Aerial poisoning of wasps

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Abstract

The feasibility of the aerial application of bait to kill wasps was investigated as a technique for large-scale poisoning of wasps in areas of 1000–5000 ha. Methods of bait dehydration and pelletisation into a form suitable for aerial delivery were tested. Bait attractiveness to wasps was determined and interest in baits by non-target species recorded. A simulated aerial application was used to test the efficacy of a toxic freeze-dried formulation for wasp control. Baits were produced that were sufficiently robust for aerial application, but processing reduced attractiveness to wasps. Some removal of freeze-dried baits occurred, but baits were more attractive when hydrated. Freeze-dried baits containing fipronil used at densities higher than that used for ground-based operations failed to reduce wasp activity. Low bait attractiveness to wasps resulted in non-target species having access to baits for long periods. Ants were the most common non-target species seen on baits. Aerial baiting of wasps is technically feasible, but reduced attractiveness of pelletised baits, non-target issues, and successes with current ground-based operations mean further improvements are needed before it would be worth adopting. To allow a cost-benefit comparison of aerial and ground-based options, we recommend investigating scaling up ground-based operations, and considering bait and application options for aerial baiting using fully hydrated bait.

Keywords: Vespula, wasps, bait, fipronil, pest control

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1. Introduction

Landcare Research has been instrumental in the development of ground-based poison baiting strategies for control of introduced social wasps (*Vespula* spp.). The Department of Conservation is currently using ground-based strategies recommended by Landcare Research to control wasps annually in 300 ha of the Rotoiti Nature Recovery Project (Butler 1998). The Nelson Conservancy of the Department of Conservation requested research on techniques for large-scale poisoning of wasps in areas of 1000–5000 ha of beech forest (*Nothofagus* spp.). This project to determine the feasibility of the aerial application of baits (the method used for large area control of vertebrate pests) for wasps, was initiated in July 1997, with a 3-year time-frame.

2. Background

Wasps are believed to have a major impact on forest communities in the northern half of the South Island. Here the beech trees (*Nothofagus* spp.) are heavily populated with the honeydew-producing scale insect *Ultracoelostoma* spp. (Barr et al. 1996; Toft & Rees 1998; Beggs & Rees 1999) which support higher wasp densities than other forests. For this forest type, an ecological damage threshold (EDT), the density of wasps at which they have detrimental effects on the more vulnerable components of the invertebrate community, was calculated at about 2.7 wasps/Malaise trap/day (Beggs & Rees 1999). Once this threshold is passed the predation rate is higher than the reproductive rate and the population of the vulnerable species will decline. The EDT can be exceeded for up to 5 months of the year if no wasp control takes place.

Currently, ground-based toxic baiting using an insecticide in protein baits is the only control method capable of reducing wasp densities below the EDT. Sardine cat food is the current standard bait as it is both cheap and attractive to wasps (Spurr 1995). Baiting trials from 1991/92 to 1994/95 in 30-ha blocks using first sodium monofluoroacetate (1080) and later Finitron® (active ingredient sulfluramid) killed most colonies within each 30 ha and reduced wasp densities significantly, but, due to reinvasion of foraging wasps from outside the treated area, did not maintain wasp populations below the EDT (Beggs et al. 1998). A poisoning operation with the insecticide fipronil, within the Rotoiti Nature Recovery Project's treatment site in February 1999, succeeded in maintaining wasps below the EDT for the entire peak of wasp abundance (Harris & Etheridge in press). All monitored nests within the treated site were killed within 24 hours. Although this result was likely aided by the low wasp densities that season (reducing the influx of foragers from surrounding areas), it highlights the success of the toxin fipronil, which is fast acting and effective at very low doses in comparison with sulfluramid, so far less bait needs to be taken into each colony to kill it. A single poison application with canned sardine cat food containing 0.1% fipronil with station spacings of 100 × 50 m, without any prefeeding, is the current recommendation.

Although ground-based control techniques can be successful, they are labour intensive, and therefore expensive. Nelson Conservancy requested an investigation of the feasibility of aerial application of baits (K. Walker pers. comm.). Aerial application of cereal-based baits is currently used for vertebrate pests such as possums and rodents. These baits are hard and dry and distributed out of a hopper in a fixed wing aircraft or a bucket carried below a helicopter. In order to make use of existing application technology, wasp baits would also need to be hard and dry.

The toxin in use at the time this investigation was initiated (Finitron®), and the more recently tested fipronil product (X-stinguish), are both currently used in a moist canned sardine cat food base that is palatable to wasps in honeydew beech forests. While a soft moist bait such as this is unsuitable for aerial dispersal using existing technology, the bait could be dehydrated to form a dry bait and processed further to form a pellet. For the dried pellets to be attractive to wasp foragers it is likely that they would need to reabsorb moisture. Adding water-absorbing chemicals to the pellet mix may speed up this process.

Because the drying and pelletising process might affect the palatability of baits to wasps, the research presented here investigates methods for dehydrating and pelletising baits, and assesses the effect of these processes on attractiveness and palatability to wasps. The attractiveness of the baits to kaka (*Nestor meridionalis*), a threatened parrot species present in the Nelson Lakes National Park, and other non-target species, is tested to determine whether they would be at increased risk if aerial baiting was adopted. Investigation of the impacts on populations of non-target invertebrate species feeding on baits is beyond the scope of this study.

3. Objectives

To determine the feasibility of aerial distribution of baits for wasp control, by:

- determining methods for dehydrating and pelletising protein baits;
- testing additives to enhance bait rehydration;
- measuring the attractiveness of dehydrated sardine baits to wasps and non-target species;
- measuring the impacts of a simulated aerial distribution of toxic dehydrated baits on wasp populations;
- testing whether kaka will feed on dehydrated and pelletised baits.

4. Methods

All field trials were conducted at beech forest sites in and around the Nelson Lakes National Park, South Island, New Zealand (Figure 1). The beech forest is heavily populated with the honeydew-producing scale insect, *Ultracoelostoma* spp.

4.1 PELLETISATION OF BAITS

4.1.1 Effect of additives and drying method on hydration

Bait (40 g) was placed in petri dishes and either oven dried (n = 4 for each treatment) to constant weight or frozen before freeze-drying (n = 4) in a laboratory freeze drier. Three additives (Alcosorb, sorbitol, and Guar gum) with potential to improve the water absorption capacity of the dehydrated baits were tested (Appendix 1). All were recommended by members of the Landcare Research team that have experience in the development of pelletised cereal baits for possum control. Each treatment (added as powder at 1%) was mixed with sardines (sardine cat food in aspic, Super Cat brand) in a cake mixer for 30 seconds. In addition, a control was prepared identically, but without any additive.

After dehydration, baits were weighed and then left exposed at ambient room conditions for 120 hours, after which time they were re-weighed. The effects of drying method and bait additive on water absorption were analysed using ANOVA.

4.1.2 Pelletisation methods

Before pelletisation the freeze-dried baits formed a loosely packed 'biscuit' in a petri dish. These baits could withstand some stress, but would not maintain their structure in the process of being fed out of an aircraft hopper. A fine fish meal would likely result that foraging wasps could not easily collect to take back to their nest. To determine if pellets suitable for aerial distribution could be made, 80 kg of sardine cat food were freeze-dried in a commercial freeze-drying plant[1]. Green dye (0.05%) was added to baits to deter birds as is the practice with vertebrate baits. The bait was dried on large trays and then transferred to a bag, resulting in the freeze-dried bait breaking up into small pieces. The sardines have a lot of oil and protein, but little to aid the agglutination of materials when the fine powder is formed after freeze-drying. As a consequence, flour was added to alter the texture, sugar and Alcosorb to aid water absorption, and then a binding agent used to facilitate the formation of pellets. Six formulations with various combinations of binding agents and water-absorbing chemicals were made up (Appendix 1) and passed through an orbital ring pelleting machine. Pellets of 13 mm diameter and from 10 to 30 mm long resulted.

[1] Tasman Extracts, Factory Rd, Brightwater, Nelson, ph. 03 542 3895

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