MS-501, MS-503, MS-510: Insect-resistant Sweetpotato Germplasm

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Additional index words. *Ipomoea batatas*, sweetpotato weevil, *Cylas* sp., wireworms, *Conoderus* sp., cucumber beetles, *Diabrotica* sp., flea beetles, *Systema* sp., WDS complex

Three sweetpotato [*Ipomoea batatas* (L.) Lam.] breeding lines, MS-501, MS-503, and MS-510, are being released by the Mississippi Agricultural and Forestry Experiment Station. They have moderate levels of resistance to the sweetpotato weevil (SPW) [*Cylas formicarius elegantulus* (Summers)] and to the wireworm (*Conoderus* sp.)–*Diabrotica* sp. (cucumber beetle)–*Systema* sp. (flea beetle) (WDS) complex.

Received for publication 14 Aug. 2000. Accepted for publication 27 Dec. 2000. Journal Article No. 9726 of the Mississippi Agricultural and Forestry Experiment Station, Mississippi State Univ. We thank the International Institute of Tropical Agriculture (IITA) for the seed furnished via the International Potato Center (CIP). The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

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Origin

MS-501, MS-503, and MS-510 are open-pollinated seedlings obtained from clones TIS-9465, TIS-8409, and TIS-8266, respectively, polycrossed with 36 breeding lines at the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria, in 1988 and 1989. The parental lines in the polycross were advanced selections from a broad-based breeding population developed at IITA through selection for earliness, high yield, and adaptation to conditions at Ibadan and nearby wetter and drier locations. Sweetpotato virus disease and sweetpotato weevils [*Cylas puncticollis* (Boheman)] are important constraints in Africa, and the IITA breeding population was reported to have resistance to both (Hahn et al., 1989). These clones were derived from the following crosses: clone TIS 3277 (a selection from seed introduced from Korea) x clone TIS 2099 (originally coded 3-382) (TIS 8266); TIS 3053 (originally coded TIB 2 OP) x TIS 2498 (TIB 1 OP-3) (TIS 8409); TIB 9 (White Star) x TIS 1499 (originally coded C9-8, a seed

introduction from Trinidad and Tobago) (TIS 9465).

Description

The stems of MS-501 are short and green, and leaves are cordate. Petioles are purple at the base and at the juncture with the leaf axis. The storage roots are round and flattened on the proximal end. Skin color is medium tan and the flesh is light yellow. Stems of MS-503 are moderate in length and green. Leaves are cordate and slightly lobed with purple abaxial venation. The petiole is purple and darker purple at the juncture with the leaf axis. Storage roots of MS-503 are round. Skin color is light to medium purple and the flesh is medium yellow. Shallow grooves are present in the roots of MS-501 and MS-503. The cause for grooved storage roots in these lines is not known, since grooves may be a genetically controlled characteristic or may result from other causes, such as growing conditions, sweetpotato leaf curl virus (C.A. Clark, personal communication), or the russet crack strain of sweetpotato feathery mottle virus (Karyeija, 1998). MS-510 has green stems of moderate length. Leaves are lobed with one sinus on each side. The petiole is purple at the juncture with the leaf axis. The storage roots are elliptic with light tan to white skin. Flesh color is cream with scattered spots of orange pigmentation most numerous in the cortex. Dry-matter percentage for the three breeding lines is 29% vs. 24% for 'Beauregard'. These lines require short days for flower initiation. Seed production is dependent on greenhouse culture during late fall, winter, and spring at Pontotoc, Miss.

Field evaluations of these breeding lines were conducted at the South Mississippi Branch Experiment Station in Beaumont, which is in a SPW-infested area, but SPW populations were low. Field infestations were made by releasing cultured weevils on each of two dates each year (Thompson et al., 1999). Consistently high WDS injury was observed on sweetpotatoes in previous years at the test site, and naturally occurring insect levels were considered adequate for evaluations. Insect injury levels were determined by recording numbers of roots injured by SPW and/or WDS complex and reporting the percentage of roots not in-

Table 1. Injury by sweetpotato weevil and WDS complex (*Conoderus*, *Diabrotica*, and *Systema* sp.) and yield of sweetpotato breeding lines (BL) and three cultivars in 1994 and 1995 at Beaumont, Miss.

BL/Cultivar	Sweetpotato weevil						WDS complex				Yield (t·ha ⁻¹) ^x	
	Roots not injured (%)		Injury severity score ^z				Roots not injured (%)		Injury severity score ^y			
			Stem		Root							
	1994	1995	1994	1995	1994	1995	1994	1995	1994	1995	1994	1995
MS-501	42 b ^w	75 a	2.0 b	2.9 c	1.3 cd	0.5 d	14 ab	58 a	1.5 cd	0.7 d	15.9 ab	6.8 c
MS-503	44 ab	74 a	3.1 a	2.8 c	1.1 d	0.5 d	12 ab	19 bc	2.0 bc	1.2 cd	16.8 ab	16.6 bc
MS-510	73 a	78 a	1.8 b	2.9 c	0.3 d	0.5 d	20 a	34 ab	1.1 d	0.9 d	26.2 a	42.8 a
Regal	36 b	35 b	3.2 a	3.5 b	2.3 bc	1.8 c	10 ab	19 bc	2.6 ab	1.7 bc	9.8 b	28.7 b
Centennial	11 c	23 bc	3.2 a	4.1 a	3.4 ab	2.4 b	12 ab	8 c	1.9 b	2.1 ab	9.6 b	20.0 b
Beauregard	10 c	9 c	2.9 a	4.2 a	3.8 a	3.2 a	6 b	3 c	2.9 a	2.6 a	9.5 b	25.9 b

^aRated on a scale of 0 to 5: 0 = no injury and 5 = severe injury.

^bBased on number of feeding scars: 0 = no scars; 1 = one to five scars; 2 = six to 10 scars; 3 = 11 to 15 scars; and 4 = more than 15 scars.

^cTotal weight of storage roots $\geq$ 25-mm diameter regardless of insect injury.

^wMean separation within columns by LSD ($P \leq 0.05$).

jured. A severity score of 0–5, where 0 = no injury and 5 = severe injury, was used to measure severity of injury by SPW to stem and storage roots, and by WDS to storage roots (Thompson et al., 1999). Yield was measured by recording total weight of storage roots with diameters 25 mm and larger, regardless of insect injury.

The control cultivars [‘Centennial’ (susceptible) and ‘Regal’ (moderately susceptible/resistant)] were chosen for their previously determined resistance levels to SPW, based on the percentage of weevil-infested roots and crown injury (Mullen et al., 1985), and to the WDS complex, based on percentage of injury-free roots and a severity index (Jones et al., 1987). ‘Regal’ is one of the most resistant cultivars to SPW and the WDS complex, based on previously cited reports. ‘Beauregard’ was included as a susceptible control (Thompson et al., 1994), since it is a high-yielding cultivar commonly grown in the United States.

In field evaluations on a Greenville fine sandy loam soil at Beaumont, MS-501, MS-503, and MS-510 were similar or superior to ‘Regal’ in response to SPW and WDS injury (Table 1). MS-510 produced over twice as many roots not injured by SPW as did ‘Regal’

in 1994 and 1995. MS-501 and MS-503 produced greater percentages of roots not injured by SPW in 1995 than did ‘Regal’. Stem injury by SPW was generally lower in the germplasm lines than in ‘Regal’. The greatest reduction was in severity of root injury. Injury scores ranged from two to eight times lower in the three breeding lines than in ‘Regal’ in all but one case. The breeding lines did not differ from ‘Regal’ in percentage of roots not injured by the WDS complex (Table 1); however, WDS injury scores were lower for MS-501 and MS-510 than for all named cultivars.

Total yield was higher for MS-510, but not for MS-501 or MS-503, than for ‘Beauregard’, ‘Centennial’, and ‘Regal’ (Table 1). Yield of MS-501 was lower than those of the cultivars in 1995. Yields of ‘Beauregard’ were higher than those of all three germplasm lines on a Falkner silt loam soil at Pontotoc, Miss. (data not shown). We have no explanation for the extremely low yields of MS-501 in 1995 and of ‘Regal’, ‘Centennial’, and ‘Beauregard’ in 1994.

Availability

Vine cuttings or roots are available upon

written request to the Pontotoc Research and Extension Center, 8320 Hwy. 15 South, Pontotoc, MS 38863.

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