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## SHORT COMMUNICATION

# EVALUATION OF A BIO-DYNAMIC TECHNIQUE FOR POSSUM PEST CONTROL

**Summary:** Bio-dynamic control involves burning pest tissue or organs and spreading the ash on areas to be protected. In New Zealand, bio-dynamic methods have been suggested for repelling possums where they damage forests or spread disease. We assessed the repellent effects of five bio-dynamic tinctures. First we tested these materials on possums in pens and noted their effects on foraging behaviour, food consumption, and body weight. Then we monitored bait consumption from treated and untreated feeder stations in the field. Although an orthodox herbivore repellent significantly deterred possums, we detected no behavioural or repellent effects of the bio-dynamic tinctures in any of our trials. We are unable to recommend these tinctures for possum control.

**Keywords:** Possum (*Trichosurus vulpecula*); bio-dynamic control; repellents.

## Introduction

Brush-tail possums (*Trichosurus vulpecula* Kerr), introduced from Australia last century, are a major pest species in New Zealand because they spread bovine tuberculosis (Coleman, 1988) and damage crops (Spurr and Jolly, 1981) and native forests (Pekelharing and Batcheler, 1990).

Government agencies primarily use sodium monofluoroacetate (1080) poison baits for intensive possum control on public land. Most recent operations using refined techniques and extensive quality control have been very successful, e.g., more than 6500 of about 7000 possums on Rangitoto Island were killed in a control operation in 1990 (Eason, Fitzgerald and Wright, 1992). However, such control needs to be repeated at regular intervals as possum numbers recover, often to *more* than half of original density after 5-8 years. There is also some public unease about the continuing use of 1080. Private possum hunters use cyanide poison or leg-hold traps, but some possum populations are now "cyanide-shy", and animal welfare groups oppose the use of such traps. Ongoing research, therefore, includes searching for alternatives to 1080 (Eason, 1991), improving baiting (Morgan, 1990), and identifying potent lures and biological control techniques.

Alternative technologies, herbal remedies, and organically grown farm produce are finding increasing public favour (Bezdicsek, 1984; Scofield, 1984), and bio-dynamic pest control (Steiner, 1972) is now practised by some farmers (Koepf, 1989; New Zealand Biodynamic Association, 1989). This homeopathic technique

(Scofield, 1984) involves burning parts of the plant or animal pest at an appropriate stage of the lunar cycle, then formulating the ash into solutions (tinctures) or mixtures with sand, the potency of which is claimed to increase with increasing dilution.

A recent New Zealand article (Anonymous, 1990) suggested that bio-dynamic control was effective against possums. However, the results of bio-dynamic control have generally not been scientifically assessable, so their success in repelling vertebrate pests from crops or reducing pest numbers remains anecdotal. For example, although a published laboratory trial (Kolisko and Kolisko, 1940) reported that caged mice behaved abnormally (including cannibalism) after exposure to materials derived from burnt mouse pelts, there were no untreated groups so it cannot be determined whether the behaviour was caused by the tincture or some other factor. This short communication describes the results of pen and field trials undertaken to assess whether bio-dynamic tinctures have a repellent effect on possums.

## Methods

We initially tested whether bio-dynamic materials prepared from burnt possum pelts and testes had a repellent or disturbing effect on a total of three male and three female wild possums acclimatised to captivity for two months, held in two mixed-sex groups of three in two large outdoor pens (20 m x 60 m). At dusk for each of eight nights, four weighed amounts of fruit and vegetables were placed at 10 m intervals in each pen. Materials for testing were smeared over and around this

food, which was placed on plastic sheets (1 m x 1 m) to prevent contamination of the pens. The treatments were rotated, in a random manner, each day to avoid any bias caused by position. The possums were then discreetly observed for one hour to monitor their reactions, and the amount of food eaten in each pen over each 24 hour period was recorded. Close observation of the animals was undertaken to determine whether there was a discernible response to treatment, such as a visible aversive reaction or reluctance to approach the fruit and vegetables. The amount of food eaten was assessed by weight. The food at each location was weighed, treatment applied, and the food remaining after 24 hours was reweighed. Total food consumption in the pens, and consumption of treated and untreated food, was then calculated. Two of the five possum repellent bio-dynamic tinctures tested (A, B) were provided by a New Zealand-based homeopathic company (Waleda N.Z. Ltd.), a third by a local farmer (C), and a fourth by the Bio-dynamic Farming and Gardening Association (D). We produced the fifth (E) by burning possum pelts and testes on 2 December 1990 (the day recommended by a bio-dynamic almanac) using detailed instructions provided by the Bio-dynamic Farming and Gardening Association. Plain sand, wood ash, tap water, and water with 5% ethanol were used as placebos. To avoid observer bias, we compared these materials using a standard double-blind protocol.

We then conducted a second trial using the same method to compare two of the bio-dynamic tinctures (A and B) with an orthodox egg/acrylic herbivore repellent, as described in Crozier (1991). These two tinctures were selected on the advice of the Bio-dynamic Association which considered that these were the most potent tinctures available. As the egg/acrylic repellent had an obvious odour, it was not practicable to run this trial blind.

In a third trial, we tested one bio-dynamic tincture on wild possums in the MacKenzie Basin of the South Island. Fifty-eight bait feeders (capped plastic tubes containing 1.2 kg of pelleted cereal bait) were located at 50 m intervals in three scrub gullies. The feeders were kept filled for three weeks to attract possums before the amount of bait eaten at each during one night was recorded. The ground in a 2m radius around half of the feeders (selected randomly) was then sprayed 3-6 hours before dusk with 50-100 cm<sup>3</sup> of bio-dynamic tincture (C), and the remaining stations were sprayed with an equivalent volume of tap water as a placebo. Bait consumption at treated *versus* untreated stations was compared on two successive nights.

## Results

Mean daily food consumption by possums in the pens varied between 280 and 440 g, with no significant

difference between bio-dynamic and placebo treatments (Fig. 1). The presence of bio-dynamic materials in the pens did not affect possum body weights. Mean weight after eight days of treatment was 3.0 kg compared with the mean pre-trial weight of 2.9 kg (ANOVA  $P=0.2$ ).

No repellent effects or other abnormal behavioural responses to the bio-dynamic materials were observed. Possums emerged from their nesting boxes at dusk, shortly after fresh food and trial material had been placed in the pens. The time taken to approach and eat food items was similar before and during the treatment phase of the study. Possums showed no unusual behaviour, aversion, or hesitation when approaching food coated with bio-dynamic or placebo treatments. In contrast, coating with egg/acrylic herbivore repellent significantly reduced food consumption (Fig. 2). Possums either completely avoided the fruit and vegetables smeared with egg/acrylic, or ate a very small amount of food then moved away quickly. This contrasted markedly with their behaviour to all other treatments.

Bio-dynamic treatment had no overall repellent effect on wild possums in the Mackenzie Basin as the mean bait take of 80 g feeder<sup>-1</sup> night<sup>-1</sup> at all stations did

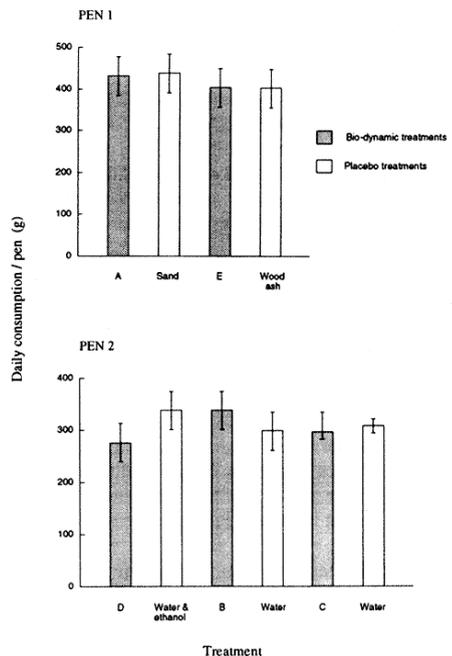


Figure 1: Effect of bio-dynamic and placebo treatments on daily food consumption by six penned possums. (Mean consumption per pen is presented  $\pm$  Standard Error.)

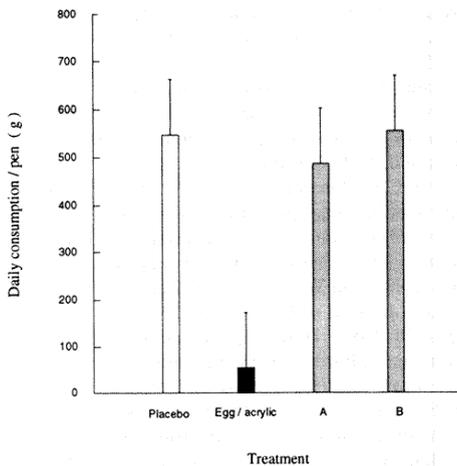


Figure 2: Effect of a placebo, an orthodox egg/acrylic herbivore repellent and two bio-dynamic tinctures on daily food consumption by six penned possums (means are presented  $\pm$  S.E.).

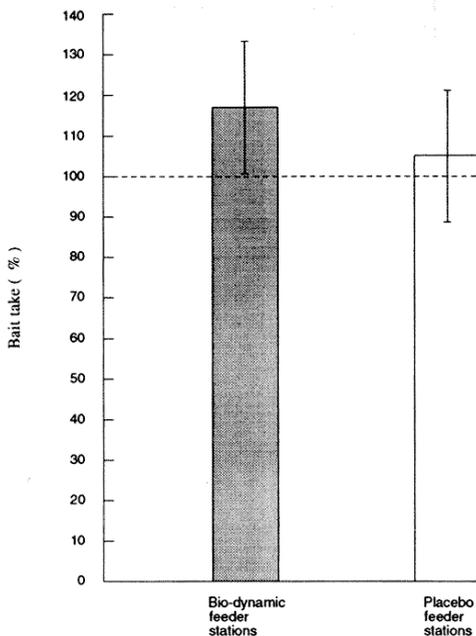


Figure 3: Post-treatment bait take (average of 2 days), as a percentage of pre-treatment levels for wild possums in the MacKenzie Basin (means are presented  $\pm$  S.E.).

not change significantly after the tincture was applied (ANOVA  $P=0.7$ ). Furthermore, bait consumption at treated feeders relative to pretreatment levels did not differ significantly from that at untreated feeders (Fig. 3), indicating the lack of a short-range repellent effect around the treated feeders.

## Discussion

All three trials suggest that the bio-dynamic materials applied to food did not deter possums from eating, even when untreated food was available nearby. In contrast, the repellent effect of the more orthodox egg/acrylic treatment was readily demonstrated. We conclude that these bio-dynamic materials were inactive, and we are unable to recommend them for possum control.

Preliminary reports of these results have generated responses from both proponents and sceptics of bio-dynamic techniques. The proponents argued that "...people [should not] draw any conclusions from this experiment except that it came up with a null result, [which does not] alter the fact that bio-dynamic farmers have reported their own successes with the method..." (Wright, 1991), while the sceptics pointed out that "...proponents [of bio-dynamics] are notoriously shy of organising proper tests of their theories; scientific administrators have more profitable uses for their scarce dollars" (Howard and Hyde, 1991). We advocate that any further such trials must be experimentally and statistically sound, and since a negative result is as relevant to the debate as a positive one, it should be given a similar degree of publicity.

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## References

- Anonymous, 1990. That old black magic - eradicating the possum the biodynamic way. *Growing Today* 3(5): 22-23.
- Bezdicsek, D.F. 1984. *Organic/arming: current technology and its role in sustainable agriculture*. American Society of Agronomy Special Publication No. 46. American Society of Agronomy, Madison, U.S.A. 192 pp.

- Coleman, J.D. 1988. Distribution, prevalence, and epidemiology of bovine tuberculosis in brushtail possums, *Trichosurus vulpecula*, in the Hohonu Range, New Zealand. *Australian Journal of Wildlife Research* 15: 651-663.
- Crozier, E.R. 1991. Practical animal repellents for tree seedlings: a success story. In: Menzies, M.I.; Parrott, G.E.; Whitehouse, L.J. (Editors), *Efficiency of stand establishment operations*. pp. 172-177. Proceedings of International Union of Forest Research Organisations Symposium, Rotorua, New Zealand, September 1989. Forest Research Institute Bulletin No. 156, Ministry of Forestry, Christchurch, New Zealand. 391 pp.
- Eason, C.T. 1991. Cholecalciferol as an alternative to sodium monofluoroacetate (1080) for poisoning possums. *Proceedings of 44th New Zealand Weed and Pest Control Conference*: 35-37.
- Eason, C.T.; Fitzgerald, H.; Wright, G.R. 1992. Sodium monofluoroacetate (1080) water-residue analysis after large-scale possum control. *New Zealand Journal of Ecology* 16: 47-49.
- Howard, B.H.; Hyde, V. 1991. Pests unperturbed: a slice of biodynamic balony. *Skeptical Enquirer* 16: 20-21.
- Koepf, H.H. 1989. *The biodynamic farm*. Anthroposophic Press, Hudson, New York, U.S.A. 245 pp.
- Kolisko, E.; Kolisko, L. 1940. *Agriculture of tomorrow*. John Jennings Ltd, Gloucester, U.K. 322 pp.
- Morgan, D.R. 1990. Behavioural response of brush tail possums, *Trichosurus vulpecula*, to baits used in pest control. *Australian Wildlife Research* 17: 601-613.
- New Zealand Biodynamic Association, 1989. *Biodynamics: New directions for farming and gardening in New Zealand*. Random House, Auckland, N.Z. 230 pp.
- Pekelharing, C.J.; Batcheler, C.L. 1990. The effect of control of brushtail possums (*Trichosurus vulpecula*) on condition of a southern rata/kamahī (*Metrosideros umbellata/Weinmannia racemosa*) forest canopy in Westland, New Zealand. *New Zealand Journal of Ecology* 13: 73-82.
- Scofield, A.M. 1984. Homoeopathy and its potential role in agriculture - a critical review. *Biological Agriculture and Horticulture* 2: 1-50.
- Spurr, E.B.; Jolly, J.N. 1981. Damage by possums *Trichosurus vulpecula* to farm crops and pasture. In: Bell, B.D. (Editor), *Proceedings of the first symposium on marsupials in New Zealand*, pp. 197-203. Zoology Publication No. 74, Victoria University of Wellington, N.Z. 280 pp.
- Steiner, R. 1972. *Agriculture - A course of eight lectures*. Bio-Dynamic Agricultural Association, London, U.K. 175 pp.
- Wright, D. 1991. Peppering in the news. *Biodynamic Newsletter, Autumn 1991*: 12-13.