* resistance, as compared with 'Mayoor', a resistant check (Mujeeb-Kazi et al., 1996), and 'Ciano 79', a susceptible check.

Seed samples (3 g) of each germplasm line will be distributed upon written request by the Genetic Resources Bank, Wheat Program, CIMMYT, Mexico.

Table 1. Characteristics of five double haploid synthetic hexaploid wheats, and seven bread wheat germplasm lines resistant to *Cochliobolus sativus* at Poza Rica, 1998–1999 crop cycle.

CIMMYT designation	Pedigree‡	Days to Anthesis	Days to Physiological Maturity	Plant height	Progressive infection score† 65	72	79	96	Grain finish§
				cm	days				
	Synthetic hexaploids								
CASS97B00040S	Gan/*Ae. tauschii* (236)//Doy 1/*Ae. tauschii*(447)	68	96	115	1-1	1-1	1-1	2-2	1
CASS97B00041S	Gan/*Ae. tauschii* (236)//Ceta/*Ae. tauschii*(895)	68	96	110	1-1	1-1	1-1	2-2	2
CASS97B00046S	Scoop 1/*Ae. tauschii* (434)//Ceta/*Ae. tauschii* (895)	70	98	110	1-1	1-1	1-1	3-3	1
CASS97B00054S	Doy 1/*Ae. tauschii* (447)//Ceta/*Ae. tauschii* (895)	70	98	115	1-1	1-1	1-1	3-3	2
CASS97B00063S	68.111/Rgb-u//Ward/3/ Fgo/4/*Ae. tauschii* (629)/5/Ceta/*Ae. tauschii* (895)	70	98	115	1-1	1-1	1-1	3-3	1
	Ciano 79¶	58	96	85	2-1	7-6	8-7	9-9	4
	LSD 0.01	1.9	1.5	2.0	–	–	–	–	0.4
	Bread wheat lines								
CIGM90.1291	Altar/*Ae. tauschii* (224)//2*Yaco	68	89	76	1-1	1-1	1-1	3-2	1
CIGM97B00024S-3DH	Sabuf//Altar/*Ae. tauschii* (224)/3/Yaco/ Croc1/*Ae. tauschii* (205)	70	93	70	1-1	1-1	1.1	2.2	2
CASS94Y00121S	Bcn//Sora/*Ae. tauschii* (323)	58	90	75	1-1	1-1	1-1	2-2	2
CASS97B00016S-1DH	Opata/3/Sora//*Ae. tauschii* (323)	70	93	90	1-1	1-1	1-1	3-3	2
CASS97B00010S-1DH	Bcn/4/68.111/Rgb-u//Ward/3/*Ae. tauschii* (325)	64	85	80	1-1	1-1	1-1	2-1	1
CASS97B00030S-3DH	Bcn//Doy/*Ae. tauschii* (447)	70	93	85	1-1	1-1	1-1	3-2	1
CASS94Y00160S	Bcn/4/Rabi//GS/Cra/3/*Ae. tauschii* (895)	58	85	76	1-1	1-1	1-1	3-2	1
	Mayoor	67	103	87	1-1	2-1	5-2	9-3	2
	Ciano 79¶	58	96	85	2-1	7-6	8-7	9-9	4
	LSD 0.01	1.7	1.3	1.5	–	–	–	–	0.4

† *Cochliobolus sativus* rated on a double digit modified scale: the first digit indicates the height of infection, where 1 = lowest leaf; 5 = up to mid-plant; and 9 = up to flag leaf; the second digit indicates disease severity on infected leaves, where 1 = 10% coverage; 5 = 50% coverage; and 9 = 90% coverage.
‡ Synthetic hexaploid with the *Aegilops tauschii* CIMMYT accession number in parenthesis.
§ Grain finish of 1 to 5, where 1 = low grain infection and 5 = severely infected.
¶ Susceptible bread wheat cultivar.

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References

Mujeeb-Kazi, A., and O. Riera-Lizarazu. 1996. Polyhaploid production in the Triticeae by sexual hybridization. p. 275–296. *In* S.M. Jain et al. (ed.) In vitro haploid production in higher plants. Kluwer Academic Publishers, Dordrecht, The Netherlands.

Mujeeb-Kazi A., R.L. Villareal, L.I. Gilchrist and S. Rajaram. 1996. Registration of five wheat germplasm lines resistant to Helminthosporium leaf blight. Crop Sci. 36:216–217.

Saari, E.E., and J.M. Prescott. 1975. A scale of appraising the foliar intensity of wheat diseases. Plant Dis. Rep. 59:377–380.

A. Mujeeb-Kazi, S. Cano, V. Rosas, A. Cortés, and R. Delgado. International Maize and Wheat Improvement Center (CIMMYT), Apartado Postal 6-641, 06600 Mexico, D.F., Mexico. Registration by CSSA. Accepted 31 Mar. 2001. *Corresponding author (m.kazi@cgiar.org).

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Registration of TEM-SLC and TEM-SEC Switchgrass Germplasms

TEM-SLC and TEM-SEC switchgrass (*Panicum virgatum* L.) germplasms (Reg. no. GP-77, PI 607837, and Reg. no. GP-78, PI 607838, respectively) were developed at the Grassland, Soil, and Water Research Laboratory, Temple, TX, and were released by the USDA-ARS and the Texas Agricultural Experiment Station on 24 Feb. 2000. These germplasms resulted from three cycles of recurrent phenotypic selection for reduced and enhanced seedling crown node elevation when grown under dim, continuous light. TEM-SLC and TEM-SEC were derived from 'Alamo' switchgrass.

Cell division at the base of the crown node normally stops when the coleoptile tip intercepts an adequate amount of red light (van Overbeek, 1936). When the amount of light is inadequate, continued elongation of the subcoleoptile internode (below the crown node) can push the crown node above the soil surface. Because adventitious roots are required for successful seedling establishment, seedlings with elevated crown (EC) nodes would need to initiate these roots above the soil surface. This seldom happens, and these seedlings often perish.

For the first cycle of selection, Alamo switchgrass seedlings were grown in dim light (Photosynthetic photon flux density 1.5 umol m^{-2} s^{-1}) at 30°C (Tischler and Voigt, 1993), and seedlings having crown nodes in the highest and lowest 10% of values were saved to give rise to populations with EC and low crown (LC) node placement, respectively. These two populations were planted in separate isolation blocks in the field and allowed to intermate. Following seed harvest, seed of the EC and LC populations was planted, and seedlings were again grown in dim light. Individuals having the highest and lowest 10% of values for crown node placement were saved from the respective populations to give rise to cycle-2 plants. The process was repeated again to produce cycle-3 plants, seed of which constitute TEM-SEC and TEM-SLC.

When seed of TEM-SLC, Alamo, and TEM-SEC were evaluated in the low-light system, crown node elevations of the resulting seedlings were 0, 0.065, and 0.285 cm, respectively (*F*-test significant, $P = 0.001$) (Elberson et al., 1998). Considerable variability in crown node elevation was observed in TEM-SEC, indicating that continued selection for higher crown node placement should be successful. Little variability remained for crown node placement in TEM-SLC. When grown in field nurseries, mature plants of TEM-SLC and TEM-SEC were similar to Alamo switchgrass in height, leafiness, and flowering behavior.

Both TEM-SLC and TEM-SEC should be useful in photobiology and physiology studies to investigate factors regulating crown node placement and their genetic control (Elberson et al., 1998, 1999). In addition, TEM-SLC may have better establishment characteristics in field plantings when competition or atmospheric conditions limit incident light at the time of seedling emergence.

Seed of TEM-SLC and TEM-SEC will be maintained at the USDA Grassland, Soil, and Water Research Laboratory at Temple, TX. Limited samples of seed are available upon request from the corresponding author for at least 5 yr.

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References

Elberson, H.W., W.R. Ocumpaugh, M.A. Hussey, M.A. Sanderson, and C.R. Tischler. 1998. Crown node elevation of switchgrass and kleingrass under low light. Crop Sci. 38:712–716.

Elberson, H.W., W.R. Ocumpaugh, M.A. Hussey, M.A. Sanderson, and C.R. Tischler. 1999. Field evaluation of switchgrass seedlings divergently selected for crown node placement. Crop Sci. 39:475–479.

Tischler, C.R., and P.W. Voigt. 1993. Characterization of crown node elevation in *Panicoid* grasses. J. Range Manage. 46:436–439.

van Overbeek, J. 1936. Growth hormone and mesocotyl growth. Rec. Trav. Bot. Neerl. 33:333–340.

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Registration of Six Lentil Germplasm Lines with Resistance to Vascular Wilt

Lentil (*Lens culinaris* Medik.) germplasm lines, ILL 422, ILL 813, ILL 1220, ILL 1462, lLL 2313, and ILL 2684 (Reg. no. GP-7 to GP-12, PI 612876 to PI 612881), were released by the International Center for Agricultural Research in the Dry Areas (ICARDA), located at Aleppo, Syria, for potential use by lentil researchers. These germplasm lines have been conserved at ICARDA under the auspices of FAO, hence they are termed as FAO-designated germplasm. The Genetic Resources Unit of ICARDA maintains the lines with the identification code L, L-422 (ILL-422), L-813 (ILL-813), L-1220 (ILL-1220), L-1462 (ILL-1462), L-2313 (ILL-2313) and L-2684 (ILL-2684). These lines have resistance to lentil vascular wilt, caused by *Fusarium oxysporum* Schlechtend.: em. W.C. Snyder & H.N. Hans. F. sp. *lentis* Vasud. and Srin.

In 1993, a core collection of 577 germplasm accessions from 34 countries was screened for resistance to lentil vascular wilt in a "sick plot" at ICARDA, Syria, in a randomized block design with three replications, using a systematically-repeated, highly disease-susceptible check (ILL-4605). Disease reaction was estimated as the percentage wilted or dead plants per plot (40 plants) when the susceptible check had died. In the following season, 88 accessions selected for resistance in 1993 were rescreened in the wilt-sick plot in the same manner. In 1995, accessions with confirmed resistance were subjected to treatment with an artificial inoculation of the fungus in pots in a plastic house using the method of Bayaa et al. (1995). These six accessions showed $\leq$5% wilted plants in a plot or pot in all three stages of screening, while the susceptible check had 100% wilted plants.

ILL-422 originated from Chile, flowers in 135 d, has a plant height of 31 cm, brown seeds, no testa pattern, yellow cotyledons, and a seed weight of 5.3 g/100 seeds. ILL-813 originated from Egypt, flowers in 115 d, has a plant height of 37 cm, brown seeds, no testa pattern, red cotyledons, and a seed weight of 3.7 g/l00 seeds. ILL-1220 originated from Iran, flowers in 138 d, has a plant height of 31 cm, brown seeds, no testa pattern, yellow cotyledons, and a seed weight of 3.6 g/100 seeds. ILL-1462 originated from Iran, flowers in 130 d, has a plant height of 30 cm, pink seeds, no testa pattern, yellow cotyledons, and a seed weight of 4.2 g/100 seeds. ILL-2313 originated from Chile, flowers in 132 d, has a plant height of 29 cm, brown seeds with no testa pattern, red cotyledons, and a seed weight of 2.3 g/100 seeds. ILL-2684 originated from India, flowers in 120 d, has a plant height of 25 cm, dotted brown seeds, red cotyledons, and a seed weight of 2.3 g/100 seeds.

The seed of the six lentil germplasm lines is maintained by the Germplasm Program, ICARDA, P.O. Box 5466, Aleppo, Syria, and is available in small quantities upon written request.

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References

Bayaa, B., W. Erskine, and A. Hamdi. 1995. Evaluation of a wild lentil collection for resistance to vascular wilt. Genet. Res. Crop Evol. 42:231–235.

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