AN IMPROVED 1080 PASTE FOR CONTROL OF POSSUMS (*TRICHOSURUS VULPECULA*)

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ABSTRACT

A new 1080 paste (PTP) was developed by Pest-Tech Ltd. and then evaluated in a series of comparative trials with Pestoff possum paste (POP). The research indicated that PTP was significantly more palatable to captive possums than POP following 57 h of exposure to 'hot' conditions (hot conditions were 30°C for 6 h followed by 18 h at 13°C on a 24 h cycle). Acceptance by bees was low with significantly less PTP than POP removed by forager bees over a 30 h period. In the field, the control efficacy of both pastes was high (89%-94% kill), with no significant differences between treatments. Based on these results, it is recommend that PTP is registered for possum control in New Zealand.

Keywords: 1080 paste, sodium monofluoroacetate, possum control, *Trichosurus vulpecula.*

INTRODUCTION

A sugar-based 1080 paste (BB13) was used to control possums (*Trichosurus vulpecula*) until 1995 when it was withdrawn from use because it was attractive to honey bees (*Apis mellifera*) and other non-target species (Morgan & Goodwin 1995). The addition of isovaleric acid to BB13 deterred bees (Morgan & Goodwin 1994), but the paste was then repugnant to field staff. In 1995, a new paste (BB3; trade name Pestoff professional possum paste) was developed that contained no sugar (Morgan & Goodwin 1994). This was later enhanced by the addition of thickeners and a 'bee–safe' sugar (Morgan et al. 1996). At that time, the Pestoff paste (POP) was demonstrated to be unattractive to bees and bats but was eaten occasionally by ground dwelling birds (Morgan et al. 1997).

Although POP has been on the market for 6 years, Regional Councils have experienced ongoing problems with efficacy and environmental safety (Henderson 2000). Stock have been killed by bait that had dehydrated and blown off earth spits, and by buried bait that did not degrade after it dried to a hard-leathery texture (G. Crawford, pers. comm.). In a series of recent field trials, POP was also found to kill low numbers of possums, irrespective of whether toxic paste was applied following feeding non-toxic baits or without such prefeeding (mean kill 62-68%; Thomas & Morgan 1999). The inconsistent results with POP have resulted in a substantial reduction in control operations undertaken by applying paste on earth spits. The goal of this research was to evaluate an alternative 1080 paste bait developed by Pest-Tech Ltd.

METHODS

Formulating a new 1080 paste

The key requirements of a new paste bait are that it should (i) remain palatable after exposure to 'hot' conditions, (ii) be of low palatability to bees and (iii) readily degrade when buried. The criteria specified by the Animal Health Board (AHB) for 'hot' conditions are a temperature of 30°C for 6 h followed by 18 h at 13°C, with palatability assessments after 9, 33 and 57 h. A new paste (PTP) designed to conform with these requirements was prepared by Pest-Tech Ltd. Details of this paste cannot be disclosed for commercial

reasons. PTP was directly compared with POP in all trials and with the sugar-based paste BB13 in the palatability and bee acceptance trials.

Palatability assessments after exposure to hot conditions

All possums used in the palatability assessments were caught from the wild and acclimatised at the Pest–Tech Ltd. animal facility (Duckworth & Meikle 1995). Twenty individually–caged possums were presented with paired trays containing 200 g of either POP, PTP or BB13 paste (non-toxic) and 200 g of non–toxic RS5 cereal bait (Animal Control Products Ltd., Waimate). Palatability was measured by calculating the percentage of paste eaten relative to total bait consumption (Henderson et al. 1999a). The pastes were then stored in a controlled temperature room, and palatability reassessed after 9, 33 and 57 h of hot conditions as described above. The data were tested by ANOVA to determine the effect of treatment on the relative amounts of paste eaten. Pair-wise comparisons between bait types were performed using Fishers LSD test. All statistical analyses were made using Minitab 13 for Windows.

Bee acceptance

Forager bees from six hives were trained to feed from a Petri dish on a table using an inverted bottle of sugar syrup (Morgan & Goodwin 1994). Once high numbers of bees (>100) were observed feeding, the syrup was replaced by two Petri dishes containing a choice of non-toxic (i) BB13 and POP paste or (ii) PTP and POP paste. Counts of forager bees and the weight of paste removed were made each hour over a 30 h period. The hourly counts of bee numbers and paste removed were compared using Student's t-test.

Persistence of 1080 in buried baits

Two plastic containers (30 cm x 25 cm) were filled to a depth of 20 cm with clay-loam soil. The soil in one container was very dry, while the other contained damp soil removed from a stream bank. In each container eight pieces of turf were inverted with a hand–held grubber to form eight spits. On alternate spits either POP or PTP were extruded as baits weighing approximately 15 g. The spits were left exposed for 5 days before they were 'turned back' to bury the bait. Samples of PTP and POP were then collected for assay after 0, 5, 10 and 20 days. The residual concentrations of 1080 in buried paste were compared by ANOVA to determine the effects of bait type on persistence of 1080 in buried bait.

Field trials

Two field trials were undertaken in *Pinus radiata* plantations in mid Canterbury. Each plantation was subdivided into two discrete blocks with a buffer zone of 300 m. PTP or POP were applied on earth spits around the forest margin, and 75 m and 150 m into the forest from the bush edge. Earth spits were made with a hand-held grubber at intervals of 5–6 m (Henderson et al. 1999b) and 15 g paste bait applied to the top of each spit. The lines of paste bait were inspected after 2, 4 and 7 nights and any paste eaten was replaced. The percentage kill in each block was estimated as the decline in the mean number of possums caught per trap night (using Victor No. 1 leg-hold traps) before and following poisoning (Warburton 1996). This trapping was done on two successive fine nights, using 10 trap lines that each contained 10 leg-hold traps. Trap lines were spaced at least 150 m apart so that they were independent. Samples of toxic paste were also assayed by Landcare Research to confirm 1080 concentrations (Bowen et al. 1995). All the research undertaken in this report was conducted with the approval of the Lincoln University Animal Ethics Committee (No. 860) and conformed to the New Zealand standards for care and use of animals for scientific purposes (AWAC 1995).

RESULTS

Bait palatability after exposure to hot conditions

The palatability of all three pastes changed after exposure to hot conditions ($P<0.001$), with the POP paste significantly less palatable than the other two pastes after 57 h ($P<0.05$; Table 1).

TABLE 1: Palatability of non-toxic paste exposed to hot conditions for 0, 9, 33 and 57 h. The LSD (P<0.05) at 57 h is 16.1.

Time in hot conditions (h)	Palatability of different pastes (%) PTP	POP	BB13
0	66.8	63.5	58.1
9	61.2	51.3	62.4
33	63.7	39.9	57.6
57	60.5	35.5	55.4

Bee acceptance of paste

Fewer bees were observed on the PTP and this resulted in significantly less PTP being removed compared to BB13 and POP (Table 2).

TABLE 2: Mean number of bees on paste and weight (g) of paste removed by bees each hour (n=30).

Bait type	Number of bees		Weight loss	
PTP	0.30	P=0.057[1]	0.38	P<0.001
POP (paired with PTP)	2.41		3.25	
BB13	126.07	P<0.001	349.02	P<0.001
POP (paired with BB13)	5.34		2.88	

[1]P-values are for comparison with paired POP bait.

Persistence of 1080 in buried baits

Initial concentrations of 1080 increased (P=0.005) as the paste dehydrated on the exposed spits (Fig. 1). The increase in 1080 concentration was greater for the POP than PTP paste (P=0.05). Once the baits were buried in damp soils they absorbed moisture (which reduced toxic concentrations), and the 1080 slowly degraded (Fig. 1). Pastes buried in very dry soils retained almost all 1080, with no significant reduction in the measured concentrations of 1080 over the 5–20 day period (P=0.86).

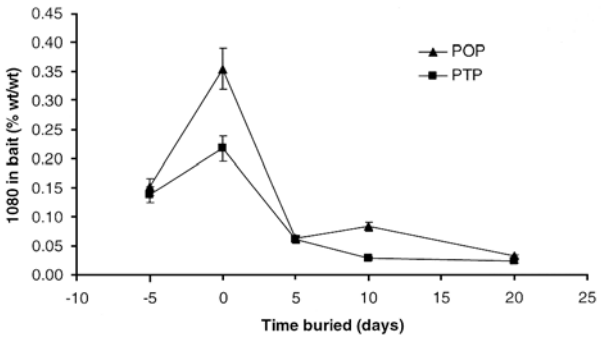

FIGURE 1: Changes in 1080 concentrations of PTP and POP baits (± 95% C.I.) during 5 days exposure to sun and wind, and then during a period of 20 days after paste was buried in damp soils.

Field trials

Both 1080 pastes were highly efficacious with no significant difference in the percentage kill at either location (Table 3).

TABLE 3: Possum kill in field trials comparing 1080 PTP and POP.

Location (ha)	Paste[1]	Mean catch per trap night pre–poison	post–poison	Percentage kill ± 95% CI	Student's t-test[2]
Mortens (31)	PTP	0.314	0.035	88.9 ± 9.0	*t*=0.28, df=18,
Mortens (31)	POP	0.187	0.025	86.6 ± 12.8	P=0.8
Steventon (21)	PTP	0.300	0.020	93.4 ± 6.5	*t*=1.28, df=18,
Steventon (15)	POP	0.131	0.020	84.7 ± 11.7	P=0.2

[1]PTP1080 concentration 0.096% wt/wt; POP 1080 concentration 0.125% wt/wt.
[2]For comparison between PTP and POP within a location.

DISCUSSION

PTP was initially highly palatable to possums and retained its palatability in hot conditions. PTP was not attractive to bees and further research has since demonstrated that the risk to native birds from PTP is lower than that from cereal bait currently used for possum control (Ross et al. 2002).

In the field trials both pastes were highly efficacious, killing 86-93% of possums with similar 1080 concentrations. Interestingly, the efficacy of POP in this study (mean kill 86%) was considerably higher than for another study on farmland (mean kill 68%; Thomas & Morgan 1999). The mean kill was also high given the low palatability of POP when exposed to hot conditions. Previous research has demonstrated that possum bait needs to have a palatability score of at least 40% (compared with the industry standard cereal RS5 bait) to kill the majority of possums in the field (i.e. greater than 90% kill; Henderson & Frampton 1999). The high efficacy of POP in this study is most likely a result of reduced rates of dehydration, as both pastes were applied in sheltered areas within a plantation forest, rather than on exposed farmland.

Pastes buried in both dry and damp soils still retained significant concentrations of 1080 after 20 days. It was apparent that in dry soil the bio-degradation of 1080 is very slow, and livestock could be at risk if spits were overturned as animals walked over them. Accordingly, in dry conditions a long withholding period (greater than 3 weeks) is recommend before any livestock is reintroduced to pasture where possums have been controlled with 1080 paste bait.

In conclusion, this study has demonstrated that excessive dehydration can have two deleterious effects on paste baits. First, as the paste dehydrates the concentration of 1080 can increase up to 0.35% (Fig. 1). At this concentration some possums will innately avoid bait (Henderson et al. 1999a). Second, as pastes dehydrate they can become significantly less palatable to possums. It is believed that these factors have contributed to the poor performance of POP in recent field trials. Since PTP dehydrates at a significantly lower rate and has low non-target risk, it is believed that this paste has potential as a replacement for POP. Accordingly, it is recommend that PTP should be registered for the control of possums in New Zealand, and Regional Councils should initiate trials to compare POP and PTP on exposed farmland sites.

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