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Data on the Life Cycle of *Cacopsylla pruni*, Psyllidae Vector of European Stone Fruit Yellows (ESFY) Phytoplasma, in France.

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Abstract

A network was created in France to obtain data on the seasonal activity of the psyllid *Cacopsylla pruni*, vector of European stone fruit yellows phytoplasma. *C. pruni* was collected on *Prunus* plants by beating trays. The insect was found in every prospected area. The reimmigrants (adults that have overwintered) were found on *Prunus* from February to May and the new generation from May to June. Not any *C. pruni* was found on *Prunus* after July. *Prunus spinosa* appeared the preferred host plant compared to the other monitored *Prunus*. The data are discussed in relation to the control of the phytoplasma disease.

INTRODUCTION

European stone fruit yellows (ESFY) is a disease of increasing importance in France in apricot and Japanese plum orchards. The causal agent is a phytoplasma. After the discovery of *Cacopsylla pruni* as vector of ESFY (Carraro et al., 1998), it appears that there were very few data on the distribution and life cycle of this insect in France. Only 2 publications reported the species in France (Lambertie, 1910 ; Malenovsky, 1999). Thus a network joining several French research and/or development institutes was established. Its general objective was to produce data which can be a basis to propose a pest management strategy against the insect in order to stop or to decrease the incidence of the disease. The first objectives of the network were 1) to confirm the presence of *C. pruni* in the different geographic areas where the ESFY had been detected, 2) to make clear the periods of presence of *C. pruni* on *Prunus* plants and 3) to determine the prefered host plants.

MATERIALS AND METHODS

The network and the location of the collecting sites

Several people of different institutes (see acknowledgments) joined together to obtain a coverage of the most important stone fruit production areas in France (fig 1).

The seasonal evolution of the abundance of *C. pruni* was recorded at each location by regular sampling on host plants (one sample per week during the period from January to July ; one sample per two weeks during the remaining period) during 3 successive years (2000 - 2002). Several *Prunus* species were sampled with at least one sample taken from *Prunus spinosa* to be able to compare the data between locations.

Standardised protocol to count *C. pruni*:

As many different people were implied in the project, the data had to be collected with a same and simple protocol to be compared. The sample unit was defined as a serie of 20 branches beaten upon a 0.5 m_ beating tray. The *C. pruni* falling on the tray were

directly counted or collected with a mouth aspirator to confirm later their identity under a stereomicroscope.

Host plants monitored

Depending on the area, several of the following *Prunus* species were sampled : *P. armeniaca*, *P. cerasifera*, *P. domestica*, *P. salicina*, *P. spinosa.*

RESULTS AND DISCUSSION

Presence of *C. pruni* on *P. spinosa* : Comparison of Locations and Years

C. pruni was recorded at each location, which proved that it was present throughout the studied area.

The seasonal variations of the abundance of *C. pruni* followed a general bimodal shape (fig. 2). The first peak of abundance corresponds to the presence of winter forms (reimmigrants) characterized by their dark color. The second peak, when present, corresponds to the adults of the new generation, characterized by their light color. Thus the data are in agreement with the hypothetical life cycle of *C. pruni* with one generation per year and an alternation between *Prunus* as reproduction plant and other plants as overwintering shelters.

The arrivals of reimmigrants on *Prunus* plants were noticed at the end of the winter. They ranged from mid-February on the Mediterranean border to the second part of March in Alsace-Lorraine. The highest population level was reached in March-April and the last reimmigrants diseappeared before the second week of May everywhere. The adults of the new generation were caught on *Prunus* in May-June. Few variations in the period of presence were observed between the 3 years for a defined place. The differences in abundance are difficult to interpret because the collection with beating trays are subjected to changing environmental factors (wind, rain, ...)

From every location, very few insects were recovered from *Prunus* after the end of June and no one after August.

Host Plant Preference

The mean numbers of *C. pruni* (adults reimmigrants and new generation) caught on each *Prunus* species was calculated (table 1). The preferred host plants appeared to be *P. spinosa*, followed by *P. cerasifera*, *P. salicina* and *P. domestica*. While regularly caught on *P. armeniaca*, few *C. pruni* were caught on this *Prunus* species. Moreover most of them were caught in orchards where *P. domestica* or *P. cerasifera* were used as rootstock and provided an abundant sucker production. In some cases nymphs were also monitored (table 2) : fewer nymphs were caught on apricot trees than on *P. domestica* and *P. cerasifera* rootstocks or on wild *P. spinosa*.

In the location where *C. pruni* was monitored on several *Prunus* species, the populations fluctuated at the same time (table 3) : this suggests that the reimmigrants came at the same time in the orchards and on the wild *Prunus* and that there is no population differentiation according to the host plant.

CONCLUSIONS

C. pruni was recorded in all the regions where ESFY is epidemic, which is in agreement with the hypothesis that this insect is the main (and most likely unique) natural vector of this phytoplasma. The wild *Prunus* species *P. spinosa* appeared to be its prefered host plant, which is in agreement with the previous entomological records in

different countries (Lauterer, 1999 ; Ossiannillsonn, 1992). The facts that the different *Prunus* species appeared to be colonised at the same time and that the populations of *C. pruni* are always more abundant on *P. spinosa* allows to consider *P. spinosa* as a sentinel species : the monitoring of *C. pruni* to detected the first activity of the insect could be performed more easily on *P. spinosa* than in orchards.

Adults and nymphs of *C. pruni* were collected more often on *Prunus* rootstock than on the apricot varieties themselves. Thus, jointly to the elimination of infected stone fruit trees in the orchards, a careful elimination of suckers from rootstock of *P. domestica* or *P. cerasifera* is advised to prevent both colonisation and reproduction of *C. pruni* in the orchard, and perhaps inoculation of ESFY phytoplasma through the rootstock. If specific phytosanitary treatments have to be applied against *C. pruni*, they should take into account the biology of the insect : an application before the peak of arrivals could prevent the reproduction of *C. pruni* in the orchards and might decrease the speed of ESFY epidemics. On the contrary any application later than the month of June will have no effect as at that time the insects are away from the *Prunus*.

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Tables

Table 1 - Mean numbers of *C. pruni* counted on different host plants (mean per year and per location)

Host plant	Reimmigrants	New generation
P.spinosa	90	72
P. cerasifera	49	49
P. salicina	32	34
P. domestica *	33	20
P. armeniaca °	5	4

* more than a half of the collected psyllids were found on *P. domestica* used as rootstock for apricot trees

° more than a half of the collected psyllids were found in orchards with numerous rootstok suckers of *P. domestica* or *P. cerasifera*

Table 2 - Number of *C. pruni* nymphs collected from 4 *Prunus* species in 14 sites of a same area (year 2000 ; data from FREDEC-SRPV Rhône-Alpes)

Prunus species :	P. armeniaca	P. cerasifera	P. domestica	P. spinosa
number of sites :	2	9	1	2
mean number of nymphs per site :	0	5	8	23

Table 3 - Similarity of the seasonal evolution of the numbers of *C. pruni* collected on different *Prunus* species during 3 years on 3 *Prunus* species (*P. armeniaca*, *P. domestica* (suckers in the apricot orchard) and *P. spinosa)* : data from area 6 (fig. 1)

	week n°	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
year / location	Prunus species																											
2000																												
Villev.	armeniaca					0	0	0	0	1	0	4	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Villev.	domestica		0			2	0	4	5	4	18	20	21	3	3	3	0	0	4	0	2	0	0	0	0	0	0	0
Montba.	spinosa					11	10	14	22	26	26	39	29	22	11	6	1	0	8	12	51	0	0	0	0	0	0	0
2001																												
Villev.	armeniaca	0		0	0	0	0	2	2	5	1	0	1	2	0	0	0	0	5		7	2	1	0	0	0	0	0
Villev.	domestica	0		0	0	4	13	12	17	13	20	28	18	20	10	5	7	1	33		17	3	2	0	0	0	0	0
Montba.	spinosa	0		1	6	25	31	68	37	42	27	42	18	15	5	0	1	41	40	33	4	2	2	0	0	0	0	0
2002																												
Villev.	armeniaca		0	0	1	0	0	2	3		6	2	0	0	0	1	0	0	20	17	6	3	0	0	0	0	0	0
Villev.	domestica		0	2	3	0	6	12	29		19	10	9	11	5	3	2	11	71	102	25	13	0	0	0	0	0	0
Montba.	spinosa		0	0	6	4	3	19	31		35	18	13	5	0	2	2	22	77	33	22	10	1	0	0	0	0	0

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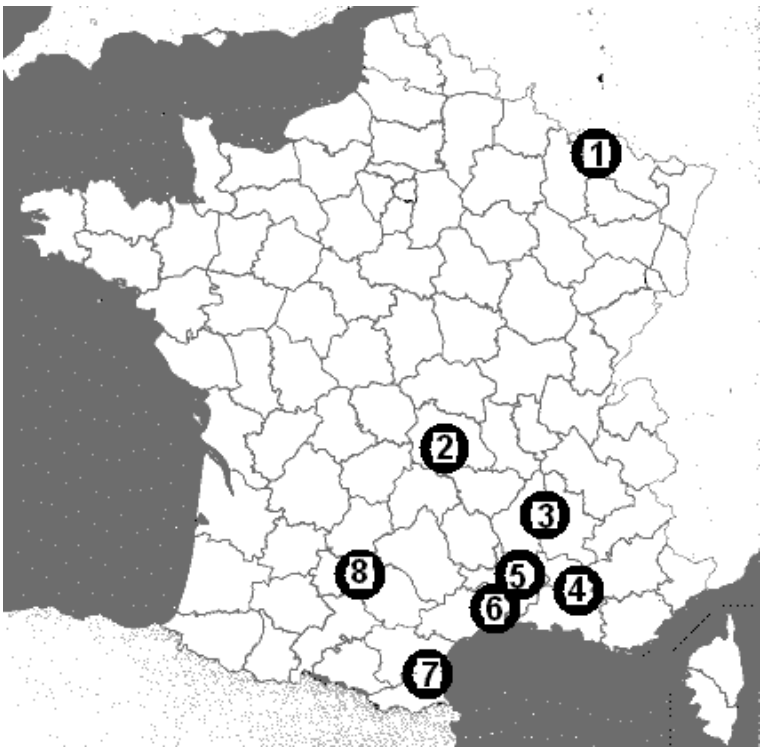

Figure 1 - Location in France of the collecting sites of *C. pruni*

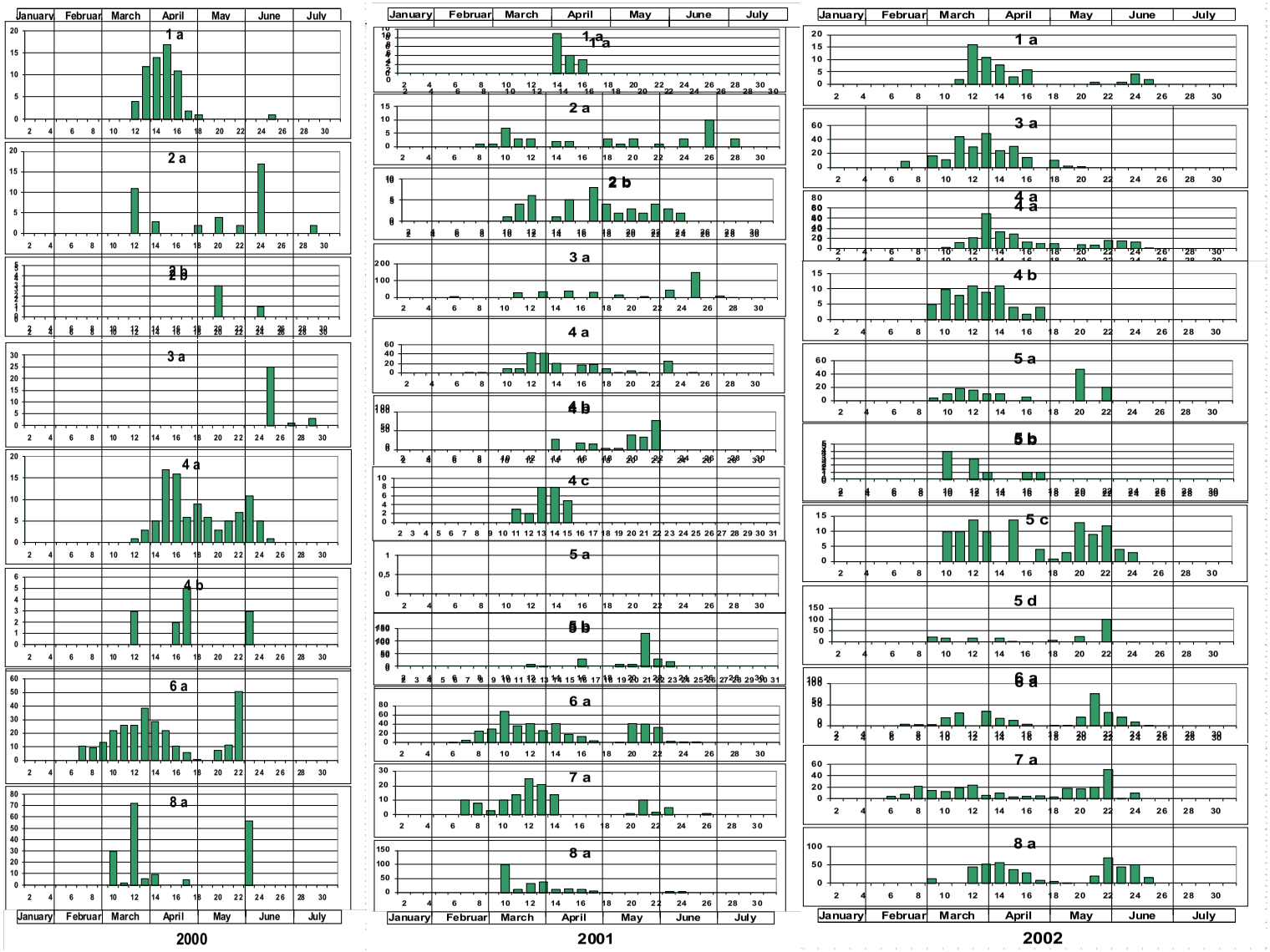

Figure 2 - Seasonal evolution of the presence of *C. pruni* on *Prunus spinosa* used as trap plants : comparison of locations and years during 3 years (2000-2002).
Y-axis : number of collected *C. pruni* per sample (variable scale) ; X-axis : weeks of the year ; graphs are identified by their location : the number refers to the number on the map (fig. 1) followed by a letter if several sites were sampled in the same area; the graphs were shortened after July because not any *C. pruni* were caught later in the season.