FRUIT PIERCING MOTHS

Various species

1 PEST PROFILE

1.1 Distribution and status

Piercing moths occur in all the traditional deciduous and citrus areas of southern Africa. Most citrus cultivars, with the exception of lemons and limes, can be subject to piercing moth attack, but early-maturing cultivars are most susceptible. However, piercing moths are very sporadic pests and reports of major damage are seldom received, except in the Eastern Cape and sometimes Western Cape, where outbreaks appear to be cyclical i.e. every five to 10 years. In the most severe cases, piercing moths have been known to destroy 50% or more of an orchard crop.

1.2 Description

The piercing moths all belong to the family Noctuidae, which indicates that they are night flyers. The following genera are regarded as important: *Calpe, Egybolis, Othreis, Pericyma, Plusiodonta* and *Serrodes.* In South Africa the number of species that have been regarded as piercing moths by different authors varies from six to 88. As a result it is not possible to offer a detailed description of piercing moths. The colour of the larvae varies from green to brown, grey and black. They can be striped or in some cases, have eye-shaped spots on individual body segments. In general the moths are large with a wingspan that varies from 20 to 90 mm according to species.

The most important species, if not all, are migratory. The migratory behaviour can involve migration over long distances and/or the more restricted movement of moths in and out of fruit orchards at night.

The species *Serrodes partita* (Fabr.) is a good example of a piercing moth. The three black spots, forming a triangle near the base of the forewing, are characteristic. It is a known, sporadic pest of citrus. This insect is the most important piercing moth species in the Cape production areas. It breeds on the wildplum *Pappea capensis* E.Z. that occurs in abundance over 80 000 km^2 of the little Karoo and parts of the Great Karoo. The larvae feed at night on the young leaves and shelter on and under the trees during the day. On completion of the developmental cycle the moths leave these trees and seek wild or cultivated fruit to feed on. Depending on climatic conditions, which have a direct influence on the amount of available food, the moths migrate and can even reach the fruit-producing districts in the southern part of the Western Cape. Outbreaks of *S. partita* are of a cyclical nature. Minor outbreaks can be expected every five years while population explosions can be expected about every 10 years. However, it appears that the moth may be present every season, but usually at levels too low to constitute any noticeable pest status. Outbreaks always follow heavy summer rains in the Little Karoo and parts of the Great Karoo, with citrus farmers experiencing the outbreak about two months later.

Growers need to be sure not to confuse fruit sucking moths with fruit piercing moths. Sucking moths cannot cause primary damage; they can only feed on fruit which has already been damaged. There are several species of sucking moths which have been associated with citrus. By far the most common is *Achaea lienardi*, which like the piercing moths is also a noctuid. Outbreaks of *A. lienardi* appear to be far more protracted than those of piercing moths, sometimes continuing for weeks. It is because of this protracted presence of *A. lienardi* that growers can easily get the impression that it is this moth which is the primary cause of the damage to their fruit. However, it is not uncommon for sucking moths to feed on the damage caused by piercing moths (and other causes of primary damage). *Achaea lienardi* simply exacerbates the damage caused by piercing moths, or anything else, enlarging the holes in the fruit and causing them to drop more rapidly. Although there is a lot of variation in the colouration and patterning of *A. lienardi*, it can be recognized by the triangular pattern towards the apex of the forewings.

1.3 Infestation sites

Piercing moths only breed on wild host plants. Cultivated fruit serve only as food sources for the moths. Only orchards with near-ripe or ripe fruit are attacked. Moths enter orchards at dusk against the prevailing wind direction. The moths feed until about midnight and then leave the orchard and continue their migratory activity. Each night a particular orchard will be subject to

attack by a new wave of moths. Ripening of Satsuma Mandarins generally coincides with migration of *S. partita*, resulting in these usually being the only variety to suffer damage by this species of fruit piercing moth.

1.4 Damage

1.4.1 Symptoms

The piercing moth penetrates the fruit with its proboscis which is also used to break up fruit tissue and juice cells and subsequently suck up the juice. These actions result in typical piercing moth damage which normally comprises a clear penetration hole with an underlying dry area in the fruit tissue where the fruit juice has been removed. After a few days the damaged area turns yellow and can become infected by fungi and the fruit later drop. If fruit is harvested shortly after being pierced, it will appear to be healthy and will only begin to decay during packing or transportation.

1.4.2 Seasonal occurrence

Only fruit which has begun to colour up is attacked.

2 MANAGEMENT ASPECTS

2.1 Infestation/damage assessment

Piercing moth damage is usually so sporadic that routine inspections of orchards for its presence are difficult to justify. Growers who have orchards that are subject to more regular attacks should use their accumulated experience as guidelines for initiating annual inspections. When early maturing varieties begin to colour up, growers can conduct nightly inspections in orchards after dark. If fruit piercing moths are present, they will be seen feeding or resting on fruit. Unfortunately, there are no general infestation criteria available on which to base control operations.
Risk of *S. partita* outbreaks can be assessed by inspection of the foliage of wild plum trees in the general vicinity of or in the Karoo. Larvae are mottled grey semi-loopers, a few centimeters in length, which are well camouflaged against branches. Infested trees will be fairly obvious, by the decimation of foliage, causing trees to appear grey.

Where piercing moth presence in an orchard and associated damage is confirmed, post-harvest assessments should also be conducted. Degreening of fruit is of great assistance in highlighting any such damage. Alternatively, fruit can be left to stand for two or three days, then be immersed in a hot water bath to observe for the appearance of bubbles from puncture wounds, or can be treated with an indigo carmine dye to highlight the same. If it is impractical to test all fruit in such a manner, then a large representative sample can be tested to indicate the risk potential of the consignment.

2.2 Control options

For the purpose of control operations all the piercing moth species can be regarded as a single pest unit.

2.2.1 Biological

Little information is available on biotic control factors. Piercing moth larvae can be subject to bacterial and viral diseases and they are also attacked by wasp and fly parasitoids. However, as a result of the widespread nature of the pest these factors cannot be manipulated.

2.2.2 Cultural

The creation of light barriers is currently the only control option available for use against piercing moths. The success of this measure relies on the fact that the eyes of these night flying moths change physiologically when exposed to light with the following results:

- Moths that fly into the light spiral upwards and away from the light barrier.
- Moths that settle on trees in the light become quiescent (as during the day) and do not feed.

An effective light barrier can be created by placing electric, gas or paraffin lamps along the lee side of an orchard. Lights with about 300 to 350 candle power will have to be spaced at 20 to 30 m intervals, about 1.5 m high and 2.0 to 2.5 m from the outside row of the orchard. More powerful floodlights can be placed further apart facing one another to create a barrier of light. Illumination must be maintained from dusk to about midnight. This measure is very effective provided the recommended procedure is followed. For example, lights must be switched on before moths enter the orchard. Once moths have settled in the orchard, the lights will have no

effect.

2.2.3 Plant protection products

Eggs and larvae of piercing moths occur only on wild host plants and it is not practical to control them with plant protection products. Some of the available products may have a contact effect on adult moths when applied to the fruit. However, as a result of the migratory nature of the moths such treatments will not reduce the nightly orchard population comprising new moths from outside the orchard environs. Treatments would also need to be applied shortly before harvest on ripe fruit and this could easily lead to residue problems.