Within-Plant Spatial Patterns and Preferred Feeding Sites of Cowpea Aphid on Alfalfa

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The cowpea aphid (*Aphis craccivora* Koch) is widely distributed in North America, having been reported in over 25 states of the U.S. and in three Canadian provinces. This aphid species is found on a variety of host plants, including legumes such as alfalfa. However, it was not known to cause damage to alfalfa before 1999, when increased population densities and crop injury were observed in several states including California (Summers 2000) and Oklahoma. More recently, damaging populations of cowpea aphid have been reported in New Mexico and Missouri. Heavy infestations have resulted in stunting of plant growth, thinning of stands, and copious honeydew production that has promoted growth of a sooty mold fungus (Summers and Godfrey 2002). Widespread occurrence of damaging infestations has greatly increased interest in studies relating to the biology and control of the cowpea aphid. Of critical concern is the development of sampling protocols and decision-making guidelines for use of insecticides against this species in alfalfa. The objective of studies described in this presentation was to determine intraplant spatial patterns and preferred feeding sites of the cowpea aphid to assist in development of accurate sampling procedures for field scouting.

Studies were conducted in a greenhouse with temperature of 25±6°C and 16 h photophase using established plants of a susceptible alfalfa cultivar 'OK08' grown in 15 cm diameter pots. After being cut back, plants were allowed to regrow until stems had 4-5 nodes, at which time all except three stems/plant were clipped at the crown. Three adult cowpea aphids were placed on the mid-portion of each stem. At 2-day intervals up to 8 days following infestation, all nymphs and adults were counted on each stem. Beyond 8 days postinfestation, when large numbers of adults were present, extensive movement of aphids on/among stems made it impossible to obtain accurate counts. Aphid numbers were recorded on each internodal stem section (stem section just below node), and on the petiole and leaf blades associated with each node. When branching occurred, aphid numbers were recorded on stem sections, petioles, and leaf blades for each axillary branch. Means were calculated for total numbers of aphids/node and numbers found on each nodepart, i.e. stem, petioles, and leaf blades. Tables and graphs were prepared to illustrate preferred feeding sites in terms of general position on stems, ranging from node 1 (=lowest) to the terminal; and nodeparts.

Internodal stem sections were greatly preferred over petioles and leaf blades as feeding sites by the cowpea aphid. With exception of modest numbers found on the leaves emerging from plant terminals, <5% of the aphids occurred on leaf blades. Of the aphids feeding on axillary branches, the highest proportions were also on stem sections. There was no obvious preference exhibited by for particular nodes along the vertical axis of stems. With exception of somewhat lower numbers on nodes 1 and 2 near the soil surface, total numbers of aphids per node were fairly consistent. Thus, for accurate estimates of population densities to be obtained in sampling programs, it will be necessary to use a method in which entire stems are pulled for retrieval of cowpea aphids. Sampling by sweepnet could result in missing substantial numbers of aphids in the lower portions of the plant canopy and substantial underestimation of population densities.

References

Summers, C.G. 2000. Tiny pest threatens California's alfalfa crop. Calif. Alfalfa and Forage Review. Vol. 3.
Summers, C.G. and L.D. Godfrey. 2002. UC-IPM pest management guidelines: alfalfa. UC-DANR Publ. 3339.