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Evaluation of Sweetpotato Clones for Soil Insect Damage

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Abstract. **The reactions of eight sweetpotato *[Ipomoea batatas* (L.) Lam.] introductions were categorized for root damage by wireworms, *Diabrotica* sp., *Systena* sp. (WDS), sweetpotato flea beetle (SPFB), and grubs. Clones were compared with resistant ('Regal') and susceptible ('SC-1149-19') entries. The number of resistant clones for the WDS, SPFB, and grubs were three, four, and one, respectively, intermediate five, four, and one, and susceptible zero, zero, and six, respectively. This test demonstrated that significant levels of soil insect resistance exist in these sweetpotato introductions for use by plant breeders.**

Sweetpotato roots are often damaged by a diversity of insects, including wireworms *(Conoderus falli* Lane, *C. vespertinus* Fabricius), *Diabrotica* spp. *(D. balteata* LeConte, *D. undecimpunctata howardi* Barber), *Systena* sp. *(S. blanda* Melsheimer, *S. elongata* Fabricius, *S. frontalis* Fabricius) (WDS complex), sweetpotato flea beetle (SPFB) *(Chaetocnema confinis* Crotch), and grubs *(Plectris aliena* Chapin, *Phyllophaga ephilida* Say). The larval stages of these pests actively feed on roots. Historically, insecticides have been the first line of defense in reducing damage by these pests, but since the removal of the persistent chlorinated hydrocarbons, control has been unreliable. Therefore, the need for resistant cultivars is increasingly vital for continued U.S. production of this nutritious food. Eight breeding clones and six cultivars with multiple resistance to the above pests have been developed and their effectiveness in reduction of injury has been demonstrated (Cuthbert and Jones 1972, 1975; Jones et al., 1987; Thompson and Hurley, 1989). The need for identifying new sources of insect resistance is essential for continued breeding progress. In this study, a part of the U.S. sweetpotato collection was evaluated for reaction to those insect pests occurring in the Charleston, S.C., area.

Seventy-seven Plant Introduction (PI) lines were received from the U.S. Dept. of Agriculture Regional Plant Introduction Station, Griffin, Ga., in 1989. Vine cuttings were used to plant trials. The plots consisted of 10 plants per clone with four replications in a randomized complete-block design. Three tests were conducted because of differences in plant development (vegetative). Plants were grown according to normal horticultural procedures. **A** clone susceptible to all the insects under consideration ('SC 1149-19') and a clone resistant to all of the insects, ('Regal') were used as controls for each test. Because of nonuniform root development and inconclusive insect damage in many of the lines, only data of Test 3, consisting of eight PIs and controls, were analyzed. Damage assessment of mildly cracked roots was confined to the intact periderm. The primary resistance factors to soil insects are in the skin (Cuthbert and Davis, 1971; Schalk et al., 1986). Therefore, feeding scars in growth cracks were disregarded.

Insect populations in field plots were encouraged by growing corn the previous season, followed by wheat. These crops are suitable hosts for the insect species (except SPFB) involved in this study. Cuttings for the test were transplanted on 14-20 June 1989, and root harvest was on 23 Oct. Immediately after harvest, roots were washed and soil insect damage was assessed.

Since root damage by wireworms, *Diabrotica,* or *Systena* is very similar and cannot be distinguished at harvest, such injury was classified as the WDS complex. Root damage by the WDS complex was rated as: a) number of roots with injury/total number of roots × 100 = percentage of roots injured, and b) a severity index was obtained by assigning each root a score based on the number of feeding scars (no scars = 0, one to five scars = 1, six to 10 scars = 2, >10 scars = 4) and averaging the scores. SPFB and grub damage were recorded as a percentage of roots injured (Jones et al., 1979). All data were subjected to analysis of variance, square-root transformation $(\sqrt{x + 0.5})$ and mean separation by Duncan's multiple range test.

The number of resistant clones for the WDS, SPFB, and grubs was three, four, and one, respectively, five, four, and one were intermediate in resistance, and zero, zero, and six were susceptible, respectively (Table 1). Correlation coefficients between percent damage for the WDS complex and WDS index ratings were significant *(r* = 0.949**). The data presented show a range of variation, and useful levels of resistance.

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Table 1. Reaction of sweetpotato Plant Introduction (PI) clones to soil insects, 1989.

PI clones[z]	Roots injured by (%)		Severity index[w]	Roots injured by (%)	
	Insects[y]	WDS[x]		SPFB[v]	Grubs[u]
344140	75.4 ab[t]	52.4 bc	0.77 bcd	13.6 bc	32.8 a
508514	86.7 a	64.9 ab	0.92 bc	5.1 cd	35.7 a
508516	83.9 a	65.5 ab	1.14 b	20.6 b	33.5 a
508519	57.2 bc	38.5 cd	0.59 cde	1.9 d	34.3 a
531137	89.9 a	79.0 ab	1.14 b	17.0 bc	23.8 ab
531146	75.6 ab	60.4 ab	0.81 bcd	16.2 bc	19.8 abc
531148	29.3 d	22.2 e	0.22 e	5.4 cd	7.3 cd
531151	35.9 d	26.7 de	0.27 e	3.3 d	10.8 bcd
Regal	37.9 cd	32.4 cde	0.34 de	2.6 d	4.5 d
SC 1149-19	95.6 a	83.3 a	1.75 a	38.9 a	31.4 a

[z]Planted 14-20 June and harvested 23 Oct. (125-131 days after planting).
[y]Injured roots for all categories.
[x]wireworms, *Diabrotica* sp., *Systena* sp.
[w]High index numbers indicate more damage, while low index numbers indicate less damage; 0 = no scars, 1 = one to five scars, 2 = six to 10 scars, 4 = more than 10 scars.
[v]Sweetpotato flea beetle.
[u]*Plectris aliena*.
[t]Mean separation in columns for each test by Duncan's multiple range tests, $P = 0.05$; data transformation by $\sqrt{x + 0.5}$ for all damage categories except severity index.

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