

Natural contamination of citrus orchards by greening disease with several chemical control procedures for the psyllid vector *Diaphorina citri*

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Figure 1. The psyllid *Diaphorina citri*, the vector of *C. Liberibacter asiaticus*.

Greening is a severe disease of citrus and one of the major threats to citrus growing. The etiological agent in Asia is the alpha-proteobacterium *Candidatus Liberibacter asiaticus*. This phloem bacterium is spread under natural conditions by the psyllid *Diaphorina citri*, a phloem-feeder associated with plants of the Rutaceae family (Figure 1). Control of the psyllid vector populations is currently the only strategy for preventing the spread of the disease and the contamination of young orchards. Two insecticide control procedures were evaluated in southern Vietnam.

Impact of the control procedure on *D. citri* population dynamics

- Without spraying (orchard 1, Figure 2), the *D. citri* population increases substantially during the dry season (from January to May). The increase is the result of strong migration to different fields and the multiplication of the psyllid within fields (strong oviposition). Insect pressure is at its maximum in this season. The population and oviposition decrease substantially during the rainy season (June to December).

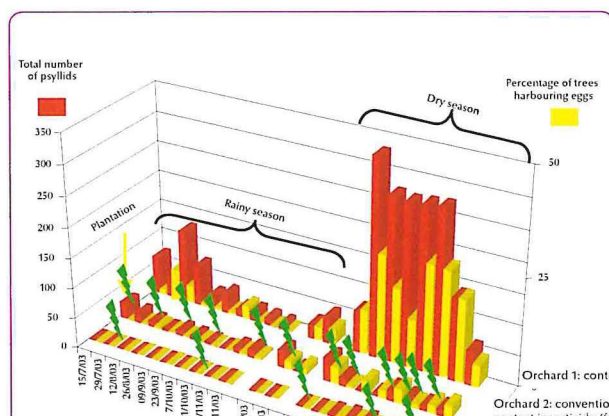


Figure 2. Evolution of the total number of adult psyllids and of the percentage of trees bearing eggs in three orchards with three management sequences.
↑ : insecticide treatment

- Contact insecticide (orchard 2) destroys the population of the plot at each spraying and prevents outbreaks of the insect during the dry season. However, the low persistence of the substance does not prevent rapid recolonising of the orchard (5 to 7 days after spraying) by psyllids from nearby orchards; these insects initiate a multiplication cycle in the orchard.
- Systemic insecticide with high persistence (orchard 3) enables better control of the recolonising of the field and strongly reduces oviposition in the orchard.

Impact of the management sequence on orchard infection dynamics

The trees in the three orchards were sampled and tested for the detection of *C. Liberibacter asiaticus* five months after planting, that is to say at the end of the rainy season (Figure 2).

- C. Liberibacter asiaticus* was detected in 2.13% and 2.90% of the trees respectively in the control orchard and in the orchard subjected to conventional insecticide spraying (Table 1). Detection gave negative results in all the trees in the orchard subjected to systemic insecticide control.
- Although conventional insecticide control limits *D. citri* populations, this procedure does not appear to be effective in controlling the contamination of orchards by greening disease because of the low persistence of the substance used. The systemic insecticide seems to have provided better protection of the orchard from both *D. citri* and the disease.

Table 1. Cumulated number of adult *D. citri* and the percentage of trees infected by greening 5 months after planting with application of the three technical procedures.

	Orchard 1 Témoïn	Orchard 2 Conventiona insecticide	Orchard 3 Systemic insecticide
Cumulated number of psyllids on the date of the test	391	97	3
Infection at planting (%)	0	0	0
Infection 5 months after planting (%)	2,13	2,90	0

Conclusion

Even during the period of small to moderate pressure by *D. citri* (rainy season), the risk of contamination of the orchards by the disease remains high. The harmfulness threshold of the insect is thus very low. For this reason, in chemical control of psyllids and greening, technical procedures using systemic insecticides with high persistence (that are respectful of beneficial fauna) should be preferred to procedures using low-persistence contact insecticides (that are very harmful for beneficials) that require more frequent application and do not provide effective protection against greening.