OCTOBER 2021

ALL ABOUT ALMONDS

INTEGRATED PEST MANAGEMENT

PEST BIRD MANAGEMENT

KEY POINTS

- Page 1: An integrated bird management plan is the most successful means of bird control.
- Page 2: The cost of crop damage must outweigh the cost of control.
- Page 3: Establish control early to prevent habituation, prevention is better than a curative.
- Page 4: Ensure control methods align with state legislation.

Introduction

As rural regions get transformed through expanding horticultural industries, many bird species are declining due to the removal habitat and native food supply. However, some pest bird populations are proliferating due to an increased food supply, reliable water source and favourable habitat changes. It is estimated that pest bird species cost the Australian Horticultural Sector more than 300 million dollars annually (Gong, Sinden, Braysher and Jones, 2009) and almond orchards are no exception. Our orchards are located in suitable environments for pest bird species to habituate and consequently exert little energy to feed on a high value caloric and nutritious food source.

Bird presence in Australian almond orchards has long been a factor that imposes both positive and negative outcomes for growers. Considerable time and money are spent on bird control measures in a bid to mitigate their impact. However, due to such high variability in damage levels between seasons, the efficacy of control is also variable and consequently so are the economic returns from the control measures.

The diversity of bird species found in almond orchards further increases the complexity in control. Some of the known species include:

- Little Raven (Crow)
- Galah
- Regent Parrot
- Sulphur-crested Cockatoo
- Rainbow Lorikeet
- Musk Lorikeet
- Adelaide Rosella
- Little Corella
- Long-Billed Corella

To read more about each of these bird species click on their names to view the factsheet.

Figure 1. Musk Lorikeet damage to green almonds

Figure 2. Little Corella damage to green almonds

Positive effects of birds in almonds

Studies have shown that there are significant economic and environmental benefits of bird presence in almond orchards. As many of the species are insectivores, this aids in controlling canopy bound insects such as caterpillars and earwigs. In addition, further studies have shown that bird predation can reduce grasshopper densities by 30-50% (Tracey et al. 2007).

The two greatest pests known to Australian almond orchards are the Carpophilus beetle and the Carob moth. Without adequate control both insect species have the ability to devastate entire crops by feeding on almond kernels. Orchardists currently use an integrated pest management approach focussing on orchard hygiene practices to remove and destroy all over-wintering mummy nuts, taking away the potential shelter and food source for these pests.

Birds can provide a valuable service by feeding on mummy nuts which in turn reduces the Carpophilus beetle and Carob moth shelter and food supply over the winter months, decreasing their population. An example of this is the Adelaide Plains growing region where damage inflicted by these insects is almost non-existent due to high bird populations and very few mummy nuts.

Figure 3. Bird scaring laser

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Measuring bird damage

Direct Damage

It is important to gauge the level of damage being imposed by birds each year in order to make an appropriate financial decision on when and what control methods to use. Direct damage can be measured by collecting a representative sample of almonds from a designated area. The damage percentage can then be calculated by the following method: [damaged nuts / total nuts collected] x 100.

A standard random sampling procedure with sampling points evenly spread across the orchard can be used to achieve accurate results. However, as bird damage is often seen at the edge of the crop, or near native vegetation, these areas should be targeted when estimating damage. The degree of accuracy will be determined by how much time and effort is invested in the measuring process. For example, collecting yield weights for damaged areas may be time consuming and expensive but is likely to be more accurate than doing a visual assessment.

Secondary damage

Secondary damage occurs when birds land in the trees, move through the canopy knocking nuts off the tree prematurely without consuming them. Also, some species, such as the Little Corella, will chew on branches and leaf petioles. Chewing the soft shoot tips when trees are young can result in extra branching and affect the future tree architecture. If left unmanaged flocks can completely defoliate trees and affect orchard productivity the following season.

Smaller birds that cannot break through almond hulls can still damage the fruit creating a site for a secondary infection such as bacteria and insects. This secondary damage is difficult to measure. Additional chemical applications against pest and disease may be required in these areas and downgrading can occur at the processors.

Figure 4. Musk Lorikeet (Image: David Stowe)

Figure 5. Little Raven (crow) (Image: David Stowe)

Early forecasting

Early forecasting of bird damage can be helpful for annual planning even though patterns are often variable. Factors to consider when forecasting damage include:

- **What was the damage in the previous season?**
  Yield damage estimates by birds from the previous season can determine if current methods are providing adequate control.
- **What was the severity of damage that other growers experienced?**
  If neighboring or local properties are being heavily impacted, it may be likely that they will increase their level of deterrents which can move the birds in to your property.
- **Which birds are likely to become a problem?**
  Bird species respond differently to different scaring stimuli, therefore identifying the most problematic species will assist in determining what deterrent method to use. The likely species should be identified early as responding to the first birds that arrive will be more affective than after a pattern has been established.
- **Are there adequate alternative food sources in the region?**
  If local natural food sources have been depleted due to lack of rainfall, land clearing etc., it is likely that the birds will migrate to feed on horticultural crops.
- **What do reports from local bird watchers and ornithologists say?**
  Local bird watchers are a great asset for regular updates on bird behaviour, their movements and populations.

Figure 6. Little Corella (Image: Grant Schwartzkopff)

Figure 7. Regent Parrot (protected species) (Image: David Stowe)

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Control techniques

All control techniques need to be evaluated and applied to the correct species of pest birds. All bird species differ in their biology and behavioral characteristics so it is likely that they will respond to different methods of control. Studies have shown that an integrated bird management plan provides the most successful control of bird damage in horticultural industries. Therefore, it is important that growers don't rely solely on a single control method, and they're changed frequently (Tracey et al. 2007).

Noise deterrents

Scaring with acoustic devices is commonly used as an effective, humane, and cheap method of bird scaring. As with many techniques' birds will begin to habituate over time with the deterrent, therefore it is important to keep moving the device around rather than staying in the same location. Studies have shown that to achieve the best outcome for noise deterrents the following points should be considered:

- The sound is presented at random intervals.
- A range of different sounds are used.
- Sounds are broadcast for the minimum time needed for a response.
- The sound source is moved frequently.

When using auidble bird scaring devices all practices must align with the regulations issued by the Enviromental Protection Authority. To ensure legal practices are performed click here.

Visual deterrents

A wide variety of visual scarring deterrents are available to growers and have shown to be effective in various situations. However, they generally only offer a short-term protection period before the pest birds realise that they're not a threat. For best results, visual scare deterrents should adhere to the following:

- Appear lifelike.
- Have motion e.g. windblown.
- Be highly visible.
- Be moved frequently to various locations throughout the orchard.

Lasers

Bird scarring laser technology involves mounting a laser above the orchard canopy and shining the light beam through bird intrusion zones. The laser follows waypoints from a program that is designed by the orchardist. This technology has been proven in other horticultural crops and is currently being evaluated by the Almond Board of Australia (see Figure 3). To read more on the laser specifications click here.

Decoy crops

Decoy food resources for birds hasn't been widely adopted into horticultural practices due to few studies being undertaken, however it has been successfully achieved in reducing bird damage to sunflower crops. Planting alternative resources requires many considerations including:

- The resource needs to be as nutritionally beneficial as the crop being damaged.
- The crop needs to fruit at the same time as the almonds.
- The bird species need to feel safe when foraging and be able to harvest the crop at the same rate as they do almonds.
- The target bird species needs to be identified to understand what crop will be most palatable.

Chemical repellents

Chemical repellents are substances that are applied to crops via foliar spraying. They deter birds through poor taste, smell or colour. There is little to no use of chemical repellents in the almond industry due to their residual effects on the fruit, making them not suitable for human consumption.

Low flying aircraft

Using either a model aircraft, drone or a light full-sized aircraft provides both acoustic and visual scare stimuli. This process involves the aircraft taking flight repeatedly throughout the day, chasing the birds and forcing them to exert significant energy supplies. It is critical that the aircraft does this regularly as when the birds return, they have an increased requirement to eat in order to replace depleted energy stores. This technique has shown promising levels of control and the cost can be offset by neighboring properties sharing the service.

Shooting for bird destruction

Bird shooting has long been the control method that orchardist believe is the most effective way to control bird populations. This method is not favoured by the general community and is time consuming and expensive for orchardists to patrol the orchard continuously. However, humane, and responsible shooting may be incorporated into an integrated strategy and used to reinforce noise deterrents.

Bird Netting

Netting horticultural crops is common practice for many commodities as it provides a physical barrier between the crop and the birds. The installation of the netting infrastructure can exceed $50-60,000 per hectare making it a significant investment for growers (Severs, 2019). Almond orchards can be seen as broad acre horticultural crops covering hundreds of hectares and therefore, netting infrastructure quickly becomes not financially viable. In addition, netting will alter the micro-climate within the orchard creating additional management challenges.

Drones

There is ongoing investment into the use of drones for bird control. Several commercial companies have autonomous drones that follow a designed program while carrying a speaker playing bird distress calls. The use of drones is quickly asserting itself as a humane and effective method of control, however developers are still perfecting the technology. A study done by Zihao Wang identified the potential of having a fully autonomous system with infield cameras that identifies the birds and alerts a drone or fleet of drones to take off. The drones have the ability to identify the birds and continuously chase them away autonomously. This type of technology was proven effective in the project and will be appealing to growers in the future.

Figure 8. Sulphur-crested Cockatoo (protected species) (Image: David Stowe)

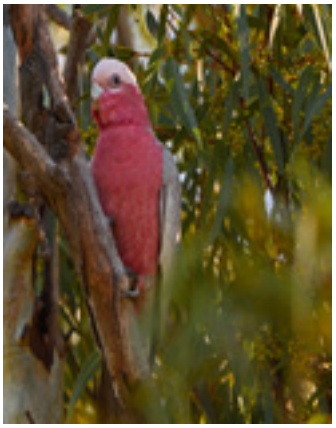

Figure 9. Galah (Image: Grant Schwartzkopff)

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Legislation

There is currently a suite of legislative regulations, licences, permits and guidelines for various bird control techniques that are in place to protect native bird species and biodiversity.

Native bird species are generally protected, and heavy penalties apply if they're destroyed without a permit. There are various provisions in state legislation that deem selected native species as 'unprotected' and therefore do not require a permit for destruction.

The destruction of non-native bird species is not illegal, nor does it require a permit, however legislation states that destruction of any bird species must be humane.

In order to gain a permit, damage or potential to damage agricultural or the environment must be demonstrated. After investigation, permits are usually issued for a specific number of birds and for a restricted period. To gain a permit for bird destruction, the grower needs to submit a 'Permit to Destroy Wildlife form to their relevant state government.

Social and environmental factors affecting bird control

Many of the bird control techniques available may be associated with social and environmental issues that need to be considered. The risk of these issues occurring are heightened in more densely populated areas. These issues include:

- Noise pollution though acoustic bird deterrents.
- Animal welfare issues associated with scaring and lethal deterrents.
- Risk of harming non-target bird species.
- Aesthetic acceptability of visual scarring devices.
- Heightened bird presence where decoy crops have been planted.

Conclusion

Bird control is a complex task that requires significant time, resources and perseverance with regular planning and evaluation. A strategic approach to control should be adopted that involves defining the problem, developing a plan, implementing the plan, with frequent (almost daily) monitoring and evaluation to make sure the plan is still working. During this process it is critical that all economic parameters are taken into consideration to ensure the cost of control doesn't outweigh the cost in damage. To gain the most control an integrated bird management plan should be implemented in a bid to discourage a greater number of bird species out of the orchard. Finally, all management techniques need to abide by federal, state, and local legislation and regulations and aid in retaining sustainable populations of bird species.

Pest bird control is not only a horticultural problem but a national problem. The control methods identified in this factsheet are reactive and do not result in a regional net reduction in bird damage. The long-term solution to managing pest birds is to develop an integrated regional program that manages pest birds all year round. The over-abundant species will need to have their populations managed and further investment will need to occur in order to understand the demography of the pest bird species.

PEST BIRD MANAGEMENT PLAN

A case study using a bird management plan template was performed in wine grapes, however the principals can be adapted to an almond orchard. Click on the links below to read more.

Bird Mangement Plan Case Study

Bird Managment Plan Template

References

Tracey, J., Bomford, M., Hart, Q., Saunders, G. and Sinclair, R. (2007) Managing Bird Damage to Fruit and Other Horticultural Crops. Bureau of Rural Sciences, Canberra.

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Severs, J., 2019. Beyond the cost barrier: Netting delivers growth - APAL. [online] Apple & Pear Australia Ltd (APAL). Available at: <https://apal.org.au/cost-barrier-netting-growth/> [Accessed 5 May 2021].

David Stowe Photography (2021) Images 4, 5, 7 & 8.

Grant Schwartzkopff (2021) Images 6 & 9.

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OTHER RESOURCES

Managing bird damage

Birds in almond crops

Guidelines for reducing Cockatoo damage

PROJECT CODE

AL19001 Australian Almond Innovation and Adoption Program

These projects have been funded by Hort Innovation, using the almond research and development levy and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

MORE INFORMATION

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