Building the case for fumigation-free apple exports

JUDITH STAHL

Early research results are showing how farm and packhouse practices yield premium pest-free fruit for Asian markets.

A large-scale study in Tasmania and southeast Queensland is building strong data to support a case for expanded access into premium Asian markets. The research will demonstrate a systems approach to manage codling moth that does not require a fumigation step.

Developing a systems approach

Fumigation is currently a treatment option for fruit exports to some markets to manage the risk of live pests. While this treatment is effective, it can impact the quality of produce – nudging export consignments out of a premium category.

"The Australian apple industry export strategy aims to make it more feasible for growers to target the highest value markets with premium quality fruit," said APAL Head of Trade Jenny Van de Meeberg. "Reducing reliance on fumigation is a critical part of our strategy."

APAL, Fruit Growers Tasmania, Tasmanian apple growers and Biosecurity Tasmania are key partners in research under the four-year Hort Innovation Safe Trade project to work towards this strategy.

CSIRO's Dr Judith Stahl leads the Safe Trade apple case study. It aims to build strong scientific evidence that shows how key practices in the apple production and packing process cumulatively reduce the risk of codling moth in apple consignments for export. An important part is to add further export protocols that align with existing commercial practices to make uptake as easy as possible for growers. For this, the team is collecting data which enable recognition of those practices by trading partners.

The study is quantifying the effectiveness of pest surveillance through trapping and crop inspection in the orchard and quality grading in the packhouse. Over the last two seasons, the research team has been gathering data through a suite of experiments in orchards, packhouses and laboratories. While the team is busy collecting data from the recently harvested apples in Tasmania and Queensland, a few trends from the preliminary data are emerging.

About the author:
Judith Stahl

Research Scientist, Market Access & Digital Agriculture, Lead Apple Case Study, Safe Trade project, CSIRO

Figure 1: Codling moth (*Cydia pomonella*) damage on a Granny Smith apple in the orchard.

First results from orchard practices

Pheromone traps are an essential tool in codling moth monitoring, and a monitoring tool has to be reliable. Our monitoring data with pheromone traps from last season suggest that the precise placement of the traps within a tree and within a block is not of great importance. However, since codling moth presence, and therefore damage, can be quite localised, a focus on historical hotspots – as generally recommended – is supported by our data.

We plan to analyse trap catch data we have collected from commercial apple blocks in combination with fruit damage and larval infestation in the same blocks. This analysis will help assess and refine trapping corrective action thresholds. To date, we have found no evidence of codling moth

Figure 2: (Left to right) Patrick Gleeson, Matthew Contarini and Bruce Davis, part of the CSIRO team, chopping freshly harvested apples and looking for codling moth in the 2025 harvest season.

damage in parts of blocks where no moths have been trapped over the season; an area we will continue to collect evidence to support.

In blocks monitored last season, fruit damage due to codling moth larvae ranged from 0 to 40 per cent – in unmanaged orchards. This underscores why codling moth is such a serious pest in pome fruit. However, even in orchards with high pest pressure where many fruit had codling moth damage, only a very low proportion of apples cut following harvest were found to contain larvae. This is likely to be due to pest management in the orchard and larvae having already completed development and left the fruit prior to harvest time. Currently, more data are being collected to confirm this. For the ongoing harvest season, more than 15,000 apples have been destructively assessed, with many more to do.

Looking at the whole production chain, the question arose as to how high the risk of postharvest infestation is. A small study conducted to answer this question showed that low rates of new damage can occur on harvested apples left in orchard blocks, at least where codling moth trap catches were very high during the season. Analysis from a similar study in packhouses is not yet complete. However, so far, the results emphasise the importance of current commercial practice to remove harvested apples from orchards soon after they've been harvested.

Another new trial assessing the packed apples has not found any codling moth to date, contributing to the body of evidence for the efficacy of the commercial practices in the production chain.

The contribution of optical grading technology

The apple case study provides an important opportunity to assess the contribution of practices in the packhouse to producing pest-free consignments for trade. One of those practices is the grading process, with a specific focus on optical scanning technologies. While optical graders are not programmed to detect insect infestation, our research can assess how effective the grading process is for rejecting fruit with insect damage from the packing line. This analysis may enable trading partners to formally recognise the contribution of commercial grading to phytosanitary risk reduction.

CSIRO's Dr Maryam Yazdani leads the optical grading research. Over the last two seasons, more than 15,000 apples from high-pressure orchards were used to evaluate three optical grading systems. Each fruit was later visually inspected and dissected for codling moth and other damage. Depending on the apple variety, the efficacy of the tested optical grading systems in detecting codling moth damage ranged between 60 and 75 per cent. External detection systems performed better than internal ones when assessed separately. Around 3,000 (20 per cent) of the inspected apples showed codling moth damage, but only 25 larvae were found in total. Notably, all apples containing codling moth larvae were rejected by the graders.

Figure 3: Judith Stahl running an experiment on postharvest infestation risk in an apple orchard.

Photo: Patrick Gleeson

Other postharvest measures

Postharvest, especially in the packing shed, is a critical stage where even growers with limited in-field control options, such as organic growers, can ensure a codling moth-free packed product. In addition to optical grading machines, manual removal of damaged fruit still plays an integral role in the packing process.

Since the packhouse is not the end of the production chain, the research team is also conducting laboratory experiments and running mathematical models to assess the phytosanitary risk if any codling moth larvae were to slip through the cracks of orchard and packhouse measures.

Impact for growers

The researchers are engaging with industry, as well as the Tasmanian and federal governments to ensure that the research is focusing on the right questions to support market access negotiations.

Data gathering and analysis for the project will continue through 2025 and 2026 towards the development of science-backed tools that streamline phytosanitary risk management by demonstrating and quantifying the contribution of commercial supply chain and production practices to risk reduction.

Armed with this data, the goal for access to more key Asian markets without fumigation for Australian apple growers should be within reach, leading to more jobs and profits thanks to premium market exports. AFG

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