APHID TRANSMISSION OF
CAULIFLOWER-MOSAIC VIRUS

HENRY H. P. SEVERIN and C. M. TOMPKINS

THE MOST IMPORTANT
SPECIES OF APHIDS ATTACKING
CRUCIFEROUS CROPS
IN CALIFORNIA

E. O. ESSIG
THE MOST IMPORTANT SPECIES OF APHIDS ATTACKING CRUCIFEROUS CROPS IN CALIFORNIA

E. O. ESSIG
THE MOST IMPORTANT SPECIES OF APHIDS ATTACKING CRUCIFEROUS CROPS IN CALIFORNIA

E. O. ESSIG

 Aphids cause great damage to cruciferous crops—broccoli, brussels sprouts, cabbage, cauliflower, kale, mustard, radishes, turnips, and others. These insects weaken, stunt, and sometimes even kill the plants by sucking the juice. They may make cabbage, brussels sprouts, cauliflower, and broccoli wholly unfit to market, for it is difficult or impossible to remove them from the heads of such plants. On seed farms, they may completely destroy the plants before harvest by infesting the seedstalks. They cause even greater losses by transmitting plant viruses, which may destroy the plants over considerable areas.

Three aphid species that breed on these plants are responsible for most of the damage in California. These are the cabbage aphid, *Brevicoryne brassicae* (Linnaeus); the turnip or false cabbage aphid, *Rhopalosiphum pseudo-brassicae* (Davis); and the green peach aphid, *Myzus persicae* (Sulzer). All three species have become world wide in distribution and are to be found generally throughout the ranges of the host plants. This paper assembles the salient facts on their synonymy, characteristics, life histories, distribution, and host plants, as a basis for studies on their transmission of viruses and on their control.

THE CABBAGE APHID

*Brevicoryne brassicae* (Linnaeus) (Van der Goot, 1915, 1918)

*Aphis brassicae* Linnaeus (1746, 1758)

*Aphis raphani* Schrank (1801)

*Aphis insatidis* Boyer de Fonsecolombe (1841)

*Aphis floris-rapae* Curtis (1860, p. 69–83)

The cabbage aphid, *Brevicoryne brassicae* (Linnaeus) is usually more abundant on cruciferous crops than any other aphid and is therefore more injurious.

The cabbage aphid can be distinguished from other aphids by the large closely crowded colonies (fig. 1), the white waxy powdery covering over the bodies of the alate and apterous individuals, and the cruciferous host plant.

---

1 Paper received for publication June 20, 1947.
2 Professor of Entomology and Entomologist in the Experiment Station.
3 See “Literature Consulted” for citations, referred to in the text by author and date.
4 The genus *Brevicoryne* was proposed by B. Das and erected by Van der Goot in 1915 (1915 and 1918).
5 First referred to by Linnaeus in 1746 (1746) and described by him in 1758 (1758).
6 A synonym erected by Schrank (1801) for an aphid feeding on cabbage in Bavaria, Germany.
7 A synonym collected in the Province of Aix, France, previous to 1841, was described by Boyer de Fonsecolombe (1841).
8 This species was described by Curtis in 1860 (1860, p. 69–83) and called the turnip-flower plant louse. In this article Curtis lists the suggested control measures (tobacco decoctions, lime dust, hand-picking infested parts of plants) and discusses at length the insect predators and parasites of this aphid.
The turnip aphid has often been confused with this species; differences are discussed on pages 412-13.

Mounted specimens are readily distinguished by the long antennal segment III, which in the alates is covered with circular secondary sensoria; by the very short cornicles; the long slender tarsi; and the unguis, spur, or filament of the terminal antennal segment, which is four to five times as long as the base. Figures 2 and 3 show details of the male and three forms of females.

**Life History.** In the warmer climates of the distribution of the cabbage aphid, there is continuous reproduction by parthenogenesis, and only apterous and alate parthenogenetic females occur. There may be as many as 30 or more generations during the year, so that extremely dense and destructive populations are built up. During the winter these populations may be slowed up and even reduced by cooler temperatures, rain, and other climatic factors. In California this aphid is found in prosperous colonies on wild mustard (*Brassica campestris*) and other native or weedy cruciferous plants. In summer and fall, many of the natural host plants disappear and the aphid is forced to cultivated crops, which may suffer severely from its attacks. Wherever summer rains occur, the native hosts continue to serve as reservoirs for feeding and breeding.

During spring—April and May—and fall—October and November—great numbers of winged migrants may be seen in California. They literally fill the air in certain areas along the foothills.
Fig. 2.—The cabbage aphid, *Brevicoryne brassicae* (Linn.): the alate and apterous viviparous females. The important body structures, including antennae, cornicles, anal plate, cauda, and tip of rostrum, used in identification, are greatly enlarged as indicated on the illustration. Note the long antennal segment III covered with sensoria and the long slender tarsi, which separate this aphid from others feeding on cruciferous plants. (Drawing by Frieda Abernathy.)

In the more northern reaches of its distribution, the spring and summer reproductives (migrants and alienicolae) are replaced in fall by sexuparae, or gynoparae. The sexuparae are apterous and alate viviparous parthenogenetic females that give birth to sexuales. Males and females of the sexuales (fig. 3)
mate, and the females lay eggs that survive the winter. Eggs of this aphid are usually laid on old stems or leaves of the cruciferous crops left in the fields. In northern Europe the eggs laid in October, November, and December hatch the following March, April, and May. Even in that climate a few adult viviparous females occasionally survive the winters, but ordinarily all of these perish, and only the eggs remain to hatch in spring and give rise to the spring, summer, and fall colonies that are so destructive.

**Host Plants.** The host plants of the cabbage aphid belong almost entirely to the large, cosmopolitan family Cruciferae and include the following:

- **Arabiopsis Maliana**
- **Arabis glabra**
- **Barbarea vulgaris**
- **Brassica adpressa**
- **Brassica arvensis (Sinapis arvensis)**
- **Brassica caulorapa**
- **Brassica chinensis**
- **Brassica erucastum (Erucastrum pollichi)**
- **Brassica fruticulosa**
- **Brassica hirta (B. alba)**
- **Brassica juncea**
- **Brassica juncea var. cris-pitola (B. japonica)**
- **Brassica kaber (B. campestis)**
- **Brassica muralis**
Septem her, 1948] Essig: Aphids Attacking Cruciferous Crops

Some other plants reported as hosts are very questionable. They may have been only resting places for the dispersing or migrating alates.

**Origin and Distribution.** The cabbage aphid is one of the commonest species to be found throughout the temperate and subtropical regions of the world. This wide distribution has no doubt been made possible by the very extensive distribution and abundance of its cruciferous host plants. The many vegetables, ornamental flowering plants, and economic weeds have been carried through commerce to all inhabited lands and have become adapted in all except the most extreme climates.

The cabbage aphid has no doubt been associated with cultivated cruciferous crops in certain areas ever since they were developed by man. Its exact place of origin may never be definitely established. However, this insect appears to have first been associated with host plants originating in the Palaearctic Region and was early reported on wild and cultivated plants in Europe. It probably occurred on cabbages and related host plants long before it was recorded in print. Frisch (1734) is credited as having first brought this aphid to the attention of the public in 1734 when he reported it from Germany, described its work, and presented drawings that aid in its identification.

So far as I am able to ascertain, the cabbage aphid does not appear to be a serious pest of cruciferous crops in Asia. It is rarely found in lists of destructive insects from that continental area. Wu (1935) in his *Catalogus Insectorum Sinensium* does not list this species. Recently Ying-Tou Mao* reviewed Chinese literature on aphids thoroughly, but found the cabbage aphid reported only from Hangchow, Fukien, and Taiwan. This species was not included in any of several large collections of aphids I have received from China. The shortage of records may simply indicate a lack of intensive study of this insect in China. Still, it is especially significant in view of the fact that many of the most important and useful members of the cabbage family originated in that country. It may be a further indication of the possible origin of the cabbage aphid in Northwestern Europe, the home of the cabbage.

The species does appear to be quite widely distributed in Japan and has been reported by many entomologists in that country.

From the information at hand, it appears possible that the cabbage aphid

---

*Ying-Tao Mao. A list of Chinese aphids and their host plants. Typewritten manuscript.
may have originated in Western Europe in association with wild or sea cabbage, charlock, cabbage, cauliflower, Brussels sprouts, kale, and other wild and cultivated cruciferous plants. Its counterpart in Asia and the Pacific islands appears to be the turnip aphid.

It is hardly practical to list all or even the larger geographical units throughout the world, especially in Africa and South America, where the cabbage aphid has been found. The following list has been compiled from many sources:

Asia: Astrakhan, Bessarabia, China (Amoy, Hangchow, Hopei, Kiangsu, Taiwan), Iraq, India (Lahore), Japan (Fukuoka, Hokkaido, Morioka), Palestine, Siberia, Syria, Transcaucasia

Africa: Bengal, Cape of Good Hope, Egypt, Eritrea, Kenya, Madagascar, Mauritius, Morocco, Nairobi, Natal, Nyassaland, Orange Free State, Rhodesia, Transvaal

Australia: Queensland, New South Wales, South Australia, Tasmania

New Zealand

Europe: Belgium, Czechoslovakia, France, Germany, Great Britain, Holland, Ireland, Italy, Latvian, Malta, Norway, Poland, Serbia, Spain, Sweden, U.S.S.R.

North America: Canada (British Columbia, Ontario, Quebec, and other provinces), United States (every state), West Indies (Cuba, Puerto Rico, Santo Domingo), Bermuda, Guatemala, Mexico

South America: Argentina, Brazil, Chile, Colombia, Virgin Islands

South Pacific: Fiji, Hawaii

THE TURNIP APHID

*Rhopalosiphum pseudobrassicae* (Davis)
*Aphis pseudobrassicae* Davis (1914, p. 231)
*Lipaphis pseudobrassicae* (Davis) (Mordvilko, 1928, p. 200)
*Aphis mathiolellae* Theobald (1918) (Hall, 1926, p. 24)

The turnip or false cabbage aphid is almost as destructive to cruciferous crops as is the cabbage aphid. It appears to have originated in Asia, where it has a wide distribution. It has apparently been introduced into many other countries and has become widely distributed in many localities.

It was no doubt early confused with the cabbage aphid and became firmly established in most areas before it was recognized as a distinct species. In fact, its true identity was not discovered until 1914 when it was described as *Aphis pseudobrassicae* by Davis (1914, p. 231) from specimens collected by W. J. Schoene on cabbage at Geneva, New York on July 15, 1912, and on mustard and kale taken at Evansville, Indiana, November 20 of the same year. In September and October, 1913, additional material was taken on radish and turnip at Lafayette, Indiana, and on turnip at College Station, Texas, by F. B. Paddock (1915).

In size and general appearance it greatly resembles the cabbage aphid. However, in California, it seems to have less powdery wax on its body. Specimens of whole colonies over large areas may appear bright green and almost devoid of the white waxy secretion so characteristic of the cabbage aphid. However, pulverulent forms do occur here. Specimens are paler in color than the cabbage aphid and lack the broad transverse broken dark bands on the dorsum of the alates and apterous forms; antennal segment III is much

---

10 This common name has also been used for the cabbage aphid, *Brevicoryne brassicae* (Linn.). The turnip aphid is also known as the false cabbage aphid.
shorter; tarsi are shorter; cornicles are longer; there are secondary sensoria present on antennal segment III and IV of the alates; the unguis, spur, or filament of the terminal antennal segment is three times the length of the base; and the cauda is triangular in shape. Important characters for identification are shown in figure 4.

Fig. 4.—The turnip or false cabbage aphid, *Rhopalosiphum pseudobrassicae* (Davis): alate and apterous viviparous females with the antennae, cornicles, anal plates, caudas, and tip of rostrum greatly enlarged as indicated. Note the sensoria on both antennal segments III and IV of the alate. (Drawings by Frieda Albernathy.)

**Life History.** The life history is similar to that of the cabbage aphid. Allen and Harrison (1941) have studied the life history in the south and state that there are 15 to 46 generations a year; 50 to 100 young are produced by a single female; aphids live as long as 2 months; no sexuales appear in the south; living forms occur throughout the year; most damage is done during the winter months—October to and including the following March. The life history in the northern limits of distribution has not been studied and, although sexual forms are probably produced, they have not been reported.

**Host Plants.** The host plants are similar to those of the cabbage aphid, but are as yet not so well known. The following are reported to date:

- *Barbarea vulgaris*
- *Brassica caulorapa*
- *Brassica cernua*
- *Brassica juncea* (*B. rugosa*)
- *Brassica kaber* (*B. campestris*)
- *Brassica napobrassica*
- *Brassica napus*
- *Brassica nigra*
**Brassica oleracea**
**Brassica oleracea var. acephala**
**Brassica oleracea var. botrytis**
**Brassica oleracea var. capitata**
**Brassica pekinensis**
**Brassica rapa**
**Capsella bursa-pastoris**

**Distribution.** As previously indicated, this aphid probably originated in Asia and has spread by commerce throughout many other parts of the world. So far no records of its occurring in Europe have been noted in publications, which seems quite remarkable. The following distribution is known:

Asia: China (Chekiang, Hopei, Kwangtung, Shantung, Taiwan), Korea (Sui-gan), India, Iraq, Japan (general, Daito Jina), Java, Loocchoo, Siam, Sumatra

Africa: Egypt, Cape Colony, Maroc, Uganda

Australia: New South Wales

New Zealand

North America: Canada (British Columbia, Manitoba, Ontario, Quebec); United States (throughout much of the entire country: actually reported from Alabama, California—Berkeley, El Centro, Half Moon Bay, Lompoe, Los Angeles, Riverside, San Francisco, Stanford University, Stockton, Ventura—Connecticut, Florida, Georgia, Illinois, Indiana, Louisiana, Maine, Maryland, Mississippi, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Wisconsin), Bermuda, Puerto Rico

South America: Argentina, Trinidad

South Pacific: Hawaii (Hawaii, Oahu)

**THE GREEN PEACH APHID**

*Myzus persicae* (Sulzer)

*Aphis persicae* Sulzer (1776, p. 105)

*Aphis dianthi* Schrank (1801)

*Aphis vulgaris* Kyber (1815)

*Aphis fureipes* Rafinesque (1817)

*Aphis rapae* Curtis (1842)

*Aphis vastator* Smee (1846)

*Aphis cyanoglossi* Walker (1848)

*Aphis egressa* Walker (1849)

*Aphis redundans* Walker (1849)

*Aphis aucta* Walker (1849)

*Aphis persicaecola* Boisduval (1867)

*Siphonophora achyranthes* Monell (1879)

*Rhopalosiphum tulipae* Thomas (1879)

*Myzus malvae* Oestlund (1886)

*Myzus pergandii* Sanderson (1901)

*Phorodon cyanoglossi* Williams (1910)

*Rhopalosiphum solani* Theobald (1912)

*Rhopalosiphum betae* Theobald (1913)

*Rhopalosiphum lactucae* Theobald (1915)

*Rhopalosiphum tuberosellae* Theobald (1919)

The green peach aphid is without doubt the most important economic species in the entire family Aphididae. It is not only cosmopolitan in distribution and feeds on more varieties of host plants, but it is also capable of transmitting more kinds of plant viruses than any other insect known at the present time.

**Description and Life History.** Like most widely distributed aphids, the green peach aphid has a variable life history, not greatly different from that of the cabbage aphid. In the warmer tropical and subtropical areas, it is maintained by continuous generations of viviparous parthenogenetic fe-

---

11 This aphid is called the tobacco aphid in Southern Rhodesia and other parts of Africa (Brain, 1940, p. 254).
males—both winged and wingless. There may be 30 to 40 generations a year, although the complete life history has not been accurately recorded in all areas. In the northern limits of its range, it is maintained chiefly by migrations from more favorable and warmer areas where it has persisted and multiplied even during the winter. The migrations or dispersals northward begin early in February, March, April, and May, and may continue until winter approaches. The advance northward is regulated by the increasingly favorable seasonal weather conditions. Escapes from greenhouses and even residences may also account for small isolated colonies which may appear in northern regions in advance of the regular migrations.

In quite cold northern climates the green peach aphid may give rise to sexuales, and eggs are produced that survive the winters and give rise to spring generations. The alternate winter hosts are usually fruit trees, including apricots, cherries, nectarines, peaches, and plums.

In California sexual forms are rarely taken. But males and females were collected on sand cherry, *Prunus pumila*, at Riverside by R. C. Dickson on December 20, 1940. They are probably quite common but are not readily discovered.

The various forms are:

*Stem mother*, a pink form that hatches from the overwintering egg and gives rise to succeeding generations.

*Apterous viviparous female* (fig. 5, *B*), a pale yellow or green form born from the stem mother and living on the primary host. She gives birth to winged spring migrants.

*Spring migrants*, greenish, yellowish, or reddish, black-marked winged viviparous females (fig. 5, *A*) that migrate from the winter primary hosts and settle on spring and summer hosts of all kinds. These may also migrate great distances, especially if carried by favorable winds. The apterous females are usually greenish and have the apical portions of the antennae and legs, and tips of cornicles dusky or black. The alates are yellowish or greenish, with the head, thorax, most of the antennae, apical portions of leg segments, bases of the cornicles, lateral spots, and a large median dorsal spot on the abdomen black. The swollen cornicles and black dorsal abdominal spot serve to identify this aphid readily.

*Summer alate* and *apterous viviparous females* are not unlike the spring migrants. They are produced through many generations on the summer hosts and disperse freely over wide areas. According to Profft (1939, p. 14–15) winged adults have been found on islands 36 miles from the North Sea coast of Germany and on Spitzenbergen, hundreds of miles from their normal habitat. The progeny of these may survive the winters in favorable areas.

*Fall migrants*, usually darker specimens that migrate to the primary host plants, where they mate and give rise to alate males and apterous sexual females. The latter lay the overwintering eggs.

*Males*, small, very dark, almost wholly black.

*Oviparous females*, apterous, not greatly different from the apterous viviparous females.

*Host Plants*. It will probably never be possible to secure an all-inclusive list of the host plants of this aphid. Its feeding habits are so varied that its
Fig. 5.—The green peach aphid, *Myzus persicae* (Sulzer): *A*, Adult alate viviparous female: *c* and *d*, fenestras or small transparent pores at the bases of the forewings; *r*, rostrum; *W ant.*, antenna; *W corn.*, cornicle; *W cauda*, cauda. *B*, Adult apterous viviparous female: *A ant.*, antennae; *A cauda*, cauda. All greatly enlarged.
capacity for acquiring new hosts seems to be unlimited. The following list is as complete as facilities at hand permit:

Abutilon sp.
Acalypha boemerooides
Acanthus spinosus
Ac·er negundo
Acer nuttali [sic]
Achyranthes sp.
Aenida cannabina (A. cuspidata)
Ageratum conyzoides
Alternanthera sp.
Althaea rosea
Amaranthus spp.
Ammania sp.
Amsinckia spectabilis
Anthemis cotula
Amaranthus spp.
Atriplex sp.
Atriplex semen
Aubrieta sp.
Barbarea vulgaris
Bauhinia variegata
Bellis perennis
Beloperone sp.
Beta vulgaris (B. bengalensis)
Bougainvillea campestris
Bougainvillea juncea
Bougainvillea spectabilis
Brassica kaber (B. arvensis)
Brassica napus
Brassica nigra
Brassica oleracea
Brassica pekinensis
Brassica rapa
Buddleia madagascariensis
Buddleia orientalis [sic]
Calceolaria sp.
Calendula arvensis
Calendula officinalis
Camelina japonica
Canna indica
Capsella bursa-pastoris
Capsieum dulce
Capsieumfrutescens
(C. annuum)
Carduus sp.
Carica papaya
Carthamus tinctorius
Catalpa speciosa
Centauraea sp.
Centranthus ruber
Cerasium semidecandrum
Ceratium fuscatum var. newelli
Ceratium pseudoquina
Chaerophyllum aromaticum
Chaerophyllum hirsutum
Chaerophyllum roseum
Cheiranthus cheiri
Chenopodium album
Chenopodium murale
Chrysanthemum viride [sic]
Chrysanthemum balsamita
Chrysanthemum cocineum
Chrysanthemum frutescens
Chrysanthemum indicum
Cichorium endivia
Citrus vulgaris
Citrus aurantium
Citrus limonia
Citrus maxima
Citrus medica
Clarkia elegans
Clarkia pulchella
Cnicus sp.
Cochlearia armoracia (Nasturtium armoracia)
Coelidium sp. (Croton sp.)
Colocasia sp.
Convolvulus arvensis
Convolvulus crispus
(Jpomoea crispas)
Coprosma baueri
Cordyline sp.
Corydalis dubius
Crateagus sp.
Crepis tectorum
Crocos sp.
Cryptostemma calendulae
Cucumis melo
Cucurbita maxima
Cucurbita moschata
Cucurbita pepo
Cyclamen europaeum
Cyclamen indicum
Cynara cardunculus
Cynoglossum grande
Cyrtanthus sp.
Cyrtisus sp.
Dalbergia sissoo
Daphne sp.
Datura stramonium
(D. tatula)
Daucus carota
Dianthus Caryophyllus
Dianthus chinensis
Digitalis lutea
Digitalis purpurea
Dipsacus fullorum
Dissoodia sp.
Duranta repens (D. plumieri)
Echinops echinatus
Emilia sonchifolia
(Senecio sonchifolius)
Erigeron canadensis
Erodium botrys
Erodium cicutarium
Eruca sativa
Erythronium dens-canis
Escallonia pulvulenta
Euonymus communis
Euphorbia helioscopia
Euphorbia pulcherrima
Ficus pumila
Foeniculum vulgare
Fragaria chiloensis
Freesia sp.
Fuchsia coccinea
Fuchsia macrantha
Fuchsia magellanica var. globosa
Galactites tomentosa
Galium mollugo
Geranium molle
Geranium robertianum
Glaucium sp.
Gloxinia digitaliflora
Glycine sp.
Gnaphalium spathulatum
Gordonia amoena
Gossypium herbaceum
Grindelia robusta
Hedera helix
Helianthus annuus
Helichrysum bracteatum
Heliotropium arborescens
(H. peruviana)
Hemericallis sp.
<table>
<thead>
<tr>
<th>English</th>
<th>Hawaiian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hibiscus abelmoschus (H. moschatus, Abelmoschus moschatus)</td>
<td>Moraea iridioides</td>
</tr>
<tr>
<td>Hibiscus esculentus</td>
<td>Myosotis scorpioides</td>
</tr>
<tr>
<td>Hibiscus rosa-sinensis</td>
<td>Myrtus sp.</td>
</tr>
<tr>
<td>Hordeum sp.</td>
<td>Narcissus sp.</td>
</tr>
<tr>
<td>Humulus lupulus</td>
<td>Nasturtium armoracca</td>
</tr>
<tr>
<td>Hyacinthus orientalis</td>
<td>Nasturtium indicum</td>
</tr>
<tr>
<td>Hydrangea sp.</td>
<td>Nasturtium officinale (Radicula nasturtium-aquaticum, Borripa nasturtium)</td>
</tr>
<tr>
<td>Ilex sp.</td>
<td>Nemoria strumosa</td>
</tr>
<tr>
<td>Iponomea batatas</td>
<td>Nemophila heterophylla</td>
</tr>
<tr>
<td>Iponomea maxima [sic]</td>
<td>Nerium indicum (N. odoratum)</td>
</tr>
<tr>
<td>Ipomea purpurea (Convolvulus major)</td>
<td>Nerium oleander</td>
</tr>
<tr>
<td>Iresine lindeni</td>
<td>Nicotiana rustica</td>
</tr>
<tr>
<td>Justicia alba [sic]</td>
<td>Nicotiana tabacum</td>
</tr>
<tr>
<td>Kleinia neriifolia</td>
<td>Onopordum acanthium</td>
</tr>
<tr>
<td>Lactuca oldhamii</td>
<td>Opuntia sp.</td>
</tr>
<tr>
<td>Lactuca sativa</td>
<td>Orthocarpus erianthus</td>
</tr>
<tr>
<td>Lactuca scariola</td>
<td>Ozalis cernua</td>
</tr>
<tr>
<td>Lactuca spicata</td>
<td>Ozalis corniculata</td>
</tr>
<tr>
<td>Lamium sp.</td>
<td>Ozalis rosea</td>
</tr>
<tr>
<td>Lantana sp.</td>
<td>Panax lancasteri [sic]</td>
</tr>
<tr>
<td>Lathyrus odoratus (Pisum odorata)</td>
<td>Papaver somniferum</td>
</tr>
<tr>
<td>Lavatera assurgentiflora</td>
<td>Parthenium argentatum</td>
</tr>
<tr>
<td>Lepidium draba</td>
<td>Pastinaca sativa</td>
</tr>
<tr>
<td>Ligustrum vulgare</td>
<td>Paulownia sp.</td>
</tr>
<tr>
<td>Lilium candidum</td>
<td>Penstemon spectabilis</td>
</tr>
<tr>
<td>Lilium longiflorum</td>
<td>Petunia hybrida</td>
</tr>
<tr>
<td>Linaria sp.</td>
<td>Pectisites tricholobus</td>
</tr>
<tr>
<td>Liriodendron tulipifera</td>
<td>Pharbitis nil</td>
</tr>
<tr>
<td>Lupinus termis</td>
<td>Phaseolus vulgaris</td>
</tr>
<tr>
<td>Lyceopersicon esculentum (Solanum lycopersicum)</td>
<td>Philadelphus coronarius</td>
</tr>
<tr>
<td>Malus communis (Pyrus communis)</td>
<td>Physalis virginiana</td>
</tr>
<tr>
<td>Malva pareiflora</td>
<td>Piersis cehioides</td>
</tr>
<tr>
<td>Malva rotundifolia</td>
<td>Pimelea sp.</td>
</tr>
<tr>
<td>Malvavastum cocceimum</td>
<td>Pimenta officinalis</td>
</tr>
<tr>
<td>Markhamia platycaulx</td>
<td>Pisum sativum</td>
</tr>
<tr>
<td>Marsilea quadrifolia</td>
<td>Pismum sativum var. arvense</td>
</tr>
<tr>
<td>Marsilea vestita</td>
<td>Pittosporum eugenioideae</td>
</tr>
<tr>
<td>Matricaria inodora</td>
<td>Pittosporum tobira</td>
</tr>
<tr>
<td>Mathiola sp.</td>
<td>Pittosporum undulatum</td>
</tr>
<tr>
<td>Maurandia hendersoni [sic]</td>
<td>Plantago sp.</td>
</tr>
<tr>
<td>Mazus sp.</td>
<td>Poa sp.</td>
</tr>
<tr>
<td>Melianthus major</td>
<td>Polygonum hydropiper</td>
</tr>
<tr>
<td>Melilotus indicus</td>
<td>Polygonum multiflorum</td>
</tr>
<tr>
<td>Mentha aquatica (M. hirsuta)</td>
<td>Polygonum persicaria</td>
</tr>
<tr>
<td>Mercurialis annua</td>
<td>Portulaca oleracea</td>
</tr>
<tr>
<td>Mesembryanthemum sp.</td>
<td>Primula forbesii</td>
</tr>
<tr>
<td>Mimulus sp.</td>
<td>Primula polyantha</td>
</tr>
<tr>
<td>Montia perforata</td>
<td>Primula vulgaris</td>
</tr>
<tr>
<td></td>
<td>Prunus americana</td>
</tr>
<tr>
<td></td>
<td>Prunus armeniaca</td>
</tr>
<tr>
<td></td>
<td>Prunus avium</td>
</tr>
<tr>
<td></td>
<td>Prunus besseyi</td>
</tr>
<tr>
<td></td>
<td>Prunus cerasus</td>
</tr>
<tr>
<td></td>
<td>Prunus domestica</td>
</tr>
<tr>
<td></td>
<td>Prunus domestica var. insititia</td>
</tr>
<tr>
<td></td>
<td>Prunus mume</td>
</tr>
<tr>
<td></td>
<td>Prunus persica</td>
</tr>
<tr>
<td></td>
<td>Prunus serotina</td>
</tr>
<tr>
<td></td>
<td>Prunus virginiana</td>
</tr>
<tr>
<td></td>
<td>Prunus virginiana var. melanoarpa</td>
</tr>
<tr>
<td></td>
<td>Psidium guajava</td>
</tr>
<tr>
<td></td>
<td>Pulicaria dysenterica</td>
</tr>
<tr>
<td></td>
<td>(Inula dysenterica)</td>
</tr>
<tr>
<td></td>
<td>Quamoclit lobata</td>
</tr>
<tr>
<td></td>
<td>Radicula curvisiliqua</td>
</tr>
<tr>
<td></td>
<td>Ranunculus asiaticus</td>
</tr>
<tr>
<td></td>
<td>Ranunculus bulbosus</td>
</tr>
<tr>
<td></td>
<td>Raphanus raphanistrum</td>
</tr>
<tr>
<td></td>
<td>Raphanus sativus</td>
</tr>
<tr>
<td></td>
<td>Raphistrum rugosum</td>
</tr>
<tr>
<td></td>
<td>Rheum rhaponticum</td>
</tr>
<tr>
<td></td>
<td>Ribes odoratum</td>
</tr>
<tr>
<td></td>
<td>Richardia africana</td>
</tr>
<tr>
<td></td>
<td>Ricinus communis</td>
</tr>
<tr>
<td></td>
<td>Rosa sp.</td>
</tr>
<tr>
<td></td>
<td>Rudbeckia laciniata</td>
</tr>
<tr>
<td></td>
<td>Rumex dentatus</td>
</tr>
<tr>
<td></td>
<td>Sagina subulata</td>
</tr>
<tr>
<td></td>
<td>Salix sp.</td>
</tr>
<tr>
<td></td>
<td>Salsola kali (S. tragus)</td>
</tr>
<tr>
<td></td>
<td>Salvia leucantha</td>
</tr>
<tr>
<td></td>
<td>Salvia mellifera</td>
</tr>
<tr>
<td></td>
<td>Sambucus canadensis</td>
</tr>
<tr>
<td></td>
<td>Sanguisorba officinalis</td>
</tr>
<tr>
<td></td>
<td>Sanicula menziestii</td>
</tr>
<tr>
<td></td>
<td>Saxifraga splendens [sic]</td>
</tr>
<tr>
<td></td>
<td>Secale cereale</td>
</tr>
<tr>
<td></td>
<td>Sedum artissimum</td>
</tr>
<tr>
<td></td>
<td>Senebiera pinnatifida</td>
</tr>
<tr>
<td></td>
<td>Senecio alpestris (S. crassifoiliis)</td>
</tr>
<tr>
<td></td>
<td>Senecio cruentus</td>
</tr>
<tr>
<td></td>
<td>Senecio elegans</td>
</tr>
<tr>
<td></td>
<td>Senecio jacobaea</td>
</tr>
<tr>
<td></td>
<td>Senecio mikanioides</td>
</tr>
<tr>
<td></td>
<td>Senecio renifolius</td>
</tr>
<tr>
<td></td>
<td>(Cineraria renifolia)</td>
</tr>
<tr>
<td></td>
<td>Senecio vulgaris</td>
</tr>
<tr>
<td></td>
<td>Sesamum orientale</td>
</tr>
<tr>
<td></td>
<td>Setaria viridis</td>
</tr>
<tr>
<td></td>
<td>Silene sp.</td>
</tr>
<tr>
<td></td>
<td>Sisymbrium canescens</td>
</tr>
<tr>
<td></td>
<td>Sisymbrium irio</td>
</tr>
<tr>
<td></td>
<td>Solandra grandiflora</td>
</tr>
<tr>
<td></td>
<td>Solanum carolinense</td>
</tr>
<tr>
<td></td>
<td>Solanum dulcamara</td>
</tr>
<tr>
<td></td>
<td>Solanum melongena</td>
</tr>
<tr>
<td>Plant Name</td>
<td>Taxonomy</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Solanum nigrum</td>
<td></td>
</tr>
<tr>
<td>Solanum pseudo-capsicum</td>
<td></td>
</tr>
<tr>
<td>Solanum tuberosum</td>
<td></td>
</tr>
<tr>
<td>Sonchus asper</td>
<td></td>
</tr>
<tr>
<td>Sonchus oleraceus</td>
<td></td>
</tr>
<tr>
<td>Spinacia oleracea</td>
<td></td>
</tr>
<tr>
<td>Stellaria aquatica</td>
<td></td>
</tr>
<tr>
<td>Stellaria media</td>
<td></td>
</tr>
<tr>
<td>Stizolobium deeringianum</td>
<td></td>
</tr>
<tr>
<td>Syringa vulgaris</td>
<td></td>
</tr>
<tr>
<td>Tamarix sp.</td>
<td></td>
</tr>
<tr>
<td>Taraxacum officinale</td>
<td></td>
</tr>
<tr>
<td>Thalictrum minus</td>
<td></td>
</tr>
<tr>
<td>Tilia americana</td>
<td></td>
</tr>
<tr>
<td>Townsendia exscapa</td>
<td>(T. sericea)</td>
</tr>
</tbody>
</table>

**Distribution.** The green peach aphid appears to be present throughout the entire world wherever agricultural crops are grown. It does not occur in the extreme cold areas of the Arctic Region nor in certain of the very hot desert oases. Whether this wide distribution is natural or aided by man cannot now be determined. Nevertheless man has indeed had a great influence in extending both its distribution and diet by the extensive development of agriculture in areas which were previously certainly not adapted to the requirements of this aphid.

In California it occurs in every county and is a pest on plants in houses, greenhouses, lathhouses, and out doors throughout the year in most localities.
LITERATURE CONSULTED

ALLEN, N., and P. K. HARRISON.

BOISDUVAL, J. A.

BRAIN, C. K.

BRITTON, W. E.

BRITTON, W. E., and Q. S. LOWRY.

CAMPELL, R. E.

CLAUSEN, C. P.

CURTIS, JOHN.

DAVIDSON, J.

DAVIS, J. J.

ESAKI, T., et al.

ESSIG, E. O.

FLETCHER, T. B.

FLUKE, C. L.

FOLSOM, J. W.

FONSOLOMBRE, BOYER DE.

FRISCH, JOH. LEONHARD.

GILLETTE, C. P., and M. A. PALMER.

GLOVER, TOWNEND.
GORHAM, R. P.  

GOWDEY, C. C.  

GRISWOLD, GRACE H.  

HALI, W. J.  


HOPFMA NN, W. E.  

HORSFALL, J. L.  


HOUSER, J. S., T. L. GUYTON, and P. R. LOWRY.  

KYBER, J. F.  

LINNAEUS, C.  


MATSUMURA, S.  

MONELL, J. T.  

MORDVILKO, A.  

OESTLUND, O. W.  

PADDOCK, F. B.  

PATCH, E. M.  

PRETHERBIDGE, F. R., and J. E. M. MELLOR.  

PRETHERBRIDGE, F. R., and D. W. WRIGHT.  

PROFFT, J.  

RAPINESQUE, C. S.  

SANDERSON, E. D.  
SCHRANK, F. VON PAVLA.

SHEN TSENG, and CHIA-CHU TAO.

SILVESTRI, F.

SMEE, A.
1846. The potato plant. p. 63. [sic.]

SULZER, J. H.

SWEETMAN, H. L.

TAKAHASHI, R.

THEOBALD, F. V.

THOMAS, CYRUS.

VAN DER GOOT, P.

WALKER, F.

WILLIAMS, T. A.

WU, CHENFU F.

ZECK, E. H.
The journal *Hilgardia* is published at irregular intervals, in volumes of about 600 pages. The number of issues per volume varies.

Subscriptions are not sold. The periodical is sent as published only to libraries, or to institutions in foreign countries having publications to offer in exchange.

You may obtain a single copy of any issue free, as long as the supply lasts; please request by volume and issue number from:

Publications Office
College of Agriculture
Berkeley 4, California

The limit to nonresidents of California is 10 separate issues on a single order. A list of the issues still available will be sent on request.