Fungi on Spotted Alfalfa Aphid

discovery of fungus-killed aphids in field infestations may lead to biological control by means of natural disease

Irvin M. Hall and Everett J. Dietrick

Epizootics—corresponding to disease epidemics among humans—almost wiped out the spotted alfalfa aphid—*Therioaphis maculata* (Buckton)—in some fields in the Del Mar Valley of San Diego County during the late summer.

Apparently the epizootics resulted from the attack of a fungus that made its appearance during the summer, built up rapidly in the period of hot weather, and resulted in almost 100% mortality to the spotted alfalfa aphid population.

Many aphids, killed by what appears to be the same fungus, have been found in alfalfa fields near Temecula, Hemet, and Riverside. Subsequent search for this or other pathogens was unsuccessful in the Palo Verde, Coachella, Perris, San Bernardino, Antelope, and southern San Joaquin Valley areas.

The fungus—taken from the spotted alfalfa aphid—is being cultured for investigation in the laboratory at Riverside.

Probably the most important pathogens of aphids are phycomycete fungi belonging to the order Entomophthorales. Entomogenous members of this order are noted for their ability to forcibly discharge conidial spores, thereby enhancing their transmission from insect to insect. Although eight different species of entomophthorous fungi in the two genera, *Entomophthora* and *Empusa*, have been recorded from aphids throughout the world, none has been reported attacking the spotted alfalfa aphid.

The pea aphid—*Macrosiphum pisi* (Kalt.)—a common pest on alfalfa in California, is attacked during the spring by the widely known *Empusa aphidis* (Hoff.). This fungus, which turns the body of the pea aphid a dull rust color at the time of death, is often responsible for extremely high mortality in pea aphid populations.

During the past year, a number of reports have been received by the insect pathology units at Berkeley and Riverside, indicating the presence of disease organisms in field populations of the spotted alfalfa aphid. In most instances, where samples of diseased aphids were brought to the laboratory for diagnosis or collections were made in following up such reports, no fungi pathogenic to the spotted alfalfa aphid were found. Quite often, the dead insects were identified in the laboratory as small pea aphids infected with *Empusa aphidis*.

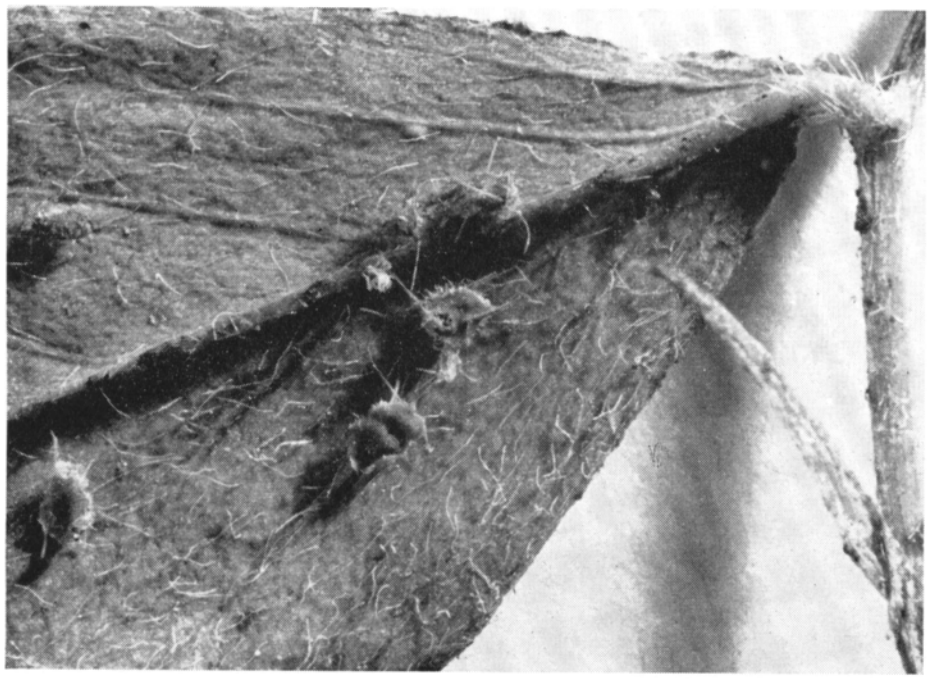
On several occasions, collections of mixed populations of spotted alfalfa aphid and pea aphid, containing many dead insects, were examined in the laboratory. In each case, the dead insects were found to be pea aphids killed by *Empusa aphidis*, while the spotted alfalfa aphids were free of disease. This would indicate that the latter is not subject to attack by *Empusa aphidis*.

Spotted Alfalfa Aphid

The spotted alfalfa aphid—Therioaphis maculata *(Buckton)—was formerly referred to as a yellow clover aphid although it is not the yellow clover aphid*—Therioaphis trifolii *(Monell)—known to be in the eastern and midwestern United States for the past 80 years.*

The spotted alfalfa aphid is believed to have been introduced accidentally into New Mexico, from India or the Mediterranean region, about two years ago. Since its introduction, the spotted alfalfa aphid has spread and become a serious economic pest in the states of Texas, Arkansas, Kansas, Oklahoma, Arizona, Nevada, Utah, Colorado, Nebraska, and California.

Spotted alfalfa aphids killed by an entomophthorous fungus in Del Mar Valley.



Aphid Not Disease-Free

The spotted alfalfa aphid is not entirely free of diseases. A number of specimens killed by fungi have been collected from alfalfa fields in southern California. A single dead aphid found near Lakeview, in Riverside County, resulted in the isolation of a fungus belonging to the order Entomophthorales. Shortly thereafter, a second isolation of an entomophthorous fungus was made from the collection of dead aphids obtained at Meloland, in Imperial County. Additional aphids killed by fungi were collected in alfalfa fields near Riverside.

Studies of the cultures from those isolations indicate that they are distinct species which differ considerably from other known species of entomophthorous fungi reported to attack aphids. Little is known of the effectiveness of either species of fungus against the aphid in the field. They are not considered to be too effective since observations during the spring have indicated that in fields

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APHID

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where either species of fungus was present, only about 1% to 5% of the aphids were dying of disease. However, great numbers of fungus-killed aphids were noted recently in San Diego and Riverside counties.

Preliminary laboratory studies of the third fungus indicate that it is an entomophthorous fungus, quite different from the two undescribed species isolated previously. It is similar in several respects to *Empusa aphidis* and has the ability to turn the body of the dead aphid a dull rust color.

The appearance of this extremely pathogenic fungus in populations of the spotted alfalfa aphid in southern California—with resultant epizootics in coastal Del Mar Valley and widespread occurrence in the Temecula, Riverside and Hemet areas—may lead to an excellent biological weapon to use against the aphid.

Studies of the pathogen will continue in the laboratory, and field inoculations of the fungus will be made in areas where it has not been observed.

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The above progress report is based on Research Project No. 1650.

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