Dec 1st, 12:00 AM

Landscape summary of aphid suction trapping network since 2005

Erin W. Hodgson
Iowa State University, ewh@iastate.edu

Matt E. O'Neal
Iowa State University, oneal@iastate.edu

Nicholas P. Schmidt
Iowa State University

Landscape summary of aphid suction trapping network since 2005

Erin W. Hodgson, assistant professor and extension entomologist, Entomology, Iowa State University; Matt E. O'Neal, assistant professor, Entomology, Iowa State University; Nicholas P. Schmidt, graduate research assistant, Entomology, Iowa State University

The invasion of soybean aphid, ***Aphis glycines*** Matsumura, into the North Central Region has changed soybean, ***Glycine max*** (L.), production practices. In addition, growers are noticing persisting aphid populations in corn, ***Zea mays*** L., too. A combination of aphid species are likely to develop on corn, including corn leaf aphid, ***Rhopalosiphum maidis*** (Fitch), and bird cherry-oat aphid, ***Rhopalosiphum padi*** (L.). Developing accurate management recommendations for aphids is difficult because of the complicated life cycle.

Aphids give live birth and reproduce asexually during the summer, which greatly shortens a generation time. If the aphids are able to asexually reproduce all year because of warm conditions, they will never generate an egg (i.e., anholocyclic life cycle). But in order to survive cold winters, aphids must sexually reproduce to generate a cold-hardy, overwintering egg (i.e., holocyclic life cycle). Most aphid species stay on one host plant year-round (monoecious), but about 10% of aphids alternate between a woody, winter host and annual/perennial summer host (heteroecious). Host-alternating aphid species are more likely to be economic pests because of their ability to build up colonies on field crops. In addition, aphids can produce a mixture of wingless and winged forms throughout the summer. Wingless forms can quickly build up large colonies, and winged forms are generated to find suitable summer hosts or to seek out overwintering habitat in the fall.

For example, the soybean aphid is a heteroecious and holocyclic species. The winter host is buckthorn, ***Rhamnus*** spp., and the summer host is soybean. This species has high reproductive capabilities (McCornack et al. 2004) and the winged forms are highly migratory (Hodgson et al. 2005). Each season, soybean aphid can produce up to 15 generations, and colonies can be found on soybean throughout the midwest. Making predictions for a multigenerational, migratory insect like soybean aphid is a complex challenge. We are still trying to understand what triggers summer migration, but likely it is a combination of environmental conditions such as crowding, plant quality, temperature, and photoperiod (Dixon 1985).

Throughout the summer, winged aphids are not only moving within fields, but are moving longer distances via prevailing winds. In 2005, a Regional Aphid Suction Trapping Network was implemented in the midwest to describe when migratory aphids are moving. Suction traps sample a diversity of migrating species simultaneously over a wide geography and throughout the entire season. Each suction trap is estimated to represent a 31-mile radius of the surrounding area (Halbert et al. 1992), and designed to capture aphids moving well above crop canopies. The suction trapping network provides us with a landscape understanding of when and where aphids are moving within the midwest.

2005-2009 summary

Currently there are 42 suction traps in ten states (IA, IL, IN, KY, KS, MI, MN, ND, OH, WI). Iowa's four suction trap locations include Ames, McNay, Nashua, and Sutherland. Visit http://www.ncipmc.org/traps/ to see all trapping locations and historical data for soybean aphid since 2005. Traps are changed weekly from June to October. Dr. Dave Voegtlin and his staff at the Illinois Natural History Survey identify aphid species and count weekly captures.

In any given year, more than 60 aphid species can be collected in Iowa's suction traps. Most of these aphids are rarely collected; however, there are a few species that are more commonly trapped each season (Table 1). Some of these abundant species are of economic concern because they have the potential to damage field crops through heavy feeding and/or plant disease transmission.

Table 1. Most common aphid species collected by Iowa suction traps

Common Name	Scientific Name	Preferred Summer Host Plant(s)[1]
Bird cherry-oat aphid	*Rhopalosiphum padi*	wheat, barley, oats, rye, triticale, corn
Buckthorn aphid	*Aphis nasturtii*	potato, beets
Corn leaf aphid	*Rhopalosiphum maidis*	sorghum, barley, oat, wheat, corn
Cotton-melon aphid	*Aphis gossypii*	extremely variable, many plant families
Cowpea aphid	*Aphis craccivora*	alfalfa, other legumes
English grain aphid	*Sitobion avenae*	wheat, barley, oats, corn
Green peach aphid	*Myzus persicae*	extremely variable, many plant families
Greenbug	*Schizaphis graminum*	wheat, barley, oats, sorghum, triticale, corn
Pea aphid	*Acyrthosiphon pisum*	alfalfa, clover, other legumes
Potato aphid	*Macrosiphum euphorbiae*	extremely variable, many plant families
Soybean aphid	*Aphis glycines*	soybean
Spotted alfalfa aphid	*Therioaphis trifolii*	alfalfa, clover, other legumes

[1] Blackman and Eastop (2000).

Presently, the soybean aphid is the most economically important and abundant aphid species in Iowa. Summary results from 2005-2009 suction traps in Iowa reveal soybean aphid is collected from June through October (Figures 1- 2). For most years, the highest trap catches of soybean aphid is in August during soybean flowering (R1-R2); a second increase in trap catches occurs in late September during migration to buckthorn (Figure 2). This data is consistent with winged aphid production in Minnesota where aphids were collected on soybean plants rather than with suction traps (Hodgson et al. 2005). Soybean aphids trapped in other states also indicate frequent movement in August (Schmidt et al. 2009). Soybean fields are susceptible to aphid infestations during this time and should be scouted through seed set (R5.5) to protect yield. In 2009, there were extremely high captures in mid-September when soybean aphids were moving to overwintering hosts (Figure 1). During the week of 11-18 September 2009, an average of 3,181 aphids was trapped in Iowa. From 2005-2008, the fall migration captures were not as abundant in suction trap captures compared to 2009 (Figure 2).

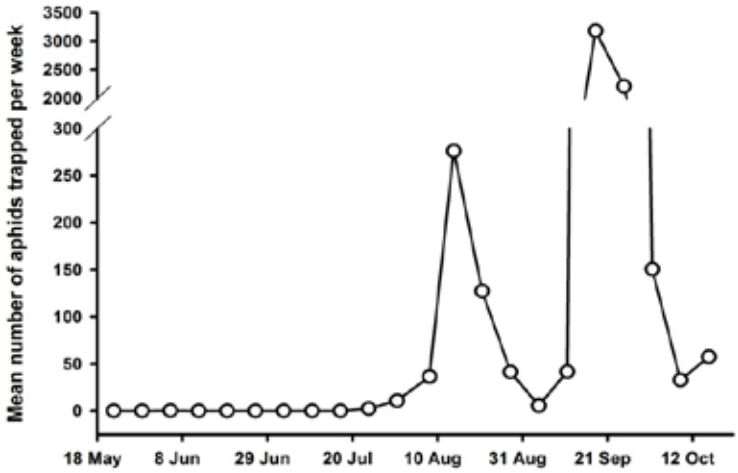

Figure 1. Seasonal abundance of soybean aphid collected from Iowa suction traps in 2009.

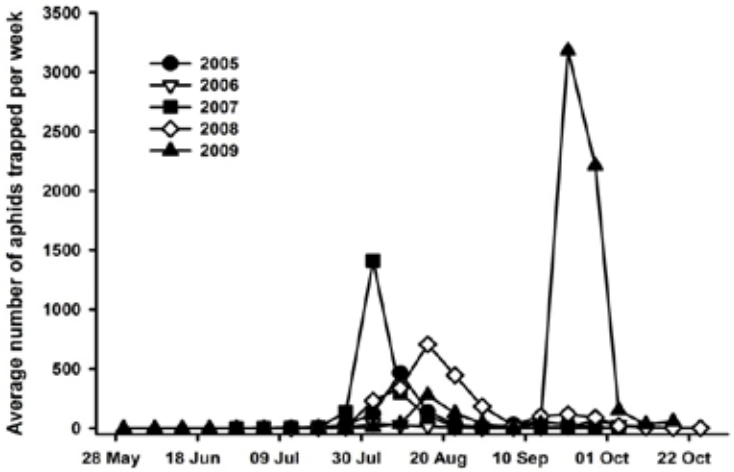

Figure 2. Seasonal comparison of soybean aphid collected from Iowa suction traps during 2005-2009.

The second and third most abundant aphid species collected by the suction traps are bird cherry-oat aphid and corn leaf aphid, respectively. These two species are becoming an economic issue in corn, with populations continuing to increase beyond tasseling. The English grain aphid, ***Sitobion avenae*** (Fab.), and greenbug, ***Schizaphis graminum*** (Rondani), can also build up numbers in corn but are not as commonly collected by the Iowa suction traps. Bird cherry-oat aphids show a consistent pattern of high migratory activity throughout August (Figure 3). Note above average catches of this species in 2009, which is a similar pattern to soybean aphid. The corn leaf aphid has been more variable since 2005, but is still highly migratory in August (Figure 4).

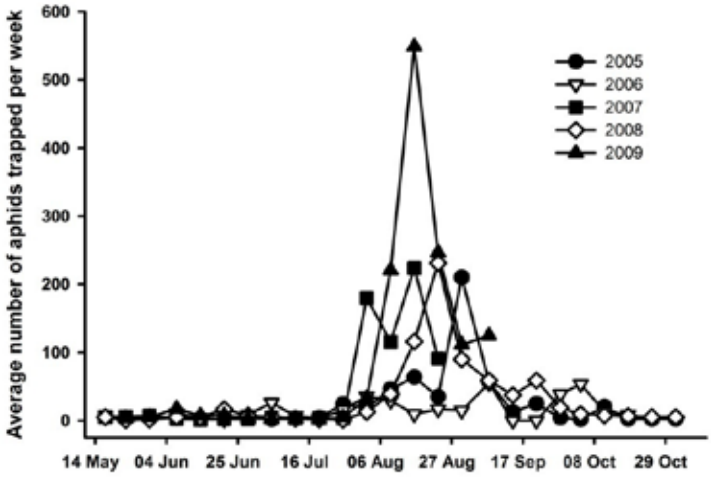

Figure 3. Seasonal comparison of bird cherry-oat aphid collected from Iowa suction traps during 2005-2009.

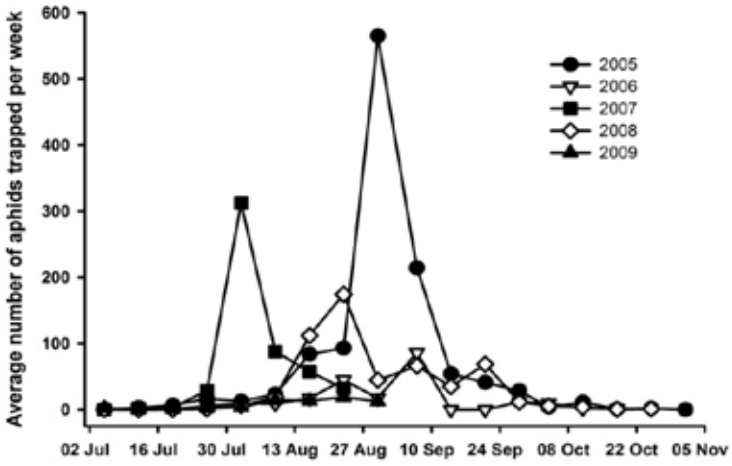

Figure 4. Seasonal comparison of corn leaf aphid collected from Iowa suction traps during 2005-2009.

Many people will have questions about aphids in corn and soybean in 2010. Based on fall migration numbers from the suction traps (Figures 1-2), most would assume strong spring populations of soybean aphid next year. Although the overwintering population on buckthorn may be potentially large, winter conditions are an important factor that strongly influences survival of soybean aphid eggs. The overwintering potential of bird cherry-oat aphid in Iowa is not fully understood, and we do not know if fall migration numbers could be linked to subsequent infestations. Overall, we do not have enough historical data to make predictions about the potential for outbreaks in 2010. Therefore, we encourage regular scouting after soybean emergence through seed set and use well-timed treatments once surpassing the economic threshold for soybean aphid. The management message also applies for aphids in corn, but scouting should start about three weeks before tasseling and continue through August.

Acknowledgments

We would like to thank David Voegtlin and Doris Lagos for identifying and counting aphids in the Iowa suction traps. Partial funding and support of the Regional Aphid Trapping Network is provided by the North Central IPM Center.

References

Blackman, R. L., and V. F. Eastop. 2000. Aphids on the world's crops: an identification and information guide, 2nd ed. John Wiley & Sons, LTD, Chichester, United Kingdom.

Dixon, A. F. G. 1985. Aphid ecology. Chapman and Hall, New York, NY.

Halbert, S. E., L. Elberson, and J. B. Johnson. 1992. Suction trapping of the Russian wheat aphid: What do the numbers mean? In (W. P. Morrison, ed.) Proceedings: Fifth Russian Wheat Aphid Conference, pp. 282-297. Great Plains Agricultural Council, Lubbock, TX.

Hodgson, E. W., R. C. Venette, M. Abrahamson, and D. W. Ragsdale. 2005. Alate production of soybean aphid (Homoptera: Aphididae) in Minnesota. Environmental Entomology. 34: 1456-1463.

McCornack, B. P., D. W. Ragsdale, and R. C. Venette. 2004. Demography of soybean aphid (Homoptera: Aphididae) at summer temperatures. Journal of Economic Entomology. 97: 854-861.

Schmidt, N. P., M. E. O'Neal, P. F. Anderson, D. Voegtlin, D. Lagos, C. Gratton, E. Cullen, D. W. Ragsdale, B. McCornack, J. Whitworth, K. J. Tilmon, C. DiFonzo, D. Johnson, W. Bailey, R. O'Neil, and C. H. Krupke. 2009. Soybean aphid migrations across the Midwest United States: A summary of the suction trap network. Annals of the Entomological Society of America, in preparation.

Ragsdale, D. W., B. P. McCornack, R. C. Venette, D. A. Potter, I. V. MacRae, E. W. Hodgson, M. E. O'Neal, K. D. Johnson, R. J. O'Neil, C. D. DiFonzo, T. E. Hunt, P. A. Glogoza, and E. M. Cullen. 2007. Economic threshold for soybean aphid (Homoptera: Aphididae). Journal of Economic Entomology. 100: 1257-1267.