

# HILGARDIA

*A Journal of Agricultural Science Published by  
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### **VIRUSES THAT INDUCE BREAKING IN COLOR OF FLOWER PETALS IN PANSIES AND VIOLAS**

HENRY H. P. SEVERIN

### **APHIDS FEEDING ON VIOLACEOUS PLANTS IN CALIFORNIA**

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# APHIDS FEEDING ON VIOLACEOUS PLANTS IN CALIFORNIA

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# APHIDS FEEDING ON VIOLACEOUS PLANTS IN CALIFORNIA<sup>1</sup>

E. O. ESSIG<sup>2</sup>

PANSIES (*Viola tricolor* var. *hortensis*) and violas, or tufted pansies (*V. cornuta*) in California are subject to two virus diseases, celery calico and western cucumber mosaic. These diseases are treated in a companion article (Severin, 1947).<sup>3</sup> The vectors are aphids, or plant lice. Celery calico was first investigated (Severin and Freitag, 1938) as a disease of celery. There are no less than ten aphid species feeding on celery in California. Other species which ordinarily do not feed and propagate on this host may also transmit the celery-calico virus under experimental conditions.

The only species apparently restricted to violaceous plants in this state and in other parts of North America is the common violet aphid, *Micromyzus violae* (Pergande). Nine additional species have been recorded as feeding on *Viola* spp. (Patch, 1938) in various parts of the world.

The purpose of this paper is to furnish those interested in the virus diseases of plants, particularly of ornamental violas and pansies, pertinent information concerning the aphid vectors of these diseases. Certain of these aphids have previously been discussed in relation to celery calico as a disease of celery in California (Essig, 1938a); and therefore the treatment of these particular aphid species excludes detailed descriptions and emphasizes more particularly synonymy, host plants, distribution, and bibliography.

It is expected that the illustrations may enable those interested in this problem to identify the aphids responsible for the dissemination of the celery-calico and western-cucumber-mosaic viruses.

## THE PEA APHID

- Macrosiphum pisi* (Kaltenbach)  
*Aphis pisi* Kaltenbach (1843, p. 23-24)  
*Aphis ulmariae* Schrank (1801, p. 116-17)  
*Aphis onobrychidis* B. de Fonscolombe (1841, p. 61)  
*Adactynus pisi* (Kaltenbach) (Rafinesque 1819, p. 18)  
*Siphonophora corydalis* Oestlund (1886, p. 25-26)  
*Nectarophora destructor* Johnson (1900, p. 58-59)  
*Macrosiphum trifolii* Pergande (1904, p. 21-23, fig. 4)  
*Illinoia pisi* Wilson (1910 b, p. 318)  
*Acyrtosiphon onobrychidis* (B. de Fonscolombe)

The pea aphid is one of the largest and most conspicuous economic aphids. Its all-green color and its propensities for leguminous plants make it easily recognized. In common with many other aphids, this species drops to the ground when the host plants are disturbed, a habit that often enables the individuals to conceal themselves under clods of earth and debris and thus escape

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<sup>2</sup> Professor of Entomology and Entomologist in the Experiment Station.

<sup>3</sup> See "Pertinent Literature," at the end of this paper, for complete citations, referred to in text by author and date.

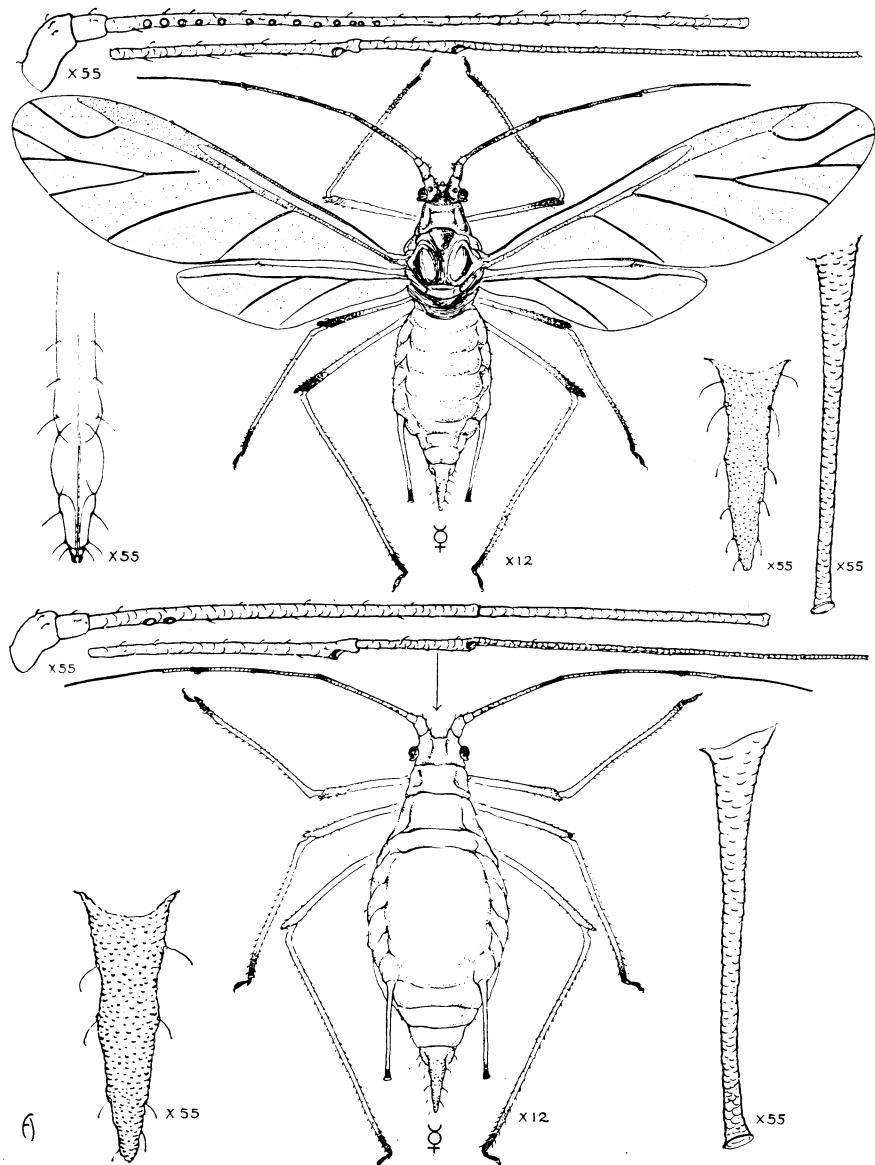


Fig. 1.—The pea aphid, *Macrosiphum pisi* (Kaltenbach): alate and apterous females with enlargements of the antennae, caudas, cornicles, and rostrum. (Enlargements indicated. Drawings by Frieda Abernathy).

insecticides. Among the many references to this destructive pest, the most important are Pergande (1904, p. 21-23), Davis (1915), and Soliman (1927, p. 132-33).

C. D. Harrington (1941, p. 461-66) has shown that a number of more or less distinct strains of the pea aphid occur in various parts of the country. Members of these strains may vary considerably in size, reproductive capacities, rate of development, destructiveness to the host plants, and resistance to insecticides. The adult apterous parthenogenetic females may attain a length of 2.5 to 3.5 mm.

In California the pea aphid is not known to produce sexual forms, although the latter may occur at higher altitudes of the Sierra Nevada. The aphid continues throughout the entire year as parthenogenetic apterous and alate females. During the winter, adults hibernate or may continue to reproduce young on perennial hosts. During the spring, summer, and fall, many generations are born and very large populations may occur in any month of the year. The greatest numbers appear in early spring and continue abundant until midsummer.

**Nomenclature.** Some authors believe that Schrank's name, *ulmariae*, should supersede *pisi* as the specific name. But the original description by Schrank seems to indicate that *ulmariae* is not synonymous with *pisi* Kalt. His statements that the antennae are shorter than half the length of the body and that the cornicles (*Seftspizen*) are longer than the very short cauda ("Schwänzchen am After") are certainly not characteristic of *pisi*, in which the antennae are as long as the body or longer and the cauda is conspicuously well developed.

*Aphis onobrychis* B. de Fonscolombe may well have precedence over all other specific names. *Macrosiphum onobrychis* B. de Fonse. is the name being used in the publications of the Imperial Institute, London, England. But the combination *Macrosiphum pisi* (Kalt.) has been used so extensively in entomological literature in North America that changing it seems unwise.

The genus *Adactynus* was erected by Rafinesque (1817, p. 18).

The genus *Illinoia* was erected by Wilson (1910b, p. 318) for this species but has not been generally adopted. It has precedence over *Metopeurum* Mordvilko (1914, p. 56, 67) and *Acyrtosiphon* Mordvilko (1914, p. 55, 62).

The generic name *Acyrtosiphon* has been extensively used for the pea aphid in Europe and by some American authors. The long array of names now being given to this insect indicates the need of greater attention to these matters by national and international commissions of nomenclature.

**Distribution.** The pea aphid has been reported from all of the continents and is widely distributed throughout the world wherever food plants are available.

It occurs in every state in this country and in all the provinces of Canada. Its powers of flight are great and it often swarms in tremendous numbers and is carried long distances by air currents during the night as well as the day, especially in warm summer weather.

**Host Plants.** Although the preferred host plants are confined to the single family, Leguminosae, the members of this plant group are so extremely numerous that they cover much of the habitable areas of the world. Many of

the host plants produce valuable crops for man and his domestic animals. The injuries caused by the pea aphid may result in great loss to these crops and even complete failure. Such injuries may result from the aphid's feeding on and actually stunting or killing the plant or from the aphid's inoculating the hosts with virus diseases which may weaken or completely destroy the plants. Plants, other than legumes, are frequently listed as hosts of the pea aphid. The adults or young may feed on some of those plants and thus transmit a virus disease. However, rearing of the young is usually impossible on the non-leguminous hosts, and on many of these plants the insect may be only a casual visitor.

The pea aphid may be able to feed intermittently on violets and pansies as well as upon many other plants. The feeding in itself is not injurious; the damage the aphid does to these hosts is to infect them with the virus disease which may destroy them.

The pea aphid was reported from *Viola* by Swain (1919, p. 176) and Patch (1938, p. 181). As already pointed out, however, this aphid is a strong traveler, both on foot and on the wing, and is a casual visitor on many plants upon which it may not actually feed.

A complete list of the known host plants follows:

<i>Alhagi maurorum</i>	<i>Lupinus</i> spp.	<i>Trifolium hybridum</i>
<i>Capsella bursa-pastoris</i>	<i>Medicago falcata</i>	<i>Trifolium incarnatum</i>
<i>Celastrus scandens</i>	<i>Medicago hispida</i>	<i>Trifolium pratense</i>
<i>Cianthus puniceus</i>	<i>Medicago lupulina</i>	<i>Trifolium procumbens</i>
<i>Colutea arborescens</i>	<i>Medicago sativa</i>	<i>Trifolium repens</i>
<i>Cytisus scoparius</i>	<i>Melilotus alba</i>	<i>Trifolium scabrum</i>
<i>Genista tinctoria</i>	<i>Melilotus indica</i>	<i>Trigonella foenum-graecum</i>
<i>Glycine soja</i>	<i>Melilotus officinalis</i>	<i>Vicia americana</i>
<i>Igatium janium</i> ( <i>Ignatia?</i> )	<i>Onobrychis viciaefolia</i> ( <i>O. sativa</i> )	<i>Vicia amoena</i>
<i>Lathyrus hirsutus</i>	<i>Ononis repens</i>	<i>Vicia atropurpurea</i>
<i>Lathyrus latifolius</i> ( <i>L. angustifolius</i> )	<i>Peganum harmala</i>	<i>Vicia angustifolia</i>
<i>Lathyrus maritimus</i>	<i>Phaseolus vulgaris</i>	<i>Vicia cracca</i>
<i>Lathyrus odoratus</i>	<i>Pisum sativum</i>	<i>Vicia faba</i>
<i>Lathyrus pisiformis</i>	<i>Pisum sativum</i> var. <i>arvense</i> ( <i>P. arvense</i> )	<i>Vicia gigantea</i>
<i>Lathyrus pratensis</i>	<i>Psoralea macrostachya</i>	<i>Vicia ludoviciana</i>
<i>Lathyrus sativus</i>	<i>Robinia pseudoacacia</i>	<i>Vicia sativa</i>
<i>Lathyrus sylvestris</i>	<i>Trifolium agrarium</i>	<i>Vicia sepium</i>
<i>Lespedeza cytisoides</i>	<i>Trifolium alexandrinum</i>	<i>Vicia villosa</i>
<i>Lotus corniculatus</i>	<i>Trifolium arvense</i>	<i>Vigna sinensis</i>
<i>Lotus oblongifolius</i>	<i>Trifolium filiforme</i>	<i>Viola</i> spp., (casual?)
		<i>Zizia aurea</i>

## THE COTTON OR MELON APHID

*Aphis gossypii* Glover

The cotton or melon aphid, *Aphis gossypii* Glover, is a prolific, widely distributed, and omnivorous species, which is responsible for transmitting many mosaic and virus diseases of plants. It is very common and abundant throughout much of California and is widely distributed in the United States. It also occurs abundantly in the tropics.

This aphid is fully discussed in a previous paper (Essig, 1938a, p. 468-70). It is a small species, often blackish or very dark olive green in color, but frequently pale white, yellow, orange, or green, on different host plants.

**Distribution.** The cotton aphid has been recorded from the following countries:

**Africa:** Algeria, Anglo-Egyptian Sudan, Belgian Congo, British Togoland, Portuguese East Africa, Egypt, Eritrea, French West Africa, Italian Somaliland, Morocco, Nigeria, Nyasaland, Rhodesia, South Africa, Tanganyika Territory, and Uganda.

**Asia:** Armenia, Asiatic Russia, Astrakhan, Ceylon, China, India, Japan, Malaya, Palestine, Pescadores Islands, Syria, Taiwan, Transcaucasia, and Turkestan.

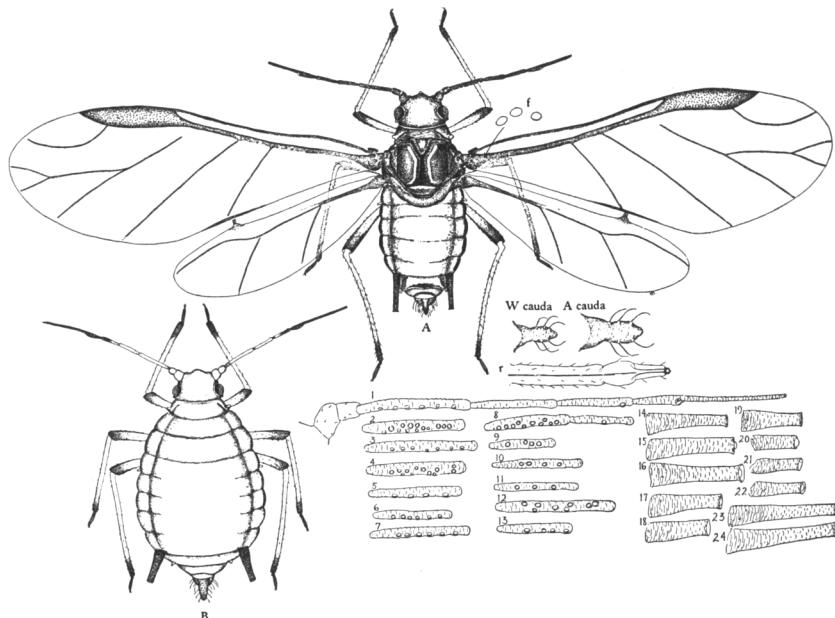


Fig. 2.—The cotton or melon aphid, *Aphis gossypii* Glover: *A*, winged viviparous female; *B*, apterous viviparous female; *W cauda*, cauda of winged female; *A cauda*, cauda of apterous female; *f*, fenestras; *r*, rostrum, *I*, antenna of winged female on cotton, California; 2-13, antennal segment III of winged female drawn to scale to show variation in number of secondary sensoria and length. (All greatly enlarged.)

**Europe:** Belgium, Crimea, Cyprus, Denmark, France, Germany, Great Britain, Italy, Netherlands, U.S.S.R., Sweden, Switzerland.

**Central America:** Canal Zone, Panama.

**North America:** Bermuda, Canada, Mexico, United States, West Indies (Cuba, Jamaica, Puerto Rico).

**South America:** Argentina, Brazil, British Guiana, Chile, Dutch Guiana, Paraguay, Peru, Trinidad Island.

**Oceania and the Pacific:** Australia, Dutch East Indies, Fiji, Guam, Hawaii, Philippine Islands, Samoa.

In California it is found abundantly throughout the state except in high altitudes above 6,000 feet.

**Host Plants.** The cotton aphid is an omnivorous feeder, being specially destructive to cacao, citrus, cotton, cucumbers, melons, squashes, hibiscus, lilies, and many other plants. A complete list of host plants follows:

<i>Abutilon theophrastii</i>	<i>Calophyllum inophyllum</i>	<i>Cucumis sativus</i>
<i>Acalypha boemeroides</i>	<i>Canna</i> sp.	<i>Cucurbita maxima</i>
<i>Acalypha virginica</i>	<i>Capsella bursa-pastoris</i>	<i>Cucurbita melo</i> <i>triculatus</i> (?)
<i>Acanthopanax trifoliatus</i> <i>(A. aculeatus)</i>	<i>Capsicum frutescens</i> <i>(C. annuum)</i>	<i>Cucurbita moschata</i>
<i>Acanthus ilicifolius</i>	<i>Capsicum dulce</i>	<i>Cucurbita pepo</i>
<i>Ageratum conyzoides</i>	<i>Cassia tora</i>	<i>Cuphea micropetala</i>
<i>Allium cepa</i>	<i>Casuarina equisetifolia</i>	<i>Cyclamen europaeum</i>
<i>Althaea nudiflora</i>	<i>Catalpa</i> sp.	<i>Cyclamen indicum</i>
<i>Althaea officinalis</i>	<i>Ceiba pentandra</i>	<i>Cynometra ramiflora</i> <i>(C. cauliflora)</i>
<i>Althaea rosea</i>	<i>(Eriodendron anfractuosum)</i>	<i>Cyphomandra betacea</i>
<i>Amaranthus viridis</i>	<i>Cereus</i> sp.	<i>Datura stramonium</i>
<i>Ambrosia</i> sp.	<i>Cestrum diurnum</i>	<i>Delphinium</i> sp.
<i>Annona muricata</i>	<i>Chaenomeles japonica</i> <i>(Pyrus japonica)</i>	<i>Dentella repens</i>
<i>Anthemis</i> sp.	<i>Chenopodium album</i>	<i>Dianthus</i> sp.
<i>Antirrhinum</i> spp.	<i>Chenopodium anthelminticum</i>	<i>Dichrocephala latifolia</i>
<i>Antigonon leptopus</i>	<i>Chrysanthemum frutescens</i>	<i>Diervilla</i> sp.
<i>Aphelandra pectinata</i>	<i>Chrysanthemum morifolium</i> <i>(C. hortorum,</i> <i>C. sinensis)</i>	<i>Diodia teres</i>
<i>Apium graveolens</i>	<i>Chrysobalanus oblongifolius</i>	<i>Dipeadi serotina</i>
<i>Aquilegia vulgaris</i>	<i>Cineraria</i> sp. ( <i>Senecio</i> ?)	<i>Dodartia</i> sp.
<i>Arabidopsis thaliana</i>	<i>Cirsium arvense</i>	<i>Dolichos lablab</i>
<i>Arabis drummondii</i>	<i>Citrullus vulgaris</i>	<i>Duranta repens</i> <i>(D. plumieri)</i>
<i>Arctium lappa</i>	<i>Citrus aurantium</i>	<i>Echinocystis fabacea</i>
<i>Ardisia esculenta</i>	<i>Citrus limonia</i>	<i>Echinocystis lobata</i>
<i>Aristolochia indica</i>	<i>Clerodendrum thomsoniae</i>	<i>Echeveria</i> spp.
<i>Asclepias mexicana</i>	<i>Clerodendrum trichotomum</i>	<i>Eclipta erecta</i>
<i>Asclepias speciosa</i>	<i>Clitoria</i> sp.	<i>Elephantopus scaber</i> <i>(E. mollis)</i>
<i>Asclepias verticillata</i>	<i>Coccobolis fleniana</i>	<i>Erechtites praealta</i>
<i>Asclepias vestita</i>	<i>Coccobolis floridana</i> <i>(C. laurifolia)</i>	<i>Erechtites hieracifolia</i>
<i>Asparagus officinalis</i>	<i>Colocasia antiquorum</i>	<i>Erechtites valerianaefolia</i>
<i>Atriplex</i> sp.	<i>Colocasia esculenta</i>	<i>Eriobotrya deflexa</i>
<i>Avena fatua</i>	<i>Colocasia kotoensis</i>	<i>Eriobotrya japonica</i>
<i>Bauhinia variegata</i>	<i>Combretum apiculatum</i>	<i>Erodium cicutarium</i>
<i>Begonia semperflorens</i>	<i>Commelina diffusa</i>	<i>Eucalyptus cladocalyx</i> <i>(E. corynocalyx)</i>
<i>Benincasa hispida</i>	<i>Commelina persicariaefolia</i> <i>(C. benghalensis)</i>	<i>Eucalyptus globulus</i>
<i>Beta vulgaris</i>	<i>Cordia myxa</i>	<i>Eugenia aquea</i>
<i>Bidens frondosa</i>	<i>Cornus mas</i>	<i>Euphorbia pilulifera</i>
<i>Bidens pilosa</i>	<i>Cosmia</i> sp. ( <i>Cosmos</i> sp.)	<i>Ficus benjamina</i>
<i>Blumea balsamifera</i>	<i>Cosmos caudatus</i>	<i>Ficus capensis</i>
<i>Boerhaavia plumbaginea</i> <i>(B. viscosa)</i>	<i>Crataegus</i> spp.	<i>Ficus elastica</i>
<i>Borago officinalis</i>	<i>Crocus doseddell</i>	<i>Flemingia congesta</i>
<i>Bougainvillea spectabilis</i>	<i>Crotalaria anagyroides</i>	<i>Forsythia viridissima</i>
<i>Brassica</i> (all species)	<i>Crotalaria mucronata</i> <i>(C. striata)</i>	<i>Fragaria chiloensis</i>
<i>Breynia officinalis</i>	<i>Cryptostegia grandiflora</i>	<i>Fuchsia</i> spp.
<i>Brunnera macrophylla</i>	<i>Cucumis citrullus</i>	<i>Galinsoga</i> sp.
<i>Buddleia officinalis</i>	<i>Cucumis melo</i>	<i>Galium circaezans</i>
<i>Bursera simaruba</i>		<i>Gardenia jasminoides</i> <i>(G. florida)</i>
<i>Caladium</i> sp.		<i>Gladiolus halte</i> s
<i>Callicarpa dichotoma</i> <i>(C. purpurea)</i>		<i>Glycine max</i> ( <i>G. soja</i> )
<i>Callicarpa formosana</i>		
<i>Callistephus chinensis</i>		

<i>Gnaphalium japonicum</i>	<i>Malus domestica</i>	<i>Psidium guacum</i>
<i>Gnaphalium spathulatum</i>	( <i>Pyrus malus</i> )	<i>Psidium guajava</i>
<i>Gossypium herbaceum</i>	<i>Malva alcea</i>	<i>Punica granatum</i>
<i>Gossypium hirsutum</i>	<i>Malva parviflora</i>	<i>Pyrus communis</i>
<i>Helenium autumnale</i>	<i>Malva rotundifolia</i>	<i>Pyrus pyrifolia</i>
<i>Helianthus annuus</i>	<i>Malva sylvestris</i>	( <i>P. serotina</i> )
<i>Heliotropium indicum</i>	<i>Malvastrum fasciculatum</i>	<i>Raphiolepis</i> sp.
<i>Heptapleurum venulosum</i>	<i>Mammea americana</i>	<i>Rhamnus purshiana</i>
<i>Hibiscus abelmoschus</i> ( <i>H. moschatus</i> )	<i>Mangifera indica</i>	<i>Rhapis excelsa</i>
<i>Hibiscus eetveldaenus</i>	<i>Medicago sativa</i>	<i>Richardia scabra</i>
<i>Hibiscus esculentus</i>	<i>Melastoma candidum</i>	<i>Rosa</i> sp.
<i>Hibiscus rosa-sinensis</i>	<i>Melilotus alba</i>	<i>Ruellia diffiformis</i>
<i>Hibiscus sabdariffa</i> ( <i>H. suddariffa</i> )	<i>Melochia corchorifolia</i> ( <i>Riedlea corchorifolia</i> )	( <i>Hygrophila diffiformis</i> )
<i>Hibiscus syriacus</i>	<i>Melothria maderaspatana</i>	<i>Rumex acetosella</i>
<i>Hibiscus tiliaceus</i>	<i>Mentha spicata</i> ( <i>M. viridis</i> )	<i>Rumex crispus</i>
<i>Hibiscus trionum</i>	<i>Mentzelia lindleyi</i> ( <i>Bartonia aurea</i> )	<i>Sagittaria latifolia</i>
<i>Hoffmannia</i> sp.	<i>Monarda fistulosa</i>	<i>Salix</i> sp.
<i>Humulus lupulus</i>	<i>Morinda</i> sp.	<i>Salsola kali</i>
<i>Hydrangea</i> sp.	<i>Mosla formosana</i>	<i>Salvia scapiformis</i>
<i>Hydrocotyle prolifera</i>	<i>Nasturtium officinale</i>	<i>Salvia splendens</i>
<i>Impatiens</i> spp.	<i>Nemesia strumosa</i>	<i>Satureja vulgaris</i>
<i>Ipomoea batatas</i>	<i>Nepeta hederacea</i> ( <i>N. glechoma</i> )	<i>Saxifraga splendens</i>
<i>Ipomoea pandurata</i>	<i>Nicotiana tabacum</i>	<i>Scutellaria multiglandulosa</i>
<i>Ixora chinensis</i>	<i>Nymphaea</i> spp.	<i>Sedum purpureum</i>
<i>Lactuca debilis</i>	<i>Ochroma pyramidalis</i> ( <i>O. lagopus</i> )	( <i>S. telephium</i> ?)
<i>Lactuca sativa</i>	<i>Ocimum basilicum</i>	<i>Sedum reflexum</i>
<i>Lagenaria siceraria</i> ( <i>L. vulgaris</i> )	<i>Oenothera biennis</i>	<i>Sempervivum</i> sp.
<i>Lantana camara</i>	<i>Oldenlandia</i> sp.	<i>Senecio cruentus</i>
<i>Lantana montevidensis</i> ( <i>L. sellowiana</i> )	<i>Orobanche aegyptica</i>	<i>Senecio mikanioides</i>
<i>Lawsonia inermis</i>	<i>Orouparia formosana</i> ( <i>Uncaria</i> sp.)	<i>Senecio vulgaris</i>
<i>Leonurus sibiricus</i>	<i>Passiflora</i> sp.	<i>Sesamum orientale</i>
<i>Leontodon autumnalis</i>	<i>Perilla ocyoides</i>	( <i>S. indicum</i> )
<i>Lepidium virginicum</i>	<i>Persea americana</i> ( <i>P. persea</i> )	<i>Sida acuta</i>
<i>Leucas lavandulaefolia</i>	<i>Petasites japonicus</i>	<i>Solanum aculeatissimum</i>
<i>Leucas zeylanica</i>	<i>Petunia</i> sp.	<i>Solanum melongena</i>
<i>Lilium candidum</i>	<i>Phacelia californica</i>	<i>Solanum nigrum</i>
<i>Lilium formosanum</i>	<i>Phaseolus coccineus</i>	<i>Solanum seaforthianum</i>
<i>Lilium longiflorum</i>	<i>Phaseolus nanus</i>	<i>Solanum torvum</i>
<i>Lilium regale</i>	<i>Phaseolus vulgaris</i>	<i>Solanum tuberosum</i>
<i>Lilium speciosum</i>	<i>Philadelphus coronarius</i>	<i>Solanum verbascifolium</i>
<i>Lilium testaceum</i>	<i>Piper nigrum</i>	<i>Sonchus oleraceus</i>
<i>Liquidambar formosana</i>	<i>Pittosporum rhombifolium</i>	<i>Sophia</i> sp. ( <i>Sisymbrium</i> sp.? <i>Pachira</i> sp.)
<i>Lonicera</i> spp.	<i>Pittosporum tobira</i>	<i>Spathodea campanulata</i>
<i>Loranthus</i> sp.	<i>Plerocarpa mutica</i>	<i>Spergula arvensis</i>
<i>Luffa acutangula</i>	<i>Portulaca americana</i>	<i>Sphaeranthus</i> sp.
<i>Lycopersicon esculentum</i> ( <i>Solanum lycopersicum</i> )	<i>Portulaca oleracea</i>	<i>Spinacia oleracea</i>
<i>Lysimachia clethroides</i>	<i>Potentilla sylvestris</i>	<i>Stellaria media</i>
<i>Lysimachia stricta</i>	<i>Pourthiae a villosa</i>	<i>Strychnos spinosa</i>
<i>Magnolia</i> sp.	<i>Pouzolzia indica</i>	<i>Taraxacum officinale</i>
<i>Malpighia</i> sp.	<i>Prunus</i> sp.	( <i>T. dens-leonis</i> )
<i>Malus coronaria</i> ( <i>Pyrus coronaria</i> )		<i>Tectona grandis</i>
		<i>Tephrosia candida</i>
		<i>Tephrosia vogelii</i>
		<i>Theobroma cacao</i>
		<i>Tighonia grandiflora</i>
		<i>Tribulus terrestris</i>

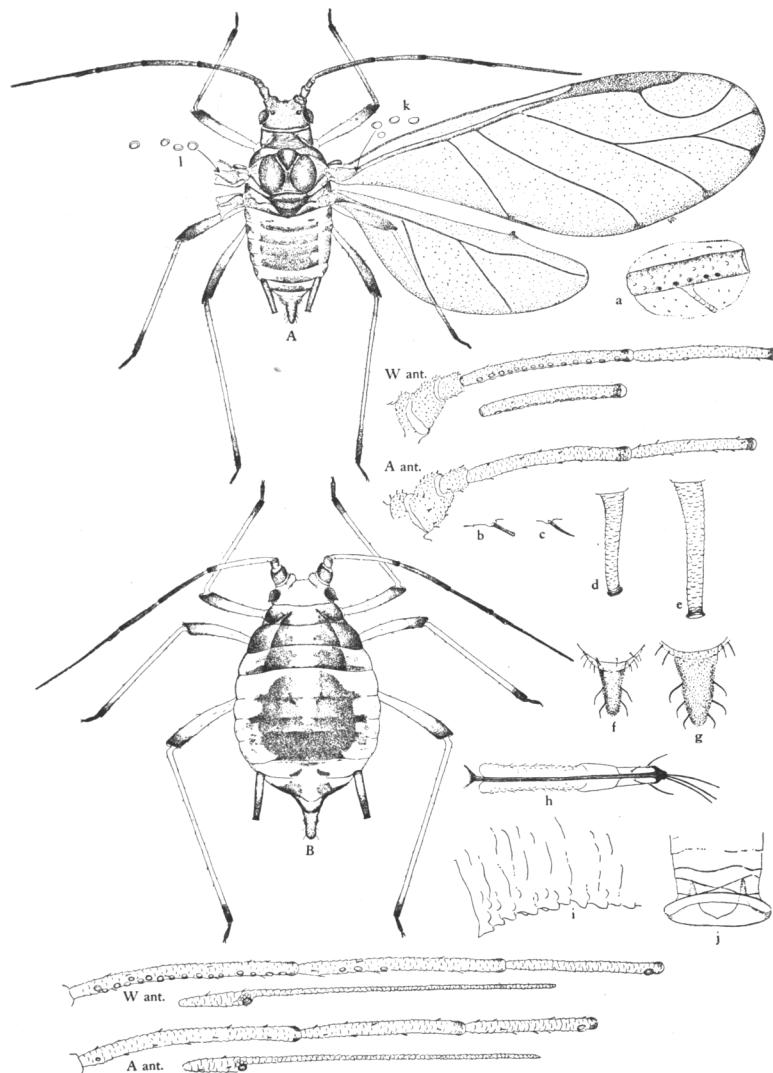


Fig. 3.—The lily aphid, *Myzus circumflexus* (Buckton): *A*, adult winged female: *a*, section of the costal vein showing fenestralike areas; *d*, cornicle; *f*, cauda; *k* and *l*, fenestras near the base of the subcostal vein; *W ant.*, antennae; *B*, adult apterous female: *A ant.*, antennae; *b* and *c*, setas on segments I and III of antenna; *e*, cornicle; *g*, cauda; *h*, rostrum; *i*, basal margin of cornicle; *j*, tip of cornicle. (All greatly enlarged.)

<i>Trifolium pratense</i>	<i>Veronica chinensis</i>	<i>Wisteria floribunda</i>
<i>Tulipa</i> sp.	<i>Veronica officinalis</i>	<i>Wisteria sinensis</i>
<i>Urena lobata</i>	<i>Veronica serpyllifolia</i>	<i>Wisteria macrostachya</i>
<i>Valeriana urticaefolia</i> ( <i>V. valericæfolia</i> )	<i>Vinca major</i>	<i>Wisteria venusta</i>
<i>Verbena bipinnatifida</i>	<i>Vinca minor</i>	<i>Zea mays</i>
<i>Verbena bracteata</i>	<i>Viola odorata</i>	<i>Zinnia</i> sp.
<i>Verbena hortensis</i> ( <i>V. hybrida</i> )	<i>Vitex trifolia</i>	
	<i>Vitis vinifera</i>	
	<i>Wedelia</i> sp.	

### THE LILY APHID

*Myzus circumflexus* (Buckton)

*Siphonophora circumflexa* Buckton (1876, p. 130)

The lily aphid is a common species in greenhouses throughout the country. It also occurs outdoors along the coast of California. It feeds and propagates on a wide variety of plants, on which it sometimes produces dense colonies, although it shows decided preferences for members of the family Liliaceae. The aphids are pale yellow, the alates being partly black, whereas the apterae often have distinct black or dusky patches on the dorsum as shown in figure 3. An extensive treatment of this species is given in a previous paper (Essig, 1938a).

**Distribution.** This aphid has been widely distributed, in commerce, on bulbs and ornamentals. At the present time it is known to occur in the following continents, countries, and states:

Asia: Japan.

Europe: England, Wales, Holland, Russia, Sweden, Switzerland.

North America: Canada; United States, in California, Colorado, Indiana, Illinois, Maine, Michigan, New York, Oregon, Utah, Wisconsin, and possibly in many other states not yet reported.

South America: Argentina.

Pacific: Java, Hawaii.

**Host Plants.** The lily aphid has been recorded from the following plants:

<i>Adiantum curreatum</i>	<i>Avena</i> sp.	<i>Diospyros</i> sp.
( <i>A. cuneatum</i> ?)	<i>Bixa orellana</i>	<i>Eichhornia crassipes</i>
<i>Aesculus californica</i>	<i>Brunnera macrophylla</i>	<i>Ficus</i> sp.
<i>Alisma</i> sp.	( <i>Anchusa myosotidi-flora</i> )	<i>Freesia</i> <i>refracta</i>
<i>Alopecurus pratensis</i>	<i>Caladium</i> sp.	<i>Fuchsia</i> spp.
<i>Anemone cylindrica</i>	<i>Calceolaria europaeum</i>	<i>Geranium</i> sp.
<i>Antholyza refracta</i>	<i>Calendula officinalis</i>	<i>Gladiolus</i> sp.
<i>Anthurium</i> sp.	<i>Carduus</i> spp.	<i>Hedera helix</i>
<i>Apium graveolens</i>	<i>Ceanothus</i> sp.	<i>Heliotropium laeve</i>
<i>Aquilegia canadensis</i>	<i>Cerastium viscosum</i>	<i>Heliotropium arborescens</i>
<i>Aquilegia canadensis</i> var. <i>flavescens</i>	<i>Cheiranthus cheiri</i>	( <i>H. peruvianum</i> )
<i>Arabis</i> sp.	<i>Chrysanthemum</i> sp.	<i>Hordeum</i> sp.
<i>Artemisia dracunculus</i>	<i>Crocus</i> sp.	<i>Hydrangea</i> sp.
<i>Arum</i> sp.	<i>Cyclamen europaeum</i>	<i>Hydrocotyle</i> <i>prolifera</i>
<i>Asparagus plumosus</i>	<i>Cyclamen indicum</i>	<i>Ipomoea</i> <i>maxima</i>
<i>Aster dracunculoides</i>	( <i>C. persicum</i> )	<i>Iris</i> spp.
<i>Aster dumosus</i>	<i>Cyrtomium</i> sp.	<i>Lilium elegans</i>
<i>Aster multiformis</i>	<i>Dahlia</i> sp.	<i>Lilium speciosum</i>
( <i>A. multiflorus</i> ?)	<i>Digitalis</i> sp.	<i>Lycium</i> sp.
		<i>Lycopersicon</i> sp.

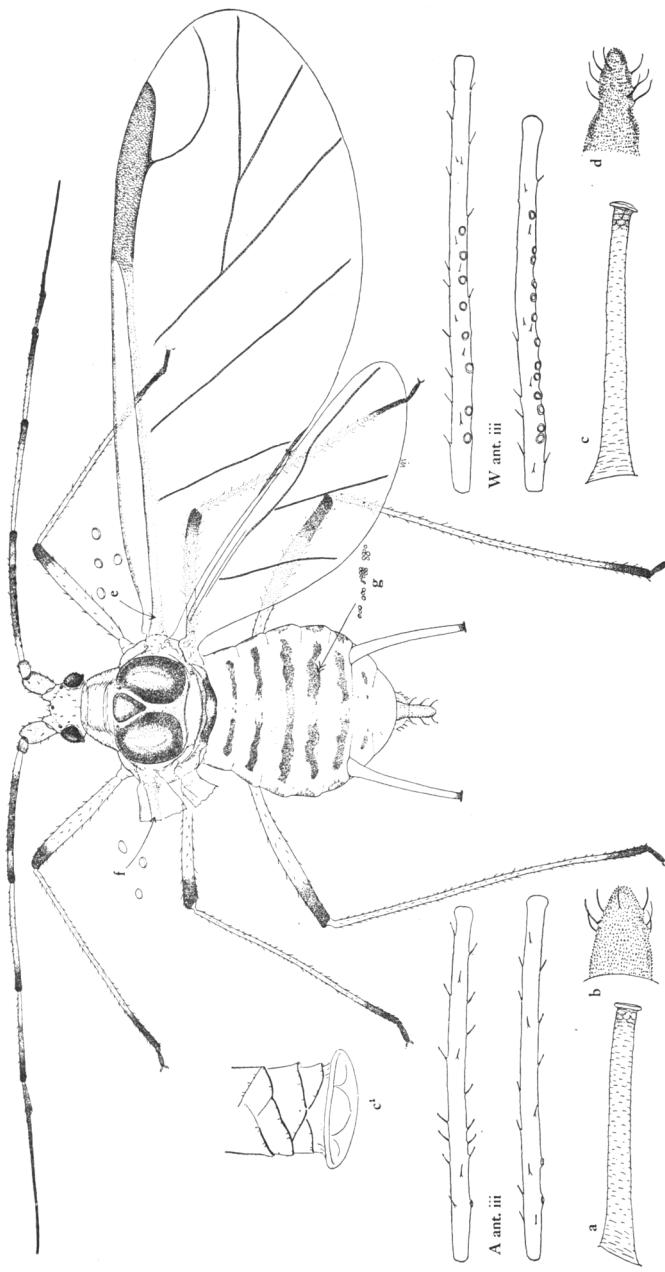


Fig. 4.—The foxglove aphid, *Myzus solani* (Kaltenbach), adult winged female; *W ant.*, antennal segment iii; *c*, cornicle; *c'*, tip of cornicle; *d*, cauda; *e* and *f*, femestras; *g*, gland pores as arranged in the dark transverse bands on the dorsum of the abdomen; *A ant.*, antennal segment iii of apterous female; *a*, cornicle of apterous female; *b*, coda of apterous female. (All greatly enlarged.)

<i>Malvastrum coccineum</i>	<i>Rudbeckia laciniata</i>	<i>Spiraea</i> sp.
<i>Myosotis</i> sp.	var. <i>hortensis</i>	<i>Stachys</i> sp.
<i>Myrtus</i> sp.	<i>Rumex</i> sp.	<i>Steironema lanceolatum</i>
<i>Nasturtium officinale</i>	<i>Sambucus</i> sp.	<i>Symporicarpus albus</i>
<i>Nicotiana</i> sp.	<i>Schizanthus</i> sp.	<i>Streptocarpus</i> sp. <i>(S. racemosus)</i>
<i>Orchis</i> sp.	<i>Senecio cineraria</i>	<i>Tradescantia fluminensis</i>
<i>Oxalis</i> sp.	<i>Senecio cruentus</i>	<i>Trifolium pratense</i>
<i>Parthenocissia quinquefolia</i>	( <i>Doronicum cruentum</i> )	<i>Triticum vulgare</i>
<i>Penstemon spectabilis</i>	<i>Senecio mikanioides</i>	<i>Tropaeolum</i> sp.
<i>Persea</i> sp.	<i>Senecio renifolius</i>	<i>Tulipa</i> spp.
<i>Physalis peruviana</i>	( <i>Cineraria renifolia</i> )	<i>Umbellularia californica</i>
<i>Plantago hirtella</i>	<i>Senecio tenuifolius</i>	<i>Vicia faba</i> var. <i>equina</i>
<i>Polymnia canadensis</i>	<i>Sinningia digitalifolia</i>	<i>Vinca major</i>
<i>Ranunculus acris</i>	( <i>Gloxinia digitalifolia</i> )	<i>Vinca minor</i>
<i>Ribes aureum</i> var. <i>tenuiflorum</i>	<i>Sisymbrium officinale</i>	<i>Viola nuttallii</i>
<i>Rorippa nasturtium-aquaticum</i>	<i>Solanum nigrum</i>	<i>Viola tricolor</i>
<i>Rosa</i> sp.	<i>Solanum tuberosum</i>	<i>Watsonia rosea</i>
<i>Rudbeckia laciniata</i>	<i>Solidago missouriensis</i>	<i>Zantedeschia aethiopica</i>
	<i>Sparaxis</i> sp.	<i>Zantedeschia melanoleuca</i>

### THE FOXGLOVE APHID

- Myzus solani* (Kaltenbach, 1843, p. 15–16)  
*Aulacorthum solani* (Kaltenbach)  
*Myzus convolvuli* (Kaltenbach)  
*Macrosiphum aucubae* Bartholomew (1932, p. 723–25)  
*Myzus gei* Theobald (1919, p. 157; 1926, p. 349–50)  
*Myzus glaucii* Theobald (1923, p. 103; 1926, p. 330–31)  
*Myzus hydrocotylei* Theobald (1925, p. 73; 1926, p. 334–35)  
*Macrosiphum matsumuraeanum* Hori (1926, p. 52–83)  
*Myzus mercurialis* Theobald (1919, p. 158; 1926, p. 350–51)  
*Myzus polyanthi* Theobald (1926, p. 341)  
*Myzus piceaellus* Theobald (1916, p. 146; 1926, p. 315–16)  
*Myzus primulana* Matsumura (1917, p. 400–1)  
*Myzus pseudolamii* Theobald (1915b, p. 274; 1926, p. 345–46)  
*Myzus pseudosolani* Theobald (1926, p. 313–15)  
*Macrosiphum veronicae* Theobald (1913, p. 93)  
*Myzus veronicellus* Theobald (1926, p. 347–48)  
*Aphis vineae* Walker (1848, p. 429)

The foxglove aphid was so designated by Patch (1928) because of its importance as a pest of the common foxglove, *Digitalis purpurea*, a European ornamental extensively cultivated throughout much of North America. Along the Pacific Coast, especially in northern California and Oregon, this plant has become naturalized and is regarded as a pest of some importance on grazing lands. In these areas this host plant affords an abundance of food for the aphid.

This aphid may be distinguished from its nearest relatives by its more than medium size; its long antennae, which are much longer than the body; the large wings extending well beyond the tip of the abdomen; the dark, broken, transverse bands on the dorsum of the abdomen of the alates; and the long, almost cylindrical cornicles, which have a few broken concentric rings or reticulations around the apices. The apices are well flared and dusky black.

The apterous forms are usually without markings, except that in mounted specimens two longitudinal rows of groups of small dorsal glands are often evident on the sides of the abdomen. The prevailing colors may vary from whitish and yellowish, to pale or dark green with dusky areas at tips of the paler antennal segments, the apices of the leg segments, and the tips of the cornicles. (See figs. 4 and 5.)

The species is variable in size and color, a characteristic which has caused considerable confusion among aphidologists and resulted in the large number

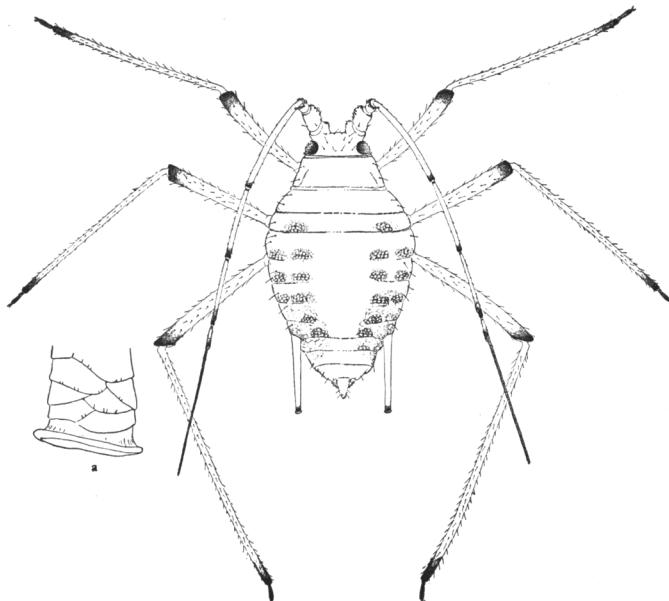


Fig. 5.—The foxglove aphid, *Myzus solani* (Kaltenbach), adult apterous female: *a*, tip of cornicle. Other details are shown in figure 5.

of synonyms. A fuller discussion of this aphid may be found in a previous paper (Essig, 1938a) and in one by Mason (1940).

**Nomenclature.** In recent years this aphid has been most often designated as *Myzus convolvuli* (Kalt.) and *Myzus solani* (Kalt.). The Imperial Institute of Entomology, London, has adopted *Macrosiphum solani*. This specific name has page precedence over *convolvuli* in Kaltenbach's work (1843, p. 15–16, 40–41). In this country the genus *Myzus* is preferred to *Macrosiphum* for this species.

The genus *Aulacorthum* was erected by Mordvilko in 1914 (1914, p. 68) and has been accepted for this species by Hille Ris Lambers and some other European aphidologists.

*Myzus convolvuli* (Kalt.) is the name that has been most frequently used for this aphid in North America. It has now been accepted as a synonym of *M. solani* (Kalt.) in Europe and by many in this country.

**Distribution.** The foxglove aphid is widely distributed in the temperate regions and occurs in greenhouses in even colder areas. It is reported from the following places:

Africa: Egypt.

Asia: China, Japan.

Europe: Belgium, England, France, and Italy.

North America: Canada, in British Columbia (Victoria) and Ontario (Vineland); United States, in California (Berkeley, Lagunitas, Lompoc, Los Angeles, Niles, Pepperwood, Point Reyes, Riverside, San Francisco, San Jose, Shafter, Stanford University, Ukiah, Ventura, Vichi Springs, Woodacre).

South Pacific: Territory of Hawaii (Hawaii, Oahu, and Maui).

**Host Plants.** The foxglove aphid is an omnivorous feeder and has been reported as feeding upon many hosts. Doubtless in some instances the insects were merely casuals which may have been only transitory visitors. The list compiled to date includes the following:

<i>Acer negundo</i>	<i>Erodium cicutarium</i>	<i>Mentha arvensis</i>
<i>Althaea</i> sp.	<i>Erodium moschatum</i>	var. <i>piperascens</i>
<i>Amaranthus</i> spp.	<i>Euphorbia booleci</i>	<i>Mentzelia lindleyi</i>
<i>Ambrosia</i> sp.	<i>Fragaria</i> spp.	( <i>Bartonia aurea</i> )
<i>Anemone</i> sp.	<i>Fuchsia arborescens</i>	<i>Mimulus aurantiacus</i>
<i>Anthemis</i> sp.	<i>Galium verum</i>	( <i>Diplacus aurantiacus</i> , <i>D. glutinosus</i> )
<i>Anthirrhinum</i> spp.	( <i>G. luteum</i> )	<i>Musa paradisiaca</i>
<i>Apium graveolens</i>	<i>Geranium</i> spp.	<i>Nemophila heterophylla</i>
<i>Aquilegia formosa</i>	(including <i>G. dissectum</i> )	<i>Oenothera</i> spp.
<i>Arctium lappa</i>	<i>Geum aleppicum</i> var. <i>structum</i>	<i>Oxalis</i> spp.
<i>Asarum</i> sp.	<i>Geum urbanum</i>	<i>Phalaenopsis</i> sp.
<i>Asclepias</i> spp.	<i>Gladiolus</i> spp.	<i>Phaseolus angularis</i>
<i>Atropa belladonna</i>	<i>Glaucium flavum</i>	<i>Phaseolus vulgaris</i>
<i>Aucuba japonica</i>	( <i>G. luteum</i> )	<i>Physalis</i> sp.
<i>Auricula</i> sp. ( <i>Primula auricula</i> ?)	<i>Glycine max</i>	<i>Picea abies</i> ( <i>P. excelsa</i> ) (casual?)
<i>Begonia</i> spp.	( <i>G. soja</i> )	<i>Pisum sativum</i>
<i>Brassica</i> spp.	<i>Gnaphalium</i> spp.	<i>Pittosporum</i> spp.
<i>Capsella bursa-pastoris</i>	<i>Helianthus tuberosus</i>	<i>Plantago</i> sp.
<i>Carum</i> spp.	<i>Helichrysum</i> sp.	<i>Portulaca</i> sp.
<i>Castilleja latifolia</i>	<i>Heracleum lanatum</i>	<i>Potentilla</i> sp.
<i>Cestrum</i> spp.	<i>Hieracium aurantiacum</i>	<i>Primula polyantha</i> ( <i>Polyanthus</i> sp.)
<i>Chenopodium album</i>	<i>Hieracium mucorom</i>	<i>Primula sieboldii</i>
<i>Chrysanthemum</i> spp.	<i>Hydrangea</i> spp.	<i>Primula vulgaris</i>
<i>Cineraria</i> spp. ( <i>Senecio</i> spp.?)	<i>Hydrocotyle vulgaris</i>	<i>Radicula curvisiliqua</i>
<i>Citrus maxima</i>	<i>Hyoscyamus</i> sp.	<i>Ranunculus</i> spp.
<i>Clintonia andrewsiana</i>	<i>Hypochaeris</i> sp.	<i>Rubus hawaiensis</i>
<i>Conium</i> spp.	<i>Ipomoea purpurea</i> ( <i>Convolvulus major</i> )	<i>Rubus idaeus</i>
<i>Convolvulus sepium</i>	<i>Lactuca sativa</i>	<i>Rubus idaeus</i> var. <i>strigosus</i>
<i>Convolvulus tricolor</i> ( <i>C. minor</i> )	<i>Lamium purpureum</i>	<i>Rubus laciniatus</i>
<i>Coprosma baueri</i>	<i>Lathyrus</i> spp.	<i>Rumex acetosa</i>
<i>Crataegus</i> spp.	<i>Leonotis leonurus</i>	<i>Rumex crispus</i>
<i>Crotalaria anagyroides</i>	<i>Lespedeza bicolor</i>	<i>Sambucus racemosa</i>
<i>Cucurbita pepo</i>	<i>Lilium</i> spp.	<i>Sanicula menziesii</i>
<i>Digitalis purpurea</i>	<i>Lycopersicon esculentum</i>	<i>Senecio</i> spp.
<i>Epipactis gigantea</i>	<i>Lysimachia</i> sp.	<i>Solanum giganteum</i>
<i>Eriodictyon californicum</i>	<i>Malus communis</i>	
	( <i>M. sylvestris</i> )	
	<i>Melilotus</i> spp.	

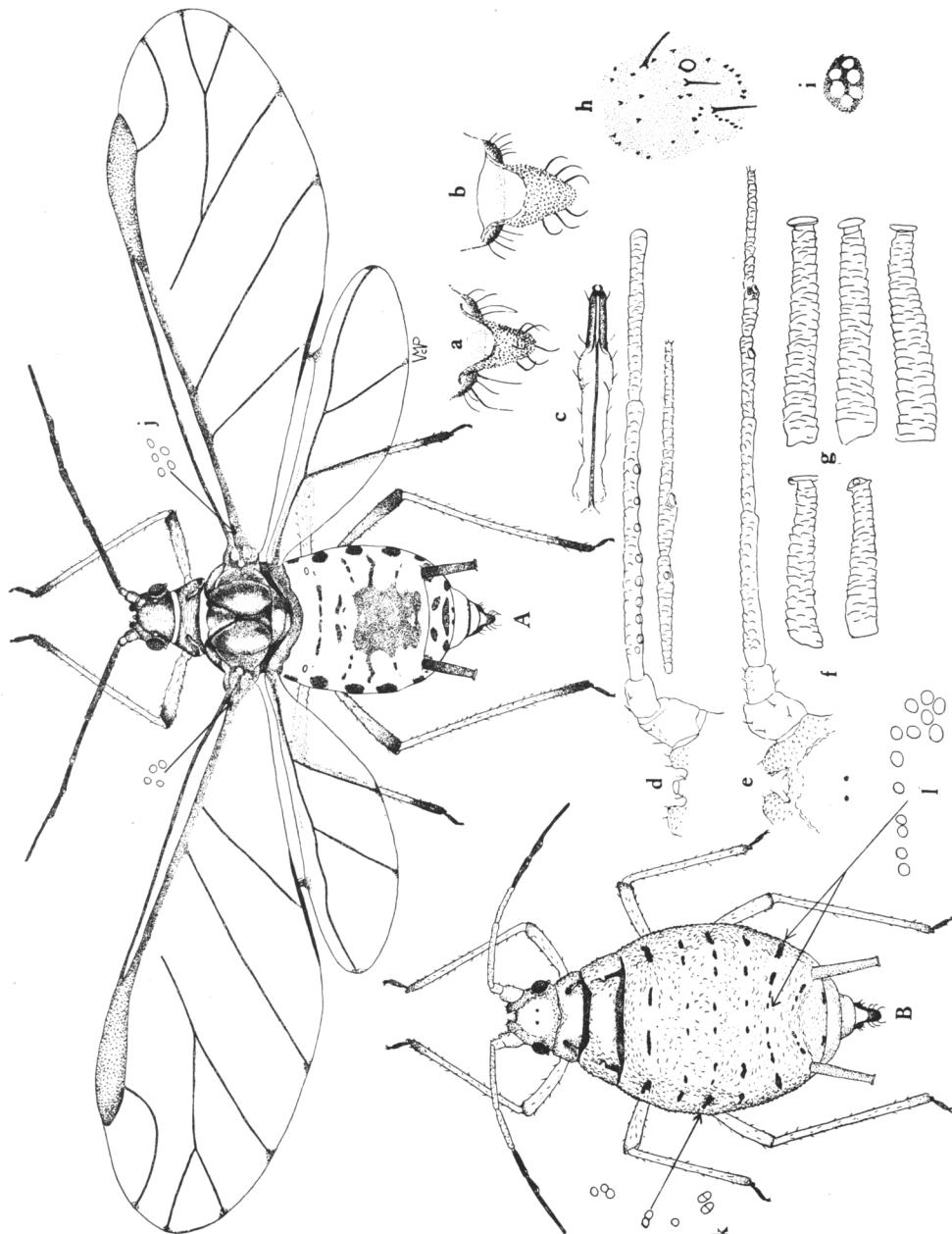


Fig. 6.—The ornate aphid, *Myzus ornatus* Laing: A, adult alate female; a, cauda; c, rostrum; d, front of head and antenna; f, cornicles; h, lateral abdominal dusky area; i, group of abdominal gland pores; j, fenestras near base of subcostal vein; B, adult apterous female; b, cauda; e, front of head and antenna; g, cornicles; l, gland pores arranged in dark broken bands on abdomen; k, lateral gland pores. (All greatly enlarged.) (From Pan-Pacific Entomologist 14:94, 1938.)

<i>Solanum jasminoides</i>	<i>Tanacetum</i> sp.	<i>Veronica beccabunga</i>
<i>Solanum melongena</i>	<i>Taraxacum officinale</i>	<i>Vinca major</i>
<i>Solanum tuberosum</i>	<i>Trifolium incarnatum</i>	<i>Vinca minor</i>
<i>Solidago</i> sp.	<i>Trifolium pratense</i>	<i>Viola</i> spp.
<i>Sonchus</i> spp.	<i>Trifolium repens</i>	<i>Wisteria sinensis</i>
<i>Stachys ajugoides</i>	<i>Ulmus</i> sp.	<i>Zantedeschia</i> sp.
<i>Stachys bullata</i>	<i>Urtica dioica</i>	<i>Zanthoxylum pterota</i>
<i>Stachys californica</i>	<i>Urtica gracilis</i>	( <i>Z. fagara</i> ).
<i>Stellaria media</i>	<i>Verbascum</i> sp.	
<i>Symporicarpos albus</i>	<i>Verbena</i> sp.	

### THE ORNATE APHID

*Myzus ornatus* Laing (1932, p. 52-53; Essig, 1938a, p. 92-95; Mason, 1940, p. 14-15)

The ornate aphid, *Myzus ornatus* Laing is very small and is quite easily recognized by the transverse, dusky, broken dark bands, on the dorsum of the apterae, as shown in figure 6. A more complete discussion of his aphid is given in a previous paper (Essig, 1938b).

**Distribution.** The ornate aphid is a newcomer in California, having first been taken in Berkeley, April 4, 1936, by the writer. It is rather widely distributed in Northern Europe. It was first reported in England in 1932 (Laing, 1932, p. 52-53). Since then it has been collected in Scotland, Ireland, and Belgium (Essig, 1938a). In 1941 it was discovered in New South Wales by Zeck (1941). In Honolulu, Hawaii, it was first collected in 1944 by E. C. Zimmerman, who also found it on the Island of Maui, 1945. In the United States it is now known to occur only in California and Oregon. In California it has been collected at Alton (H. T. Osborn), Berkeley (in greenhouses and outdoors, E. O. Essig), Lompoc (R. M. Bohart, K. F. Baker, W. C. Snyder), Los Angeles (R. H. Smith), and Sacramento (J. B. Steinweden); in Oregon, at Portland and Yachats (J. H. Schuh).

**Host Plants.** A list of known host plants follows:

<i>Achyranthes</i> spp.	<i>Fragaria</i> sp.	<i>Picris</i> sp.
<i>Apium graveolens</i>	<i>Fuchsia elegans</i>	<i>Plantago major</i>
var. <i>dulce</i>	( <i>F. globosa</i> ?)	<i>Potentilla</i> sp.
<i>Artemisia vulgaris</i>	( <i>F. coccinea</i> ?)	<i>Primula</i> spp.
<i>Baccharis viminea</i>	<i>Geum urbanum</i>	<i>Ranunculus repens</i>
<i>Bellis perennis</i>	<i>Hedera helix</i>	<i>Rheum rhaboticum</i>
<i>Brassica</i> spp.	<i>Helenium peregrinum</i>	<i>Richardia rehmannii</i>
<i>Buddleia orientalis</i>	<i>Helianthemum</i> sp.	<i>Rubus procerus</i>
<i>Calceolaria</i> sp.	<i>Heliotropium arborescens</i>	<i>Rumex acetosella</i>
<i>Camellia</i> sp.	<i>Hydrangea</i> sp.	<i>Rumex obtusifolius</i>
<i>Capsicum frutescens</i>	<i>Ilex</i> sp.	<i>Salvia</i> sp.
<i>Chrysanthemum</i> sp.	<i>Lantana</i> sp.	<i>Scabiosa</i> sp.
<i>Cineraria</i> sp.	<i>Lapsana communis</i>	<i>Taraxacum officinale</i>
(Senecio sp.?)	<i>Loiseleuria procumbens</i>	<i>Teesdalia nudicaulis</i>
<i>Clematis</i> sp.	( <i>Azalea procumbens</i> )	<i>Trifolium pratense</i>
<i>Coleus</i> sp.	<i>Malus communis</i>	<i>Ulmus procera</i>
<i>Crepis virens</i>	( <i>Pyrus malus</i> )	<i>Urtica dioica</i>
<i>Crotalaria anagyroides</i>	<i>Matricaria chamomilla</i>	<i>Valeriana</i> sp.
<i>Dianthus barbatus</i>	<i>Medicago sativa</i>	<i>Veronica</i> spp.
<i>Digitalis purpurea</i>	<i>Nasturtium officinale</i>	<i>Viola</i> sp.
<i>Dipsacus fullonum</i>	( <i>Roripa nasturtium</i> )	
<i>Erodium</i> sp.	<i>Panax lancasteri</i>	

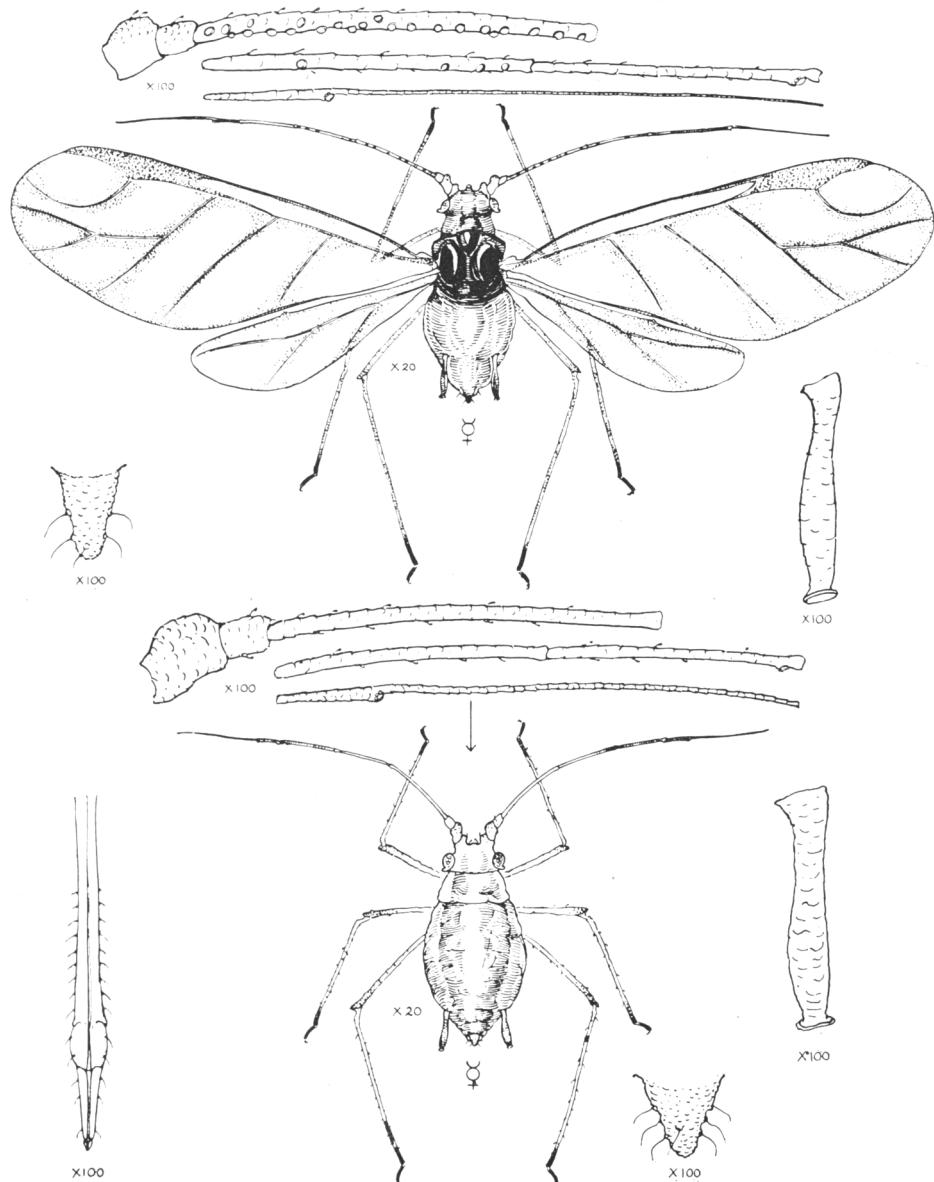


Fig. 7.—The violet aphid, *Micromyzus violae* (Pergande) : winged female with antenna, cauda, and cornicle greatly enlarged; apterous female with antenna, rostrum, cauda, and cornicle. (All enlarged as indicated.) (Drawings by Frieda Abernathy.)

## THE VIOLET APHID

- Micromyzus violae* (Pergande)  
*Rhopalosiphum violae* Pergande (1900, p. 29-30)  
*Rhopalosiphum violae* Essig (1909, p. 4-8)  
*Fullawayella violae* (Pergande) Baker, 1919, p. 45-46; Takahashi, 1921, p. 29; Hardy, 1931, p. 34-35)  
*Neotoxoptera violae* Theobald (1915a, p. 131-32; Baker, 1919, p. 45-46)

The violet aphid may at once be recognized by the pictured or cloudy wings and its very dark red, maroon, brownish, or even greenish-black body. The long antennae, slightly swollen cornicles, and short cauda also aid in separating it from other species infesting violets and pansies. It is slow and sluggish and appears to move only with considerable exertion. For more extended descriptions see Sanborn (1904, p. 64-65) and Essig (1935, p. 157). The winged and apterous females are shown in figure 7.

**Nomenclature.** Although this species has been shifted among at least four genera, the genus *Micromyzus* van der Goot (1916) now appears to be most logical.

The species *Rhopalosiphum violae* Essig was described without knowledge of Pergande's description. It is a synonym.

The genus *Neotoxoptera* was erected for what appears to be a variant of *Micromyzus violae* (Pergande). Specimens of this species frequently diverge from the type.

**Distribution.** The violet aphid has become widely distributed through commerce and now occurs in many parts of the subtropical and temperate regions where violets and pansies are cultivated or grow wild in the open. The aphid also abounds on the host plants grown in greenhouses or in other sheltered places. It has been reported from the following localities:

- Africa: Onderstepoort, Transvaal.  
Asia: Formosa.  
Australia: Queensland.  
North America: British Columbia; California (Claremont, Berkeley, Porterville, Riverside, Santa Ana, Santa Paula, Stanford University, Ventura), Connecticut, Illinois, Kansas, Mississippi, New Jersey, New Mexico, New York, and Washington.

**Host Plants.** The violet aphid feeds chiefly on the tender new growth of violets and pansies, including the leaves, leaf stems, and flowers; when abundant, it may occur on the entire plants and especially on the undersides of the leaves close to the ground. Infested plants often appear dwarfed, the foliage curled and sickly—no doubt the result of the virus diseases transmitted by the aphid. The only recorded host plants of this aphid are:

- Lilium* spp.  
*Mazus japonicus*  
*Viburnum* sp.  
*Viola* spp.—many, but apparently not all species, are infested.

Adult alates may be found resting on many other plants upon which young are not reared.

## OTHER SPECIES OF APHIDS REPORTED AS FEEDING ON VIOLETS AND PANSIES

Species of aphids feeding on violets and pansies and on other members of the family Violaceae are not numerous. In addition to the species already discussed, the following aphids have also been reported by Patch (1928, p. 180-81) as feeding upon these plants:

The buckthorn aphid, *Aphis abbreviata* Patch, on *Viola tricolor*; Maine (Patch, 1924, p. 38). Patch has made this a synonym of *Aphis rhamni* Boyer de Fonscolombe (1841, p. 177).

*Aphis certa* Walker on *Viola tricolor* England (Theobald, 1929, p. 63).

*Aphis malvae* (Koch) on *Viola tricolor*; Lahore (Das, 1918, p. 273).

*Aphis malvacearum* v.d. Goot (= *A. malvoides* Das) on *Viola tricolor*; Lahore (Das, 1918, p. 273).

*Aphis plantaginis* Schrank on *Viola* sp.; England, Belgium, France, Germany, Italy (Theobald, 1927, p. 131).

*Aphis violae* Schouteden on *Viola tricolor*; Belgium (Schouteden, 1900, p. 127; 1906, p. 229).

*Macrosiphum malvae* (Mosely) on *Viola odorata* and *V. tricolor*; England and Italy (Macchiati, 1883, p. 230; Theobald, 1926, p. 124). Theobald considers this species to be a synonym of *Macrosiphum pelargonii* (Kalt.). This latter species has so often been confused with *Myzus solani* (Kalt.) that it is possible *Macrosiphum malvae* may be a synonym of it.

The tulip leaf aphid, *Rhopalosiphoninus tulipella* (Theobald), on *Viola* sp.; England (Theobald, 1926, p. 222). This species has been found on tulip bulbs from Washington state (Essig collection, 1934), and alates resting on *Hesperis matronalis* at Corvalis, Oregon, April 15, 1941, by J. Schuh (Essig collection). It has been taken in quarantine on tulip bulbs from Holland (California State Department of Agriculture, March 6, 1945).

The green peach aphid, *Myzus persicae* (Sulzer), has been successfully used by H. H. P. Severin in transmitting celery calico to pansies. This insect does not appear to have been recorded as regularly feeding and reproducing on pansies and violas, although it has been listed on more than 200 host plants. It has been fully discussed by the author in a previous paper (Essig 1938a, p. 482-85).

*Saltusaphis insessa* Walker reported on *Viola* sp. by Walker in England, represents perhaps casual visitors on violets or an error (Theobald 1927, p. 199). This aphid was subsequently taken on *Juncus maritima* in England.

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