S. Shrestha, E. Scheenstra, P. Kreider, and C. Miles
WSU Mount Vernon NWREC
16650 State Route 536, Mount Vernon, WA 98273
http://vegetables.wsu.edu/

Sweet Potato for Wireworm Resistance 2020

The study was carried out at Washington State University Northwestern Washington Research and Extension Center (WSU NWREC) Mount Vernon in 2020. Eight accessions were obtained from Phil Wadl, USDA ARS, on 11 February 2020 (Table 1). Tissue culture plantlets were washed and transplanted into 4-inch pots on the day they arrived and placed in a humidity box in the greenhouse at WSU NWREC (Figs. 1 and 2). Two of the accessions (PI 666139 and W388) did not survive. As the plants became adapted to environmental conditions, we started propagating the remaining 6 accessions in the greenhouse (Fig. 3).

Table 1. Number of plantlets obtained from USDA ARS per accession and number of plants transplanted per accession per plot.

S.N.	Accession No.	No. Plantlets	No. plants
1.	W382	1	35
2.	PI 666141	1	18
3.	PI 666139	1	-*
4.	09-130	2	28
5.	04-284	2	20
6.	W388	1	-*
7	04-136	2	11
8.	04-791	1	13

*Accessions did not survive in the greenhouse.

On 8 June 2020, the plants were placed in the same field (Fig. 3) where sweet potatoes were grown in 2019 and experienced severe wireworm damage. The plants were grown 15 inches apart in a single row in a raised bed (2600 Rain-Flo Irrigation, East Earl, PA) covered with soil-biodegradable black plastic mulch (0.7 mil, 48 in. wide; Organix Solutions, Grove, MN). Drip tape (T-Tape, Model #508-08-340, 8 in. emitter spacing, 0.34 GPM flowrate; John Deere, San Diego, CA) was installed at the center of the bed under the mulch at the same time the bed was formed. Fertilizer (Triple 16; Wilbur-Elis Co, San Francisco, CA) was applied to the center of the row at the rate of 100 lb N per acre with a 6 ft drop-spreader (Gandy, Owatonna, MN) just before the bed was formed. The experiment had a single replicate and there was a varying number of plants per accession due to propagation differences (Table 1).

On 7 October, 2020 sweet potatoes of the four accessions that had larger plot size (W382, PI 666141, 09-130, and 04-284) were hand-harvested from 5 ft subplots at the end of each plot (Fig.

4). For the two accessions that had short plots (04-136, and 04-791), harvest was from the whole plot. Hand harvested sweet potatoes were used for data collection. The remaining sweet potatoes in the four plots were harvested with a potato harvester the following day.

A curing chamber was made with a PVC pipe frame covered with clear plastic and was set on a wire bench in the greenhouse. The bottom of the chamber was not covered in plastic to allow air circulation. Sweet potatoes in bulb crates were placed in the curing chamber on the day of harvest (Fig. 5). The chamber was maintained at 85 ^{o}F, and a humidifier (WarmMist Humidifier, Model V750, Procter & Gamble, Cincinatti, OH) was placed inside the chamber and relative humidity was maintained at 70%. Sweet potatoes were cured for 3 weeks.

The sweet potato storage roots of each accession that had no wireworm damage were selected and placed in paper bags. The paper bags were placed in bulb crates and the crates were stacked on the bench in the greenhouse. The stack of crates was covered with black fabric (Contractor Landscape Fabric; American Nettings & Fabric, Ferndale, WA) to avoid sunlight (Fig. 6). The temperature in the greenhouse is approximately 55℉ day/night.

Results

The overall results are presented in Table 2. The greatest storage root weight per plant was obtained for accession PI 666141 (2.22 kg) (Fig. 7) and the lowest yield was for accession 04-136 (0.42 kg) (Fig. 8). The greatest storage root number per plant was obtained for accession 09-130 (Fig. 9) and the storage root number per plant was comparable for all other accessions. Accession 04-284 had the greatest percentage of storage roots with wireworm damage (40%) (Fig. 10) and accessions 04-791 and 04-136 had the lowest percentage of damaged storage roots (4% and 7%, respectively) (Figs. 11 and 8). The average number of holes per storage root due to wireworm damage was greatest for accessions 09-130 and 04-791 (4.0) (Figs. 9 and 11) and lowest for accession 04-136 (1.67) (Fig. 8) followed by W382 (Fig. 12). Two accessions, 04-136 and 04-791 had irregularly shaped storage roots (Fig. 13).

Table 2. Storage root weight and number per plant, and wireworm damage (percent, number of holes) per storage root, for sweet potatoes grown at WSU Mount Vernon NWREC in 2020.

	Storage Root			
Accession no.	Weight per plant (kg)	No. per plant	Wireworm damage (%)	No. holes
W382	0.73	5	11	2.37
PI 666141	2.22	4	14	3.38
09-130	0.91	10	22	4.00
04-284	0.87	5	40	2.83
04-136	0.42	4	7	1.67
04-791	4.00	4	4	4.00

Figure 1. Tissue culture (TC) plants upon arrival at WSU Mount Vernon NWREC on 11 February, 2020 (left), and removal of TC plants from jars and test tubes (right).

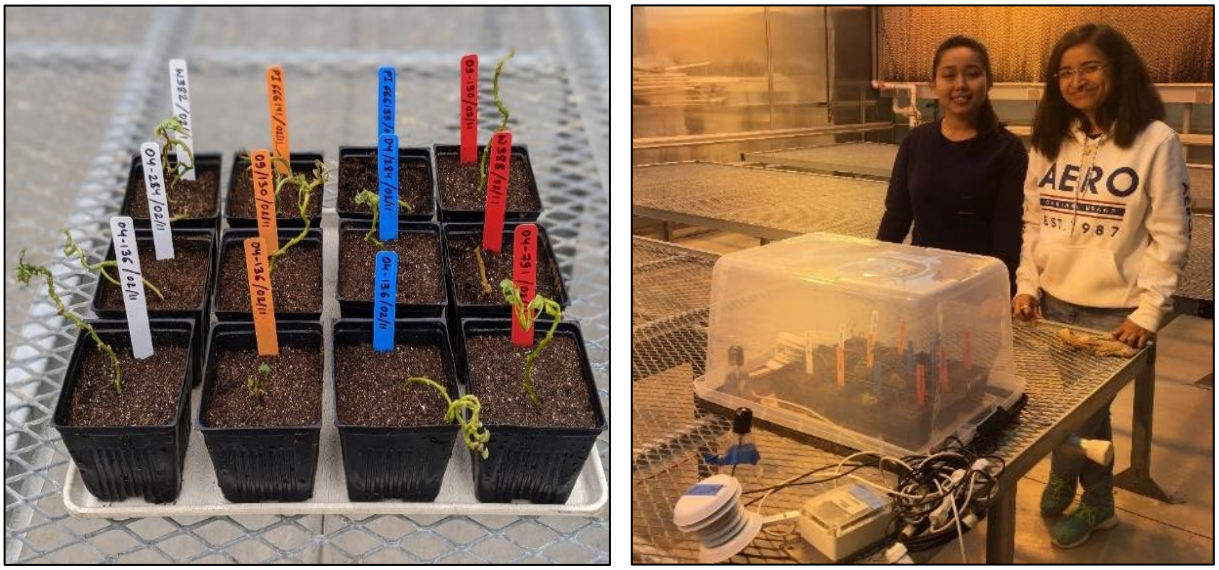

Figure 2. Placing TC plants in pots (left) and into a humidity box in the greenhouse (right).

Figure 3. Propagation of sweet potato plants in the greenhouse (left), and two plots of sweet potato in the field on 15 July, 2020 (right).

Figure 4. Sweet potato plants prior to harvesting (left) and harvesting 5 row ft per plot for data collection (right).

Figure 5. Curing sweet potatoes on a bench in the greenhouse.

Figure 6. Storage of sweet potatoes on a bench in the greenhouse.

Figure 7. Accession PI 666141 tubers per plot (left) and a sample of wireworm damaged tubers (right).

Figure 8. Accession 04-136 tubers per plot (left) and a sample of wireworm damaged tubers (right).

Figure 9. Accession 09-130 tubers per plot (left) and a sample of wireworm damaged tubers (right).

Figure 10. Accession 04-284 tubers per plot (left) and a sample of wireworm damaged tubers (right).

Figure 11. Accession 04-791 tubers per plot (left) and a sample of wireworm damaged tubers (right).

Figure 12. Accession W382 tubers per plot (left) and a sample of wireworm damaged tubers (right).

Figure 13. Irregular shaped tubers of accession 04-136 (left) and accession 04-791 (right).