

Minimising the Impacts of Vertebrate Pesticides on Non-Target Species



Aroha Miller¹, Shaun Ogilvie², Charlie Eason^{1,2}
¹Bio-Protection and Ecology Division, ²Innovation Research Ltd,
 Lincoln University, P.O. Box 59613,
 Greenmount, Auckland, New Zealand

Objective: There has been considerable research on impacts of vertebrate pesticides on non-target species in New Zealand. Here we review this research, focusing on 1080 bait targeted at possums, with the aim of making recommendations that can be actioned to reduce non-target impacts. Four key areas emerged from the literature where greatest advances can be made in reducing non-target impacts: bait quality, bait presentation, repellents and toxin choice.



Bait Quality

Bait Size:

- Seven large bird species (i.e. kokako, weka, kaka) ate baits as large as 6 g, the largest offered to them¹. Baits larger could deter these species.
- Carrot baits screened: fragments <2 g removed^{2,3}. Cereal baits: sizes range from <1 g to >10 g weight⁴ – high variability is unacceptable.
- More birds found dead after aerial 1080 operations using carrot compared to cereal baits⁵.

Bait Shape:

- No literature found investigating bait shape to deter non-target species.

Toxin Concentration:

- Concentrations of at least 0.15% 1080 and 0.8% cholecalciferol achieves maximum kill rates (90-95%).
- Efficacy is reduced if bait becomes damp or partially degraded⁶, therefore apply during forecast spells of dry weather.
- Sub-lethally poisoned animals becoming bait-shy, bait remains longer in the environment, increasing exposure time of non-target species to poisons – ensure bait concentration is high enough to kill target pests.

Non-Target Species Repellents

Tastes & Scents:

- Cinnamon oil currently added at 0.1 - 0.15% w/w to baits^{5,6}.
- For 7 bird species, the repellent effect of cinnamon worked for 1 day but then wore off⁷.
- North Island robins regurgitated cinnamon coated mealworms⁸.
- 50% fewer invertebrates were found on cinnamon lured baits⁹.
- Suggested increasing cinnamon oil strength to 0.3% w/w (Morgan *pers. comm.* in⁵).
- Other promising repellents include: aniseed lure⁸; citronella oil, eucalyptus oil, neem oil, DEET, DMP, and alpha cypermethrin as invertebrate repellents¹⁰; dimethyl anthranilate (DMA), decreased cattle feed eaten by birds¹¹; neem at 1.5% conc¹² repelled European starlings¹¹; caffeine on rice seed decreased black bird consumption¹².
- A deer repellent has been successfully developed, and was found to decrease the risk to robins from carrot bait¹³, and did not increase mortality of robins and tomtits^{13,14}.

Colours:

- Toxic baits currently dyed green. Initial studies conducted on fowl¹⁵ found green dye decreased the amount of bait eaten in this species.
- More recent studies found differing results.
- Overall, light, medium and dark blue dyed baits^{16,17,18,20} were most repellent to a variety of species.
- Blue and green dye does not adversely affect cereal bait acceptance by possums²¹.

Bait Presentation

Pastes and Gels:

- Pastes commonly used in ground control operations on earth "spits"²², or on tin or cardboard for easy removal at the end of the operation²³.
- Stock is removed from the control area.
- Ground dwelling birds are susceptible to poisoning using these methods, therefore use stronger repellents, different presentation methods, or lay paste above ground level to reduce impacts.
- Gel and gel blocks can be used in purpose built bait stations²⁴, nailed to trees or posts out of reach of many non-target species.

Macroencapsulation & Microencapsulation:

- Feratoc ® (macroencapsulation) is used in bait bags and stations²⁴. Placement out of reach of non-target species important.
- Microencapsulation slows onset of symptoms, reducing bait-shyness in sub-lethally poisoned animals²⁵.
- However, this may result in overdosing, increasing secondary poisoning risks²⁶.

Bait Stations:

- Spacing at 150 m with pre-feeding achieved the same efficacy as spacing at 100 m when located 1.5 m above ground²⁷.
- Spacings of 100 m in small forests and pine plantations are recommended²⁷.
- Pre-feeding with non-toxic baits achieved similar possum kills as aerial 1080 drops²⁸.
- Where stock is present bait stations 2 m above ground level; otherwise a height of 35 cm is ideal²⁹.

Aerial Application Rates:

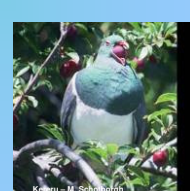
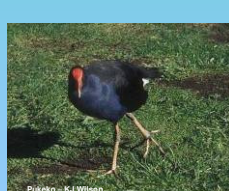
- Dramatically improved by the use of GPS³.
- Aerial application rates of 3kg/ha equally effective as 10kg/ha³⁰.
- Trickle sowing combined with pre-feeding uses 80% less bait than current application rates. This is equal to the application rate of 0.3kg/ha³¹.

Choice of Toxin

- Brodifacoum and other second generation anticoagulants are extremely persistent. Widespread, repeated use of second generation anticoagulants should therefore be avoided.
- First generation anticoagulants such as diphacinone that are less persistent, used alone or in combination with cholecalciferol, trapping or cyanide should be used in preference to brodifacoum on mainland sites.
- Cholecalciferol is reported to have a lower risk of secondary poisoning, and bird species appear less susceptible to this than 1080⁶.
- 1080 rapidly biodegrades in the environment and does not bioaccumulate.

Recommendations

- Abandon the use of carrot baits
- Pre-feed with non-toxic baits
- Dye baits blue rather than green
- Standardise bait weight to at least 6 g, if not larger
- Increase cinnamon oil concentration to 0.3%w/w
- Trickle feeding with pre-feed used where appropriate
- Bait stations 2 m above ground if stock is present, 35 cm above ground otherwise
- Bait station design to minimise bait spillage and non-target species interference
- Consider toxin choice based on advantages, disadvantages, operation and non-target species present
- Bait station spacing at 150 m intervals with pre-feeding in forests, or 100 m intervals in small forests and pine plantations



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