

Relationships between Aphids, Potato Virus Y and Potato Varieties Important in Wisconsin Production

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Progress toward all objectives are progressing on schedule. Aphid monitoring was continued at eight sites this year, five in Langlade, two in Oneida and one in Villas county. Trapping, as in years past, began approximately the first week in June and extended through the end of September.

In addition to the aphid trapping program, several other projects were conducted. The varietal susceptibility of major commercial potato varieties to aphids and PVY, was assessed through a replicated field experiment which was conducted at the Hancock Research Station. In another project also conducted at the Hancock Research Station, 57 potato lines which were genetically engineered for resistance to PVY were evaluated for disease, insect resistance and physical characteristics.

Results

Trapping

The number of aphids trapped per week in the pan traps was fairly similar to that collected during the summer of 1992 but still below that of 1991 (Figure 1). The distribution is about the same, with few aphids collected until about the second week of July. The peak which occurred during the week of August 9th and represents aphids collected on the 17th, occurred about two weeks later than the peak aphid flights observed for 1992 and almost a month later than that observed in 1991. Aphids residing on rotational crops were also monitored through sweep net sampling. The pea aphid on clover was quite numerous during June, however, populations were effectively controlled through cutting. Many grain fields were scouted for the bird cherry oat aphid, the English grain aphid and the corn leaf aphid. English grain aphids were very common and populations were quite high early in the season on all oats sampled. Toward mid-August, however, the bird cherry oat became the dominant species. Corn leaf aphids were not found on the small grain but were prevalent on corn at tasselling. Although not as widespread, corn leaf aphids were readily found on the corn through the end of September. We will look at how the composition of the populations (number of non-winged vs. winged species) relates to the number of these species found in the pan traps placed in the potato fields.

Identification of the aphids caught throughout the season is currently being conducted. However, a cursory look at the samples collected during the peak aphid flight indicate that a large majority are corn leaf aphids.

Variety Susceptibility to Aphids and PVY

Eight commercially available potato varieties (Russet Norkodah , Russet Burbank, Snowden, Atlantic, Dark Red Norland, Shepody, Superior, and Gold Rush) were planted in 4-row, 10 meter long plots and replicated four times at the Hancock Research Station. Aphids populations were evaluated by three techniques. Horizontal mosaic green pan traps monitored the non-resident aphid species, leaf counts measured the resident aphid population (green peach and potato aphids) and sticky traps also monitored non-resident aphid species. Sampling with the pan traps began at plant emergence (6/11/93) and ended at vine kill (9/8/93). Leaf counts and sticky trap sampling began on (7/1/93) and continued weekly until vine kill.

As with the trap sampling in the northern areas, aphid populations early in the season were quite low until about the last week in July. The peak occurred one week earlier than that reported in the northern area, during the first week in August. Green peach and potato aphid populations did not appear in large numbers until the second week of August. Although the analysis is not complete, it appears that there are significant differences between the varieties in the number of aphids caught in the traps during weeks 9-12. During week 9, traps placed in Russet Norkodah and Dark Red Norland potatoes had significantly more aphids landing in them than those placed in Shepody, Atlantic and Russet Burbank plots (Table 1). Additionally, there were significant differences between varieties in the number of aphid on the leaves for weeks 10, 12 and 13 (Table 2). Russet Norkodah and Dark Red Norland have higher populations than the other varieties in week 10. Information on the amount of PVY in each plot will be gathered this winter from tubers that were harvested from these plots and used to determine how aphid populations relate to PVY transmission.

Evaluation of Genetically Engineered Resistance to PVY

Thirty-one Russet Burbank, 10 Superior, 3 Shepody and 13 Snowden transgenic lines plus 1 control line of each variety of plantlets were evaluated at the Hancock Experiment Station for PVY resistance. In addition, the plants were evaluated for insect resistance (mainly Colorado potato beetle and physical characteristics). The green peach aphid population was artificially elevated with manual introductions of this species. Populations of this species as well as potato aphids (which were not artificially introduced) were quite high. Foliar ELISA testing was conducted on 8/16/93.

Twenty Russet Burbank, one Superior, one Shepody and six Snowden lines tested negative in all four replications in the foliar ELISA test. Tubers from these lines were harvested and held for ELISA testing this winter. These tests will be completed in this spring.

Figure 1. Average number of aphids trapped per week using horizontal mosaic green pan traps. Langlade Co., WI - 1991-93

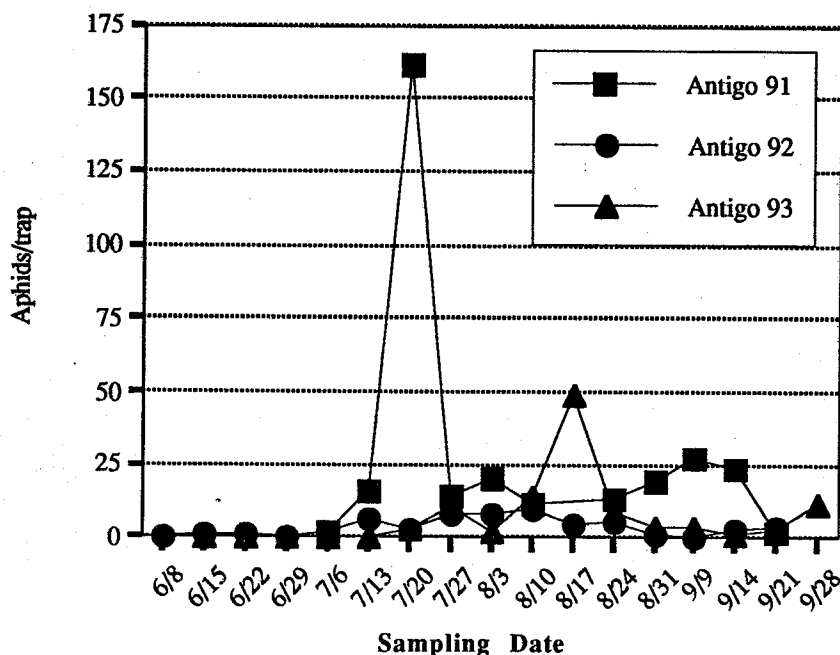


Table 1. Mean number(n=4) of aphids collected in horizontal mosaic green pan traps. Hancock, WI 1993

Variety	Week 9 (8/4/93)	Week 10 (8/11/93)	Week 11 (8/18/93)	Week 12 (8/24/93)
Russet Norkodah	25.0a	93.0ab	23.3bc	42.5a
Russet Burbank	6.2d	17.8c	9.3c	22.0b
Snowden	15.5abcd	53.8abc	21.3bc	24.3b
Atlantic	10.3cd	59.3abc	12.3c	17.5b
Dk Red Norland	23.0ab	104.3a	44.0a	29.3ab
Shepody	4.8d	23.5c	17.8c	20.5b
Superior	13.0bcd	98.8ab	37.8ab	28.3ab
Gold Rush	19.0abc	36.0bc	20.8bc	20.3b

Means followed by the same letter are not significantly different at $P < 0.05$.

Table 2. Mean number (n=4) of aphids per 25 potato leaves. Hancock, WI, 1993.

Variety	Week 10 (8/11/93)	Week 12 (8/24/93)	Week 13 (8/31/93)
Russet Norkodah	6.3a	---	---
Russet Burbank	0.5b	4.6b	11.4b
Snowden	0.6b	10.0b	22.7b
Atlantic	0.3b	13.5b	10.3b
Dk Red Norland	6.0a	---	---
Shepody	0.6b	6.9b	61.3a
Superior	1.3b	---	---
Gold Rush	1.8b	22.9a	69.7a

Means followed by the same letter are not significantly different at $P < 0.05$.