Rosy apple aphid dynamics on apple in spring

Method/protocol submitted by:

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Objectives of the method/protocol:

The method is used in apple orchards to evaluate the infestation dynamics of the rosy apple aphid *Dysaphis plantaginea* (RAA) at shoot level in spring, and to describe the complex of natural enemies preying in RAA colonies along the infestation period. This method does not provide information on the overall infestation level in the orchard (as is the case of methods proposed by IPM guidelines[1]), but on the evolution of RAA population in infested shoots, associated natural enemies, and phases of RAA biological cycle (infestation peak, migration phase).

Brief description of the method/protocol:

Infested marked shoots are visually observed to evaluate aphid numbers through abundance classes and to count natural enemies in exact numbers.

Possible uses of this method/protocol:

The method is used to evaluate the evolution of the infestation (expansion, peak and migration phases) and to observe the sequential arrival of natural enemies.
It can be adopted to evaluate the effect of cultural practices or the effect of the environment (e.g. plant diversity, landscape) on the aphid-natural enemy relationship in orchards.

Method/protocol:

Infested shoots (around 50 per orchard or modality) are marked at the very beginning of RAA infestation (before or just after bloom). A shoot is a one-year growing fruiting or vegetative organ of the tree. These shoots are weekly or regularly observed during spring infestation period. Each shoot is assigned to one of the following abundance classes, depending on the number of RAA (all stages) in the colony:

A: no aphid
B: 1-5 aphids
C: 6-25 aphids
D: 26-50 aphids
E: 50-125 aphids
F :>125 aphids

During the migration phase, winged aphids can also be recorded using the same classes. Natural enemies and parasitized aphids (mummies) are counted in exact numbers. Other apple aphids and ants can also be recorded with a presence/absence index or counted (classes or exact numbers). Any

[1] The usual method to evaluate aphid infestation in orchards in spring and to manage protection is based on a presence/absence index of aphids in 2 randomly selected shoots from 50 randomly selected trees in the orchard (e.g. ACTA 1988 Guide de protection raisonnée pommier-poirier; Ctifl 2006 Protection intégrée Pommier Poirier).

other arthropod can also be recorded. If necessary, RAA-curled leaves are unrolled to estimate RAA numbers and count natural enemies.
The abundance classes which were initially delimited by powers of 5 have been refined because the initial 26-125 class was too large to correctly account for the severity of the infestation and the further dynamics of the colony (above 50 RAA per shoot, shoots are generally severely damaged and the control of RAA by natural enemies is hardly possible).
For analysis purpose, the middle of each class is used to estimate RAA numbers, e.g. 3 aphids for class B, 15.5 aphids for class C etc. except for class F which is considered to be 200 aphids.

Advantages/disadvantages of the method/protocol:

The method is non destructive.
Some practice is necessary to evaluate the classes correctly and to adjust the observations between observers. Training is necessary to (i) use infestation classes; (ii) identify egg, larval and nymphal forms of most natural enemies.
Because leaves are severely curled by the rosy apple aphid, counting aphids may damage the leaves when uncurling them.

References or examples of studies carried out by using this method/protocol:

Dib H, Sauphanor B, Capowiez Y (2010) Effect of codling moth exclusion nets on the rosy apple aphid, *Dysaphis plantaginea*, and its control by natural enemies. Crop protection 29, 1502-1513

Dib H, Simon S, Sauphanor B, Capowiez Y (2010) The role of natural enemies in the regulation of the rosy apple aphid, *Dysaphis plantaginea*, in organic apple rochards in south-eastern France. Biological Control 55, 97-109

Morel K, Defrance H, Garnier A, Durand E, Le Corre M, Simon S (2010) Rosy apple aphid and beneficial insect dynamics: effect of the situation within the orchard. IOBC Bull 54, 305-308

Ladybird (*Coccinella septempunctata*) in a shoot infested by the rosy apple aphid (infestation class of the shoot was F)

Syrphid larvae preying on a rosy apple aphid