Relative importance of arable weeds for phytophagous insects*

**Coleoptera* (*Curculionidae* and *Chrysomelidae*) and *Diptera* (*Agromyzidae*)

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Introduction

Arable weeds are increasingly recognized as an important resource for farmland biodiversity. Few studies have however inventoried insects associated to arable weeds. ⇨ **The aim of this study is to provide an update of a pioneering study** that listed phytophagous insects associated to threatened segetal species and to extend this list **to include more common arable weeds to assess their role in supporting biodiversity.**

Materials & Methods

- **Plants** : **461 arable weeds** observed within the French monitoring survey ***Biovigilance Flore***
- **Insects** : focus on families known to be **host-specific or at least oligophagous**
- Linkages plant-insect from the literature:
  - ***Curculionidae*** (Hoffmann, 1958)
  - ***Chrysomelidae*** (Doguet, 1994)
  - ***Agromyzidae*** (Benavent-Corai *et al.*, 2005).
- **Insect pests** identified with HYPPZ
- **Index of host-specificity** ⇨ more weight to arable weeds harbouring host-specific species.
- Distinction of **3 categories of plant species** : (a) common arable weeds, (b) threatened segetal species and (c) species of the field boundaries and the surrounding habitats.

Some examples of host-specific or oligophagous insects


Solanum nigrum* ⇆ *Epitrix intermedia
only on *Solanum nigrum* and *S. dulcamara*


Stenocarus fuliginosus* ⇆ *Papaver argemone
only on the genus *Papaver*


Lithospermum arvense* ⇆ *Longitarsus anchusae
on several genus of the Boraginaceae

Results

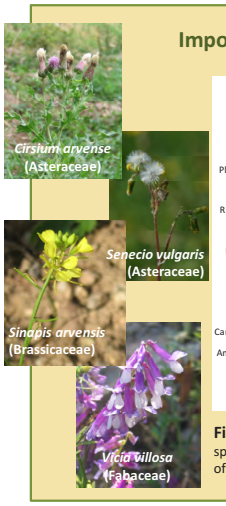
❶ Insects are not distributed homogeneously on weed species with significant differences according to the family (Fig 1).

333 arable weeds (~ 71% of the most frequent species) harbour at least one insect species with an average of 9.31 insect species per weed (range: 0-45).

Table 1. The twenty most important (a) arable weeds and (b) threatened segetal species for phytophagous insect diversity.

	Insect species	Index of host-specificity	Pest species	Curculionidae	Alticinae	Agromyzidae
(a) Arable weed species						
Sinapis arvensis	41	12,56	7	14	18	9
Cirsium arvense	38	11,35	3	14	4	20
Senecio vulgaris	42	10,60	1	0	7	35
Solanum nigrum	25	9,95	3	0	3	22
Rumex acetosella	16	8,88	0	8	5	3
Taraxacum officinale	23	8,51	1	4	1	18
Sisymbrium officinale	31	8,27	8	11	10	10
Matricaria perforata	23	7,93	1	12	1	10
Trifolium campestre	21	7,49	3	10	0	11
Plantago major	23	7,33	0	4	11	8
Myosotis arvensis	11	7,17	0	2	2	7
Centaurea scabiosa	29	7,11	1	7	4	18
Juncus bufonius	7	7,00	0	1	0	6
Malva sylvestris	22	6,93	2	7	4	11
Trifolium arvense	22	6,74	2	11	0	11
Lathyrus tuberosus	23	6,01	2	3	0	20
Ranunculus sardous	40	5,92	1	0	1	39
Daucus carota	14	5,76	1	3	0	11
Descurainia sophia	13	5,33	2	8	3	2
Malva neglecta	19	5,18	2	6	2	11
(b) Decreasing or threatened segetal species						
Lithospermum arvense	13	7,67	0	3	6	4
Ranunculus arvensis	40	5,92	1	0	1	39
Vicia villosa	33	4,52	3	8	0	25
Anchusa arvensis	8	4,17	0	2	3	3
Centaurea cyanus	22	3,69	1	1	3	18
Thlaspi arvense	13	3,14	3	5	4	4
Iberis amara	9	3,10	0	2	4	3
Galium tricornutum	11	2,08	0	0	0	11
Stachys annua	13	2,03	0	0	5	8
Glaucium corniculatum	4	2,01	0	2	0	2
Spergula arvensis	2	2,00	0	1	1	0
Vicia articulata	25	1,74	2	0	0	25
Vicia pannonica subsp. *striata*	25	1,74	2	0	0	25
Bupleurum rotundifolium	3	1,50	0	0	0	3
Bupleurum subovatum	3	1,50	0	0	0	3
Anthemis arvensis	10	1,38	0	2	1	7
Ajuga chamaepitys	7	1,29	1	0	0	7
Neslia paniculata	3	1,26	0	1	1	1
Papaver argemone	8	1,20	1	2	0	6

Important plant families of arable weeds for insects



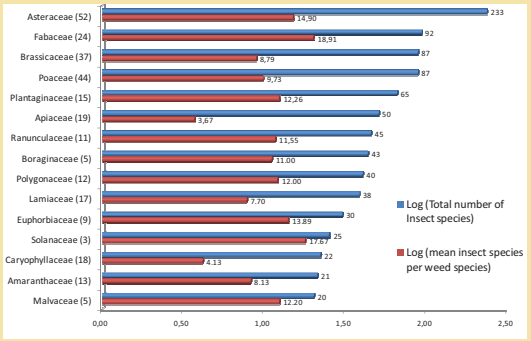


Figure 1. Total number of insect species recorded per plant family and mean insect species per weeds within families. Numbers between brackets indicates the number of weed species per family.

❷ Widespread arable weeds (*Sinapis arvensis*, *Cirsium arvense*) and plant species of the field boundaries (*Senecio jacobaea*, *Artemisia vulgaris*) harbor a greater diversity of insects - and of host-specific insects - than do threatened segetal species (Fig. 2 & Table 1).

⇨ **This result underlines the importance of ordinary biodiversity and field margins integrity for agroecosystem functioning.**

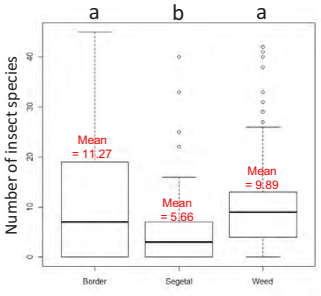


Figure 2. Number of insect species per group of plant. Legend: **Border**=species rather found on the field boundary, decreasing **segetal** species and common arable **weed**s).

❸ Among decreasing segetal species, *Ranunculus arvensis* and species of the genus *Vicia* harbour the highest number of insects but many of them are polyphagous and feed on the whole genus (especially *Agromyzidae* species). If the number of host-specific or oligophagous species is considered, then *Lithospermum arvense* has the highest functional values (Table 1). A few other segetal species (*Neslia paniculata*, *Papaver* spp., *Spergula arvensis*) have also an original entomofauna.

Perspectives

These first results give a good idea of the relative functional value of arable weeds for phytophagous insects. It should be kept in mind that these values only represent the potential species richness per weed. Another task will be to measure the observed diversity of insects within the fields as a function of management practices.

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