South-west Medfly study highlights improved control strategies

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Mediterranean fruit fly has become an extremely important pest of commercial orchards in recent years, with there being numerous reports of control problems from fruit growing districts in the South-west of Western Australia. To assist in finding a solution to the problem of effective Medfly control, a study commenced in July 1995 to develop further understanding of Medfly ecology and to evaluate control strategies under varying climatic and management conditions in the South-west region. Sonya Broughton and Francis De Lima report on the outcomes of the three-year study.

The Mediterranean fruit fly (Medfly), Ceratitis capitata, is one of the world's most destructive pests, infesting over 200 fruit and vegetable species in many areas of the world. In Western Australia, the pest can be found as far south as Esperance and as far north as Derby.

Problems of effective Medfly control in the South-west region of Western Australia were first investigated, with support from the Western Australian Fruit Growers Trust Fund, from December 1992 to April 1993. The study showed that while recommended treatments were effective, control failures resulted from insufficient knowledge of the ecology of the pest.

To assist in finding a solution, the Horticultural Research and Development Corporation (HRDC) and the Australian Apple and Pear Growers Association funded the Management of the Mediterranean Fruit Fly in Apple and Pear Orchards project (AP95045). The project started in July 1995, with the aim of developing suitable methods and protocols for the management of Medfly through an understanding of the ecology of the pest, and by evaluating control strategies under varying climatic and management conditions.

Study area

Trapping grids and electronic weather stations were established during 1995 in apple and pear orchards (pomefruit) and urban centres in Manjimup and Donnybrook. Non-pomefruit orchards that fell within the grid were also included.

The project aimed to obtain population data for Medfly under two different climatic sites where pomefruit is cultivated. The data from Donnybrook gave information relating to cool and damp conditions, while the data from Manjimup gave data for very cold climatic conditions.
Adult Medfly populations and their fruit hosts were sampled at weekly intervals for immature stages and for data on fruit physiology.

**Medfly life-cycle in Donnybrook and Manjimup**

Based on climatic data obtained from weather stations at Donnybrook and Manjimup, a population model for Medfly was developed (see Figure 1). The model showed:

- Development of immature Medfly increases rapidly from late spring and continues into summer.
- In autumn and winter, development is negligible.
- Eggs and three larval stages are present during winter in fruit such as citrus, and in the ground as pupae, although their development is minimal until the onset of warmer weather. This is known as ‘overwintering’.
- New adults emerge to infest fruit when the orchard crop is at the right stage for the female Medfly to lay eggs in the fruit that will survive.
- Fairly high populations of mature adults continue to survive through autumn and early winter, which coincides with pomefruit maturity. The market value of fruit crops is reduced by ‘sting’ marks. These are made in fruit by the female, which probes the fruit when depositing eggs.
- Medfly longevity depends on temperature, ranging from six months at 18°C to six weeks at 30°C.

**Figure 2** outlines the risk of infestation to various fruits over a 12-month period.
General distribution findings

Overall, higher numbers of Medfly were consistently found in Donnybrook over the three seasons of the study, with peaks occurring in late summer and early autumn (see Figure 3). Medfly were also more widely distributed in Donnybrook, with high numbers found both in town and in the orchards. This was attributed to ineffective orchard baiting and the absence of a coordinated shire-baiting program.

While the Manjimup Medfly population was significant in 1996, it was well controlled in 1997 when a limited town-baiting program was introduced. However, the population increased again in 1998 in the absence of town-baiting.

Medfly persisted in backyard orchards in both Donnybrook and Manjimup. In addition, there were a number of overlapping and long-term populations of Medfly in Donnybrook due to the presence of abandoned apple and pear orchards (see Figure 4).
Citrus groves and trees provide a year-round habitat for Medfly, especially in winter. Adults survive winter in the foliage of trees and are frequently captured during the winter months, especially when day temperatures exceed 10°C, which is the threshold for flight (see Figure 5).

Where orchards had a combination of pomefruit, stonefruit and citrus, Medfly activity was able to continue all year. Once again, citrus plantings within commercial orchards showed higher incidence of Medfly in Donnybrook than in Manjimup.

**Conclusions**

Neglected or abandoned orchards close to other production orchards were sources of Medfly infestations. Where control measures were no longer in place, Medfly captures were many times higher than the average trap count for the area.

In terms of seasonal influences, it was found that Medfly became a threat to apples and pears from January onwards. However, their ability to survive on a year-round basis meant that late spraying in autumn would be necessary to eliminate flies that would be the source of the following season’s infestations.

Medfly-free zones can be achieved for both Donnybrook and Manjimup with extensive baiting in summer and autumn. In Donnybrook, Medfly is more widely found in production areas than in urban areas, which
means that an area-wide Medfly control program would be required. However, in Manjimup, baiting within the town site would be enough to create Medfly-free zones.

Recommendations

Management options

A scoring system has been recommended for use in various fruit crops. The level of baiting or cover spraying is worked out according to the number of Medfly caught. A scoring system for pomefruit orchards is provided in Table 1.

<table>
<thead>
<tr>
<th>Number of Medfly caught/trap/week</th>
<th>Action Required</th>
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<tbody>
<tr>
<td>0-1</td>
<td>Weekly perimeter baiting in summer to early autumn, otherwise none (i.e. baiting for immigrants)</td>
</tr>
<tr>
<td>2-4</td>
<td>Weekly baiting of orchard</td>
</tr>
<tr>
<td>5-9</td>
<td>Twice-weekly baiting of orchard</td>
</tr>
<tr>
<td>10 or more</td>
<td>Twice-weekly baiting. Cover spray of orchard if necessary</td>
</tr>
</tbody>
</table>

Table 1 - A scoring system of trap counts for determining bait/spray actions in apple and pear orchards.

NOTE:
1. Traps should be rotated to follow new leaf growth and fruiting.
2. A trap should be placed in citrus trees if present.
3. Other fruitfly control methods should be adhered to e.g. collecting fallen fruit and properly disposing of them, stripping trees of undersized fruit after harvest, etc.

In addition, a whole orchard approach is recommended to eliminate Medfly not only from stone and pomefruit crops, but also from citrus trees that are often found in commercial orchards.

Area-wide control is considered the most effective method of achieving sustainable Medfly control. Many orchardists work out their spray schedules individually. However, when bait spraying is coordinated, Medfly populations are more effectively suppressed and resurgence is delayed. In addition, the number of sprays required per season can be reduced.

New insecticides

Apple and pear growers are committed to reducing pesticide use as demonstrated in 1991 by their signing of the Pesticide Charter with consumer and environmental groups. However, in many crops, it is very difficult to control Medfly without frequent sprays.

Alternatives to current chemicals, such as spinosad and fipronyl, provide good control when mixed with protein. These alternatives are considered to be environmentally benign and will be particularly useful on properties where IPM (integrated pest management) has been adopted, and where decreased pesticide usage is desired. Lab trials using alternative chemicals have commenced, with field trials to follow.