Research and Methods

Methods and cost of the control of fruit fly: the case of clementine in Corsica

The diversity of the methods used to control Mediterranean fruit fly (*Ceratitis capitata*) and the average per-hectare cost were studied within the framework of analysis of producers' practices (see 'Context of the study'). A strong increase in damage caused by fruit fly was observed on clementines during the 1990s. Serious damage had already been observed from 1965 to 1975. Today, fruit fly control forms part of annual orchard management. Spraying was organised progressively from 1990 onwards. In 1995, nearly 90% of producers used a control method and over 70% sprayed their entire holdings.

The treatment policy varies slightly according to the varieties, depending on the harvest period. The early clementine varieties that ripen in early autumn are more subject to attack by fruit fly than the ordinary variety of clementines harvested from November onwards in cooler weather conditions. This explains why several growers do not spray their ordinary clementines. This is the case in particular of growers whose fruits ripen late, who have cash flow problems or who practice organic farming. Producers also give priority to treatment against fruit fly in the calendar of autumn jobs. Although citrus growing is almost always part of a mixed farming system, spraying dates are only exceptionally affected by work on other crops.

Growers spraying decision methods

- 70% use a rational method.
- 1 in 2 uses traps to evaluate fruit fly populations. The decision to spray may or may not be taken in concertation with a technical adviser.
- Others use a warning system set up by the Plant Protection Service or by the Chamber of Agriculture. As fruit fly populations are currently high, the tolerance threshold is attained rapidly, leading to spraying all the fields.
- 1 in 4 sprays the entire orchard preventively, without monitoring fly population levels.
- A few farmers spray when they observe damage (typical discoloration and fallen fruits), but spraying is started too late in this case.

Number and dates of sprays per field

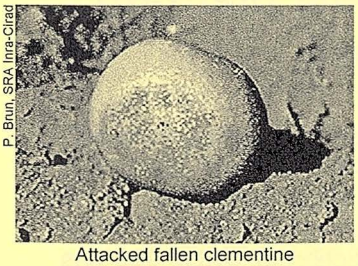
- The number of sprays varies from 0 to 6 according to the farm.
- 50% of farmers who do not spray practice organic farming.
- 1 in 3 performs only one spray and 1 in 2 performs at least two sprays.
- Spraying is carried out between 1 September and 15 November.
- The interval between two sprays varies from 10 to 30 days, and is generally between 10 and 15 days.
- When only one spray is performed, this is generally in October and often between 10 and 15 October.
- Except in special cases, the higher the number of sprays, the earlier the first of them. The first spray is between 1 and 10 October for two sprays, between 1 September and 30 September for three sprays and towards 1 September for four sprays.

Spraying techniques

- Spraying is always mechanised but the technique varies according to the farm and sometimes within the same farm.
- Spraying is performed in the whole or part of a field (from 1 row in 2 to 1

Context of the study

The INRA-CIRAD agricultural research station at San Giuliano in Corsica has been carrying out work aimed at improving the quality of clementines at all levels in the management of the chain since 1994. A programme entitled 'Analysis of producers' practices' is aimed at identifying the limiting factors of production and quality at field and orchard level. Within the framework of this programme, a survey of cultural practices was performed on a network of 68 farms with more than 2 hectares of clementine; these were sampled by random choice and cover all the clementine production zones in the island, currently concentrated in the eastern plain. It can be considered that this sample (a quarter of the 262 farms listed in 1994 and a third of the farms of more than 2 hectares) is representative of the diversity of the situations possible, at least for orchards of more than 2 hectares. The farms monitored had a total area of 899 hectares in 1994, that is to say 41% of the 2 175 hectares of clementines in Corsica at the time.


P. Brun, SRA Inra-Cirad

Attacked fallen clementine

The growth cycle in fruit-fly

Mating is followed shortly afterwards by egg-laying in the fruits, at a shallow depth beneath the skin. The eggs are white and elongated and laid in small batches. They soon hatch as grubs that feed on the fruit pulp throughout their growth period. The fruits affected start to rot and then fall; the grub then reaches the ground where pupation takes place. The pupae resemble tiny brown barrels. The next generation of adults hatches a few days later. The complete cycle from egg to adult lasts for 20 to 30 days at 25°C according to the species.

in 5) or only in the peripheral rows, including wind-breaks or not.

- When only part of a field (or its borders) is sprayed, an attractant (Buminal) may be added to the insecticide solution.
- The insecticides used are dimethoate, fenthion and deltamethrin when harvest time approaches. The volume of solution varies from 1 000 to 2 000 litres per hectare.
- The solution is sprayed with an 'Arbo' sprayer with a capacity of 1 000 to 2 000 litres.

Average weighted cost per hectare

The area under clementine on the farms surveyed varied from 2 to 50 hectares, with an average of 15 hectares. Plantings less than 5 years old and not yet in production are not taken into account and neither are plantations of less than 2 hectares not included in the survey.

The cost discussed here forms a little more than 2% of pre-harvest production cost. When calculated per kilo of fruits sold, minus rejects, the cost of sprays is between Frf0.074 per kilo for 10 tonnes sold per hectare and Frf0.03 per kilo for 25 tonnes sold per hectare.

The cost of the control of Mediterranean fruit fly on clementine in Corsica does not seem to be high in relation to total production costs. However, without spraying, the damage can reach a level such that the growers may not harvest. One kilo of packing station rejects (thus not sold) costs Frf1.75 for picking and sorting only. Moreover, the pricking symptoms may not be visible at harvesting and subsequently appear during the marketing process, with unfavourable consequences for sales and the grower's image.

An alternative control method for Mediterranean fruit fly should soon be developed in Corsica because of the announced withdrawal of the most commonly used products (because they are not registered or because manufacture is to cease). This is all the more urgent as control of fruit fly is indissociable from the quality improvement strategy implemented through plans for a Protected Geographical Indication (PGI) for Corsican clementines. An association of professionals set up in 1999 is drawing up the plans for the PGI with technical support from administrative structures, professional organisations and the agronomic research sector ●

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Average cost of spraying per hectare