A Case Study of Huanglongbing (Greening) Control in Reunion

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ABSTRACT. In an effort to reduce the serious effects of citrus huanglongbing (HLB) (greening) over the past 25 years in Reunion, citrus growers were supplied with disease-free plants and biological control of the psyllid vectors was implemented. A survey was conducted in 1995 in the area of Petite Ile which represents all the features of citrus cultivation in Reunion. A mere 0.5% of the over 6,000 orchard trees surveyed, ranging in age from 3 to 25 years, were found to have HLB symptoms, clearly illustrating the success of the program.

Citrus huanglungbing (HLB) (greening) and its two psyllid vectors, *Trioza erytreae* (Del Guercio) and *Diaphorina citri* Kuwayama, are known to threaten seriously citrus crops of Reunion and the neighbouring islands of Mauritius and Madagascar (3, 4, 7, 8). The devastating effect of the disease was demonstrated by an extensive epidemiological study conducted over an 8 years period (1971-79) in Reunion, for assessing the symptomatology and spatio-temporal spread of HLB (6). This study covered 2,740 trees originating from clean budwood obtained from the Station de Recherche Agrumicole (SRA - San Giuliano - Corsica) and established in 1971 into seven different orchards. The results showed that (i) the spread of the disease followed a clear clustering pattern, this being linked apparently to vector behavior, and (ii) more than 65% of the trees were badly affected and rendered unproductive only 7 years after planting under conventional cultural practices. Similar findings were obtained with an epidemiological study of HLB in Chinese orchards established originally with disease-free planting material (6).

For controlling the adverse effect of HLB, a strategy was implemented in Reunion since the mid 1970's consisting in (i) the setting up disease-free foundation blocks and nurseries to supply growers with healthy trees and (ii) promoting biological control of the two psyllid vectors. The former objective was achieved by multiplying selected budwood of SRA origin under insect-free conditions while the latter was finalized by importing and acclimatizing exotic natural enemies, especially the parasitic wasps *Tamarixia radiata* Waterston and *Tamarixia dryii* Waterston (2). This dual approach combining clean policy nursery and integrated vector control has proven to be effective in re-establishing profitable domestic citrus production.

As an illustration a recent new survey was undertaken in Reunion 20 years after the launching of the above strategy of control for assessing the current HLB situation in local orchards.

MATERIALS AND METHODS

The communal area of Petite Ile in the south of the island was chosen as it exhibits the typical aspects of citriculture in Reunion. In this area citrus is grown from sea level, where *D. citri* thrives, to 1,000 m elevation, which is suitable for *T. erytreae*. The land-owning system is extremely fragmented with most orchards covering less than 1 ha. In addition to being a commercial crop, citrus is also grown in countless backyard trees, most of them without any psylla control.

Citrus commercial orchards were identified from aerial photographs taken for a general survey of fruit crop cultivation. This was followed by a ground scouting for checking the presence of psylla on young flushes,

TABLE 1
DISTRIBUTION OF TREES FOUND TO EXHIBIT CITRUS HUANGLONGBING (HLB) CANOPY SYMPTOMS

Plot number	Mandarin cultivar	Age of planting (yr)	Elevation of orchard (m)	No. trees with HLB symptoms
3	Beauty SRA262	15	800	2
41	Beauty SRA262	11	250	7
52	Beauty SRA262	20	300	2
57	Beauty SRA262	5	150	1
51	Clementine SRA63	15	300	2
56	Clementine SRA63	5	150	1

and for HLB symptoms. The survey was done in September and October 1995, this period of the year representing the optimal time for both vectors and symptoms outbreak. Note was also made of any Zn and Mg deficiency symptoms, and other non-HLB induced yellowing and dieback. Specific HLB symptoms on pilot trees in this area had been confirmed previously by PCR (5). A total of 6,115 trees, representing 50% of the established communal orchards in the area were inspected, with the dominant cultivars being Ortanique, Beauty mandarin and Clementine mandarin, well known for their sensitivity to HLB.

RESULTS

The majority of the orchards of this communal area were found below 500 m elevation, with only 10% at higher altitudes. Thirty percent of the orchards were over 10 years old (one orchard is 27 years), and nearly 40% were 6-7 years old, with the remainder 5 years or younger. Over a total of 6,115 trees carefully inspected only 15 trees were found to exhibit HLB symptoms, representing only 0.5% of the inspected trees (Table 1). No evidence of psylla was found in commercial orchards.

DISCUSSION AND CONCLUSION

The concerted effort in Reunion to control HLB is appearing very successful. This has been achieved by the combined effort to supply certified disease-free nursery plants, and achieve proper conditions of the biological control of psylla vectors. *T. erytreae* was totally eradicated by 1979-80 (1), but *D. citri* can still be found in some old backyard trees. The Center for International Cooperation in Agricultural Research and Development - Department of Fruit and Horticultural Crops (CIRAD-FLHOR), the major citrus nursery operator in Reunion, has released over 300,000 healthy trees over the last 30 years. Proper monitoring, such as the one conducted in this survey, was necessary to ensure that HLB remains under good control. This success has allowed to switch the attention to other problems such as tristeza, canker and fruit fly, for improving the competitivity of citriculture in Reunion. A similar program was launched in 1991 in Mauritius island and is also giving excellent results as to HLB aspect. In Madagascar another project aimed at applying this strategy is presently being launched.

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