Almond IPM: Monitoring carob moth - an update

INTRODUCTION

Pest monitoring is a critical component of IPM systems. It can provide growers with valuable information on the presence, distribution and population levels of pests, and on the impact of pest management activities. Monitoring of carob moth in almonds is documented in detail in the Australian Almonds fact sheet 'Carob moth in almonds: monitoring guidelines'. This update provides further information including findings from more recent research and is intended to help growers achieve better results from their monitoring efforts.

NUT SAMPLING

Summer sampling of new crop nuts

Sampling of the new crop of nuts in summer is used to determine infestation and damage levels to help in the planning of post-harvest management of the crop. Orchard blocks that show higher levels of pest infestation may be targeted for earlier harvest and fumigation and/or processing, to limit further damage.

Sampling position is important

Nuts collected from the ground immediately after trees are shaken represent the entire crop throughout each tree, and so provide a good overall average of damage or infestation levels throughout the tree. Nuts collected from trees before harvest represent only those areas from which they are collected and may yield infestation and damage levels that differ markedly from the overall average, as is the case with carob moth.

Carob moth is known to generally infest almonds only after hull split (Gothilf 1984; Madge et al 2015), and hull split is known to start in the upper parts of trees (Flint 2002). It could therefore be expected that higher levels of damage would be found in those upper areas where nuts are exposed to infestation for the longest period prior to harvest.

Detailed sampling during the 2018 and 2019 harvest confirmed this to be the case. As Figure 1 **Error! Reference source not found.**shows, nuts collected from the upper third of the canopy of 6 m high trees had much higher damage levels compared to those from the middle and lower thirds of the canopy. The lower canopy samples represent nuts that could be collected by hand by a person standing on the ground.

This same pattern was observed in three sampling situations where kernel damage levels in the upper canopy ranged from 8 to 18%. In all three situations, samples picked by hand from ground level would clearly have underrepresented the average damage levels of the crop. In contrast, and as expected, kernel damage levels in samples collected from the ground after tree-shake provided a much more accurate measure of average damage levels throughout the trees.

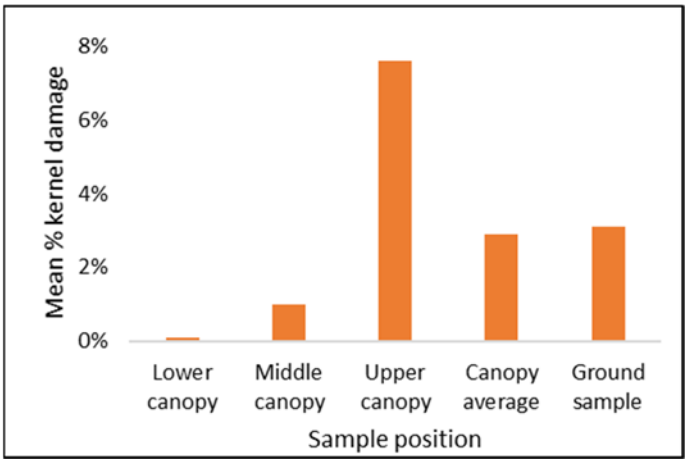

Figure 1. Variation in carob moth damage to almond kernels at harvest between various sampling positions.

Take-home message: To determine carob moth damage levels in new crops, sample nuts from the ground after tree-shake, or ensure that the full height of the canopy is represented in samples collected directly from trees.

Timing of sampling is important

Local and overseas experience has shown that carob moth infests almonds as soon as hull split occurs; kernel damage is seen within two weeks; and damage can continue to increase rapidly until the nuts are harvested and disinfested or processed. As Figure 2 shows, the percent of kernels damaged can more than double over a two-week period. Pre-harvest samples collected a considerable time (e.g. 2-3 weeks) before harvest may lead to a significant under-estimation of actual crop damage levels at harvest.

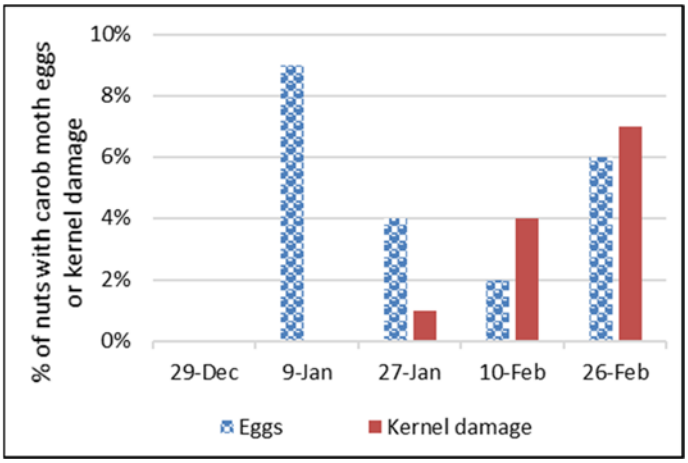

Figure 2. Growth in kernel damage by carob moth over time.

Take-home message: Pre-harvest samples to determine damage levels from carob moth should be collected as close as practicable to the time of harvest.

Winter sampling of mummy nuts

Sampling of old mummy nuts and leftover crop from the most recent harvest can be used to determine the levels of carob moth infestation being carried into winter. This may help orchard managers to target hygiene efforts towards the most heavily infested blocks.

Sampling position appears unimportant

Extensive sampling of mummy nuts from high and low in the canopy of 133 trees and from the ground, showed that on average, levels of infestation with carob moth varied very little between those sampling positions (Figure 3).

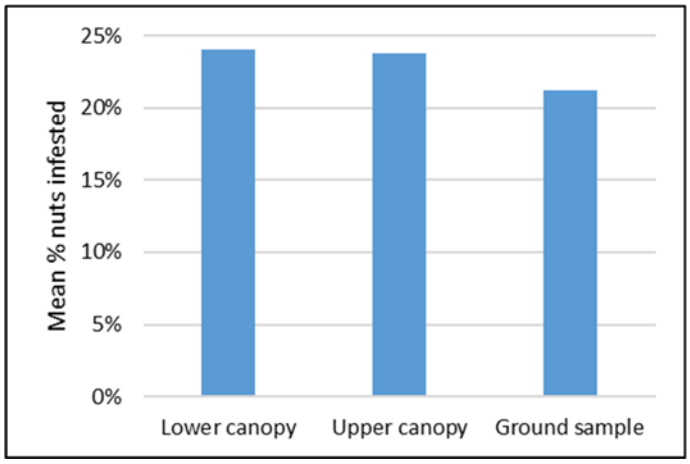

Figure 3. Variation in infestation of almond mummy nuts with live carob moth between various sampling positions.

Take-home message: When sampling mummy nuts for carob moth infestation in winter, the position from which nuts are collected does not appear to be important.

MOTH TRAPPING

Pheromone-based male traps are useful indicators of carob moth flight patterns and population levels as described in the monitoring guidelines mentioned above.

Trap position influences the result

Like some other moth pests of tree crops, higher levels of carob moth activity tend to be observed higher in the tree canopy. Because of this, traps placed nearer the top of the canopy tend to capture more carob moths than traps placed lower in the canopy, such as at head-height (Figure 4). However, although high traps have been observed to catch up to 50% more moths than low traps, low traps still provide a useful guide to relative levels of carob moth activity over time and between orchard blocks.

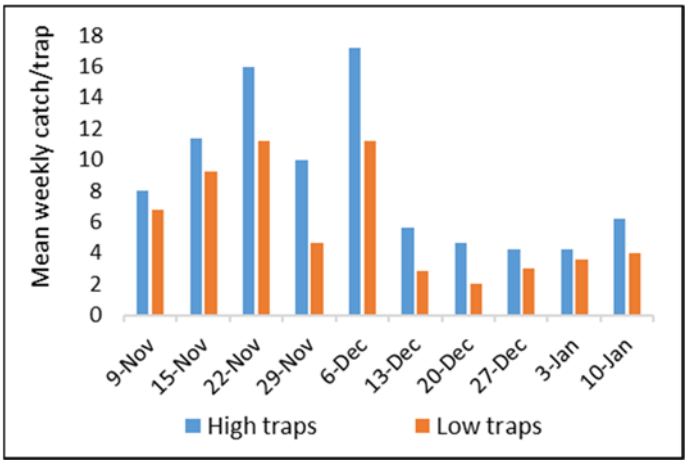

Figure 4. Carob moth catches in high and low traps in almonds.

Take-home message: High-placed pheromone traps capture more carob moths, but low traps are probably just as effective for determining relative levels of moth activity.

REFERENCES

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