Scouting of *Macrosiphum euphorbiae* on tomato plant

Method/protocol submitted by:

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Objectives of the method/protocol:

The objective of the protocol is to give a method for quick characterisation of the aphid *Macrosiphum euphorbiae* on tomato**.**

Brief description of the method/protocol:

The protocol consists in a visual and non-destructive method with known precision to describe the populations of tomato aphid *M. euphorbiae* in tomato greenhouse.

Possible uses of this method/protocol:

As for all scouting methods, adequation has to be found between the expected precision, the scientific or applied needs and the field constraints. The method allows two levels of results: the first level is composed of the indexes of abundance classes, the second one of the average values from the calibration classes. The first level is perfectly adapted to scouting for pest monitoring aspects or ecological quantitative studies. The second level is useful for biological control, notably to estimate number of beneficials to introduce, knowing the number of pests (it was used for instance to evaluate the effects of the parasitoid *Aphelinus abdominalis* on M. euphorbiae, in the framework of biological control in tomato greenhouse, see Boll 1991).

The same protocol and abundance classes can be used for the black mummies of *M. euphorbiae* parasitized by *Aphelinus abdominalis.*

Method/protocol:

- Scouting method:

The unit of observation is the whole plant. The observer has 30 to 40 seconds to determine which aphid abundance class his /her observation fits in. The choice of a class must not rely on counting, even if the aphid population is small or the plants are young. Such modifications of the observation method would make the observation longer and the different results unsuitable for comparison.
At each survey, the average height of the plants is noted. When several people are implied in the experimentation, it is advised to make some simultaneous adjustment evaluations, in order to avoid excessive variability among observers.

- Visual abundance classes :

The visual abundance classes used in the scouting are detailed below.

VISUAL CLASS	THEORETICAL NUMBER OF APHIDS
1	absence
2	1 to 3 aphids
3	4 to 10 aphids
4	11 to 30 aphids
5	31 to 100 aphids
6	101 to 300 aphids
7	301 to 1000 aphids
i	10*(i-2)/2 < class i < 10*(i-1)/2

Visual abundance classes for scouting of *M. Euphorbiae* on tomato

i : number of the class

N.B: if the scouting is carried out by two experimenters, each one can observe one side of the plant during 20 seconds. If the abundance classes given by the two experimenters are different, the class kept is the highest one. If the two observers give the same abundance class, the immediately superior class is attributed to the plant, apart from the class 1 which is kept if the two observers give it.

- Calibration of the abundance classes

A calibration of the visual abundance scale was performed: the attribution of visual classes was associated to a precise counting of aphids.
The column “average number of aphids counted on the plants” in the table below gives the average and the standard deviation of the real number of aphids for each class.

VISUAL CLASS	THEORETICAL NUMBER OF APHIDS	AVERAGE NUMBER OF APHIDS COUNTED ON THE PLANTS
1	absence	**8.7** ± 17.7 n = 376
2	1 to 3 aphids	**36.8** ± 48.3 n = 100
3	4 to 10 aphids	**60.6** ± 63.6 n = 113
4	11 to 30 aphids	**99.2** ± 90.8 n = 112
5	31 to 100 aphids	**171.5** ± 143.3 n = 92
6	101 to 300 aphids	**340.1** ± 244.6 n = 40
7	301 to 1000 aphids	**763.6** ± 697.6 n = 13
i	10*(i-2)/2 < class i < 10*(i-1)/2	

Calibration of the visual abundance classes for quick counting of *M. euphorbia* on tomato

i : number of the class
n : total number of observations for the class i

Advantages / Disadvantages of the method/protocol:

This is a quick non destructive method, which is quite easy to learn. It allows two levels of results with known precision.
As shown by the calibration, the abundance class method implies a systematic under-estimation of the real number of aphids, with a strong variability of the intra-class countings. The over-lapping of the abundance classes (see the standard deviation) indicates that the definition of the classes is

perfectible, or that the number of observations realised for the calibration is not sufficient. Moreover, absence of aphids is not represented in the calibration.

In order to address this question, a predictive model ("projection pursuit" model TOM), was built. Since it gives a prediction (and not an estimation in the field) of the number of aphids, it is not presented on QuantiPest. Details are available upon request: please contact the author of the protocol.

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

Boll R. et L. Lapchin, 2002. Projection pursuit nonparametric regression applied to field counts of the aphid *Macrosiphum euphorbiae* (Homoptera : Aphididae) on tomato cros in greenhouses. J. Econom. Entomol., 95(2) ; 493-498.

Boll R., 1991. Méthodologie du dénombrement visuel du puceron Macrosiphum euphorbiae T. en serres de tomates. Mémoire de l'Ecole Pratique des Hautes Etudes, Section : Sciences de la Vie et de la Terre, Montpellier, 49 pp.