Important aphid vectors of fruit tree virus diseases in tropical Asia

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Outbreaks of virus diseases often cause serious damage to fruit trees on small-scale farms in tropical Asia. Many of the virus diseases are transmitted by homopterous insects, of which aphids constitute an important group. This extension leaflet gives diagnostic characters of important vector aphids, and some basic information about their ecology.

Some ecological aspects of aphids: Host Specificity

Some aphids are what is known as polyphagous species, with a wide range of host crops. Some examples of this kind of aphid are *Myzus persicae* and *Aphis gossypii*, both well-known pests of various crops and vectors of various virus diseases. However, only a few aphid species are polyphagous. Most are highly host specific (Fig. 1). It should be borne in mind that most aphid species living on wild vegetation are not primary pests which cause damage directly to crops. Rather, they may play an important role as reservoirs of polyphagous natural enemies.

Life Cycle

The life cycle of aphids is characterized by 1) the alternation of generations and 2) the alternation of hosts (Fig. 2). The alternation of generations, or the alternating appearance of sexual and asexual phases, is common in areas with severe winters, where aphids overwinter

![Fig. 1. Host specificity of aphids](image-url)
as fertilized eggs which can tolerate low temperatures. In the tropics, the sexual phase often disappears, since asexual forms can reproduce throughout the year under favorable climatic conditions.

In host alternating species, the sexual generation occurs on primary hosts, which are usually woody plants. After repeating parthenogenetic generations during summer on the secondary hosts, which are often herbaceous, they return to the primary hosts to produce fertilized eggs for hibernation. In the tropics, this host alternation often disappears, since aphids can continue reproducing parthenogenetically only on secondary hosts.

**Seasonal Prevalence of Alate Aphids**

The parthenogenetic generations of aphids consist of alate and apterous forms. The alate (winged) aphids play two roles; firstly, migration to accomplish the host alternation and secondly, dispersal to other places where nutritional or ecological conditions are more suitable. The seasonal prevalence of alate aphids appears as the sum of these two different processes. It shows a different pattern according to the aphid species, the phenology of the host plant, the vegetation of the surrounding areas, climatic conditions, etc. It is of prime importance to know the occurrence pattern of the alate aphids of the vector species in the target field when we try to control virus diseases.

Five species of aphids have been selected as important virus vectors of fruit trees, especially of papaya, banana and citrus.

**Aphis gossypii (Glover) [Cotton aphid, Melon aphid] (Figs. 3,4)**

**Description:** Variable in color from pale yellow, yellowish green, ochorous green to dark bluish green. Body about 1.5 mm long. Antennal tubercles undeveloped. Siphunculus cylindrical, dark. Cauda concolorous with body, or slightly fuscous, with 4 - 6 setae.

**Ecology and economic importance:** Polyphagous aphid with both autoecious and heteroecious forms. Sexuales are known to occur on Hibiscus, Rhamnus and some other plants. This is perhaps a mixture of closely related species or subspecies. A part of the heteroecious components, if not all, may be properly replaced by the name frangulae, but a 'traditional' usage of the name is followed here. This aphid transmits more than 80 kinds of virus disease, including banana mosaic, papaya mosaic, papaya ring spot, citrus tristeza and passionfruit woody virus.

**Distribution:** World-wide. (Details in CIE Map No. 18).

**Aphis spiraecola Patch [Spirea aphid] (Fig. 5)**

**Description:** Body apple green or mat yellow, 1.2 - 1.7 mm long. Siphunculus cylindrical, black. Cauda elongate, black, round at apex and constricted at basal third, bearing 6 - 12 setae. Hind tibia bearing setae which are about as long as its middle diameter.

**Ecology and economic importance:** Polyphagous and autoecious. Sexuales are known to occur on Spiraea and Citrus in temperate regions. The infested leaves of certain plants are conspicuously curled over (e.g. Chlomoraena). The aphid transmits a number of important virus diseases, such as papaya mosaic, papaya ring spot and citrus tristeza.

**Distribution:** World-wide. (CIE Map No. 256).

**Myzus persicae (Sulzer) [Green peach aphid] (Fig. 6)**

**Description:** Body 1.8 - 2.0 mm in length, variable in color from pale yellow to dark ochorous green or reddish brown. Alata with a large irregular shaped dorsal patch on abdomen. Antennal tubercles converging to each other and gibbous, forming a bottle-shaped furrow on front. Siphunculi fuscous, slender and slightly swollen apically. Cauda pale, with 5 - 7 setae.
Ecology and economic importance: Polyphagous. Host alternation is known in temperate regions, with Prunus as the primary host. Known to be a vector of more than 180 kinds of virus disease, including papaya mosaic, papaya ring spot, citrus tristeza, citrus vein enation and passionfruit woody virus.

Geographical distribution: World-wide. (CIE Map No. 45).

4. Pentalonia nigronervosa (Coquerell) [Banana aphid] (Fig. 7)

Description: Body dark brown to black, 1.2 - 1.8 mm in length. Antennal tubercles angulate, protruding forward. Siphunculi dark, pale basally in some cases, weakly clavate on apical third. Cauda dark, attenuated on apical third and constricted just basally. Wing pigmented dark along veins, with media fused with radial sector.

Ecology and economic importance: The aphid occurs mainly on the plants of Musaceae, Araceae and Zingiberaceae, living hidden beneath the leaf sheath. Mostly anholocyclic, but sexual females have been recorded from India. The aphid is known to be a vector of banana bunchy top and banana mosaic.

Geographical distribution: This aphid is considered to have its origin in tropical Asia. It shows circumtropical distribution, and spread from there to the temperate regions where it may thrive in protected environments such as greenhouses. (CIE Map No. 242).

5. Toxoptera citricida Kirkaldy [Tropical citrus aphid] (Fig. 8)

Description: Body dark brown, 2.0 - 2.4 mm in length. Antennal tubercles undeveloped. Antennae of the aptera pale basally and increasingly infuscated from apical part of 4th segment, but often darker at apices of 3rd and 4th segments. Antennae of alatae infuscated on middle part (rhinariated area) of 3rd segments, otherwise as in apterae. Siphunculus black, cylindrical. Cauda black, with 26 - 38 setae. Hind tibia with a row of spiny setae on inner surface.

Ecology and economic importance: Polyphagous, living on various kinds of bushes, but prefers rutaceous plants such as Citrus and Poncirus. The aphid is a vector of citrus tristeza and citrus vein enation.

Geographical distribution: Widely distributed in different parts of the world but especially common and noxious in subtropical and tropical areas. (CIE Map 132).

Fig. 2. Life cycle of the aphid (in this case, the pear aphid Schizaphis piricola)
Fig. 3. Cotton or melon aphid (*Aphis gossypii* (apterous form))

Fig. 4. *Aphis gossypii* (alate form)

Fig. 5. Spirea aphid (*Aphis spiraecola*)

Fig. 6. Green peach aphid (*Myzus persicae*)

Fig. 7. Banana aphid (*Pentalonia nigronervosa*)

Fig. 8. Tropical citrus aphid (*Toxoptera citricida*)