Vol. 22, No. 17 Research Report July 2001

MS-501, MS-503, and MS-510: Insect-Resistant Sweetpotato Germplasm

P.G. Thompson, J.C. Schneider, B. Graves, and E.E. Carey

Introduction

The sweetpotato weevil (SPW)[*Cylas formicarius elegantulus* (Summers)] is the most destructive pest of sweetpotato worldwide. Greatest losses from SPW injury in the United States occur in the southernmost production areas of the Southeast. Losses are avoided in northern areas by state-administered quarantines to restrict movement of the insect. However, many losses continue to occur in previously weevil-free locations because of spread of the insect from infested areas.

Other soil-inhabiting insects are also injurious to sweetpotato storage roots and are serious sweetpotato pests in the United States. These include the WDS complex of insects — wireworm (*Conoderus* sp.), *Diabrotica* sp. (Cucumber beetle), and *Systena* sp. (flea beetle). Injury caused by larvae of the WDS complex is primarily to the surface of storage roots, affecting their appearance and grade. Insecticidal control is often ineffective in preventing injury by these insects and considerable losses are often incurred. An integrated pest management (IPM) program would be the most effective insect control measure for SPW and the WDS complex, but increased host-plant resistance to these insects is needed for such a program to be effective.

Three sweetpotato breeding lines — MS-501, MS-503, and MS-510 — are being released by the Mississippi Agricultural and Forestry Experiment Station to provide additional sources of insect resistance for use in breeding. They have moderate levels of resistance to the SPW and the WDS complex.

Origin

MS-501, MS-503, and MS-510 are open-pollinated seedlings from TIS-9465, TIS-8409, and TIS-8266, respectively, polycrossed with 36 breeding lines at the International Institute of Tropical Agriculture (IITA) in 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*) are important constraints at IITA, and the IITA breeding population was reported to have resistance to both (Hahn et al. 1989). The pedigree of TIS-8266 is TIS-3277 (a selection from seed introduced from Korea) x TIS-2099 (originally coded 3-382). The pedigree of TIS-8409 is TIS-3053 (originally coded Tib 2 OP) x TIS-2498 (Tib 1 OP-3). The pedigree of TIS-9465 is Tib 9 (White Star) x TIS-1499 (originally coded C9-8, a seed introduction from Trinidad and Tobago).

Thompson is assistant superintendent of the Pontotoc Ridge-Flatwoods Branch Experiment Station in Pontotoc, Mississippi; Schneider is an entomologist in the MSU Department of Entomology and Plant Pathology; Graves retired as superintendent of the Truck Crops Branch Experiment Station in Crystal Springs; and Carey is a research scientist at the Kansas State University Research and Extension Center in Olathe, Kansas. For more information, contact Thompson by telephone at (662) 489-4621 or e-mail at thompson@ra.msstate.edu. This research report was published by the Office of Agricultural Communications, a unit of the Division of Agriculture, Forestry, and Veterinary Medicine at Mississippi State University.

Experiment Station
Vance H. Watson, Director
Mississippi Agricultural & Forestry Experiment Station
Malcolm A. Portera, President • Mississippi State University • J. Charles Lee, Vice President

Description

The stems of MS-501 are short and green. 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 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%, versus 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, Mississippi.

In field evaluations at Beaumont, Miss., these lines were similar or superior to 'Regal,' the most highly resistant control in response to SPW and WDS injury (Tables 1 and 2). MS-510 produced over twice as many roots uninjured by SPW as did 'Regal' in 1994 and 1995. MS-501 and MS-503 produced greater percentages of SPW-uninjured roots in 1995 than 'Regal.' SPW stem injury was also mostly lower in the germplasm lines than in 'Regal.' The greatest reduction in injury by SPW to the breeding lines compared with 'Regal' 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 uninjured by the WDS complex (Table 2); however, WDS injury scores were lower for MS-501 and MS-510 than for all named cultivars.

Total yield of MS-510 was higher than 'Beauregard,' 'Centennial,' and 'Regal' on a sandy loam soil at Beaumont (Table 1). No differences were observed in yields of MS-501, MS-503, and the control cultivars at Beaumont. Beauregard yielded more than all three germplasm lines on a silt loam soil at Pontotoc (data not shown).

Table 1. SPW injury and yield of sweetpotato breeding lines (BL) and three commercial cultivars in 1994 and 1995 at Beaumont, Miss.

BL / cultivar	Roots not injured		Stem score[1]		Root score[1]		Sweetpotato yield	
	1994	1995	1994	1995	1994	1995	1994	1995
	%	*%*					*tons/ha*	*tons/ha*
MS-501	42 b[2]	75 a	2.0 b	2.9 c	1.3 cd	0.5 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	16.8 ab	16.6 bc
MS-510	73 a	78 a	1.8 b	2.9 c	0.3 d	0.5 d	26.2 a	42.8 a
Regal	36 b	35 b	3.2 a	3.5 b	2.3 bc	1.8 c	9.8 b	28.7 b
Centennial	11 c	23 bc	3.2 a	4.1 a	3.4 ab	2.4 b	9.6 b	20.0 b
Beauregard	10 c	9 c	2.9 a	4.2 a	3.8 a	3.2 a	9.5 b	25.9 b

[1]Rated on a scale of 0-5: 0 = no injury; 5 = severe injury.
[2]Mean separation within columns by LSD ($P \leq 0.05$).

Table 2. Injury to sweetpotato breeding lines (BL) and to three commercial cultivars by WDS complex (*Conoderus, Diabrotica,* and *Systena* sp.) in 1994 and 1995 at Beaumont, Miss.

BL / cultivar	Roots not injured		Injury score[1]	
	1994	1995	1994	1995
	%	%		
MS-501	14 ab[2]	58 a	1.5 cd	0.7 d
MS-503	12 ab	19 bc	2.0 bc	1.2 cd
MS-510	20 a	34 ab	1.1 d	0.9 d
Regal	10 ab	19 bc	2.6 ab	1.7 bc
Beauregard	6 b	3 c	2.9 a	2.6 a
Centennial	12 ab	8 c	1.9 b	2.1 ab

[1]Based 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.
[2]Mean separation within columns by LSD ($P \leq 0.05$).

References

Hahn, S.K., J.C.G. Isoba, T. Ikotun. 1989. Resistance breeding in root and tuber crops at the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria. *Crop Protection* 8:147-168.

Karyeija, R.F., R.W. Gibson, and J.P.T. Valkonen. 1998. The significance of sweet potato feathery mottle virus to subsistence sweet potato production in Africa. *Plant Dis.* 82:4-15.

Availability

To request vine cuttings or roots, please write the following address:

Pontotoc Ridge-Flatwoods Branch Experiment Station
8320 Highway 15 South
Pontotoc, MS 38863

Mississippi State University

Printed on Recycled Paper

Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product by the Mississippi Agricultural and Forestry Experiment Station and does not imply its approval to the exclusion of other products that also may be suitable.

http://www.msucares.com **16698/750**