Counting method by plant collection for aphids and syrphids in wheat fields

Method/protocol submitted by:

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Objectives of the method/protocol:

Quantifying aphids and syrphids in wheat fields.

Brief description of the method/protocol:

Cereal crops are infested by various pests, notably three aphid species: *Rhopalosiphum padi, Metopolophium dihrodum* and *Sitobion avenae.* Natural enemies and beneficials, such as syrphids, are also present, and it can be useful to quantify these populations to estimate their impact.
The counting method by capture presented here is aimed at quantifying the populations of these aphids, aphid mummies (parasitized aphids), plus syrphid larvae and eggs.

Possible uses of this method/protocol:

Ecological studies of prey-predator relationships.

Method/protocol:

- Observation unit:

The different insect populations have to be expressed on an equivalent surface unit.
A convenient observation plot is a 25 sqm area represented in the field by a square, 5m by 5m, which can be delimited by stakes.

- Material:

The only tools needed for the counting of the insects are:
- a wooden ruler of about 1 m, with –for instance – 3 reference marks
- a dibble to extract the selected wheat plants
- if necessary, plastic bags to separate the plants and bring them to the laboratory

- Sampling of the wheat plants:

The ruler is thrown haphazardly three times in the plot.
The number of plants corresponding to the 1m ruler is counted.
The wheat plants situated nearest each mark of the ruler are collected: theoretically, 3*3 plant are thus collected with this method.

N.B: the number of marks on the rule and the number of times the ruler is thrown can be adapted to the time available.

If the wheat density is not homogeneous in the plot, it is necessary to throw the ruler in each different areas to take this heterogeneity into account.

- Estimation of the wheat density:

To be able to obtain the density of aphids and syrphids in the plot, you first have to estimate the wheat density in the plot.

The wheat density in the observation plot is obtained by the formula:

$$Dwp = (\sum_{n}^{1} Npc / n) * Lp * Nrp$$ and in our example: $$Dwp = (\sum_{3}^{1} Npc / 3) * 5 * Nrp$$

with
Dwp = density of wheat plants in the observation plot
Npc = number of plants counted along the 1m ruler
Nrp = number of sown rows in the plot (to be counted)
n = total number of times the ruler is thrown
Lp= length of the side of the observation square (m)

The **density by sqm** is obtained by dividing the number obtained by Lp*Lp.

- Counting of the insects:

In the laboratory, number of stalks and ears are counted by wheat plant, then hulled. The counting essentially concerns the aphids and the syrphids which are collected with a brush and counted by species and life stages.

- Estimation of the insect densities:

For a given species and lifestage (adults, aphid mummies, syrphid larvae, eggs) the density of insects **in the observation plot** is obtained by the formula:

$$Dip = (\sum_{nph}^{1} Nic / nph) * Dwp$$

With
Dip = density of the given species and lifestage
Dwp = density of wheat plant in the plot (see above)
nph = number of plants hulled
Nic = number of individuals counted on a plant

The **density by sqm** is obtained by dividing the number obtained by Lp*Lp.

Advantages / Disadvantages of the method/protocol:

This method requires about 10 minutes of sampling and bagging in the field (for 9 plants) and 1-10 minutes of hulling and counting **by plant** in the laboratory. The total time-cost for 9 plants can reach, and even exceed, 1 hour.
This sort of collecting methods is used when visual estimation methods are not valid. They are precise but long and destructive. In the case of wheat, direct visual observation of aphids and syrphid larvae is impossible or seriously biased by external conditions (wind, light…) or the behaviour of the insects (some life stages have the same colour as the plant and are often located inside the growing leaves or ears).
NB : The most frequent species of syrphids encountered in the reference study were *Epistrophe. balteata* and *Sphaerophoria scripta*.

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

Lapchin L. *et al.*, 1987. Coccinellids (Coleoptera: Coccinellidae) and syrphids (Diptera: Syrphidae) as predators of aphids in cereal crops: a comparison of sampling methods. Can. Ent. 119: 815-822.