

11 December 2020

Bryan Stralow

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Tēnā koe Bryan

Thank you for your Official Information Act request to the Department of Conservation, received on 03 December 2020 in which you asked for:

Does the DOC have any data from previous studies on the transpiration of 1080 (sodium monoflouroacetate) with any available proven rate of evaporation?

The Department has information about the transpiration of 1080 into plants. The following is a summary of the current research, taken from our 1080 Pesticide Review document:

1080 uptake has been reported in a number of plants including: kāpuka (New Zealand broadleaf) (Ogilvie et al., 1998), kāramuramu (Ogilvie et al., 2006), puha (Miller et al., 2009), broad beans (David and Gardiner, 1951), cabbage (David and Gardiner, 1953), *Elodia canadensis* (Ogilvie et al., 1996), *Helianthus annuus* (Cooke, 1976), lettuce (Ward and Huskisson, 1972), peanut (Preuss and Weinstein, 1969), perennial ryegrass (Ogilvie et al., 1998) and sugar cane (Hilton et al., 1969).

However, not all plants appear to take up 1080. No uptake of 1080 was reported in pikopiko when single 0.15% 1080 pellets were placed at the base of pikopiko in the field, and the plants monitored for 1080 uptake (Ogilvie et al., 2006).

Where uptake occurs, it is unlikely to be in large amounts. Ogilvie et al. (1998) reported that rye grass took up only 0.015% of the available 1080 from pellets placed beside the grass. When single 0.15% 1080 pellets were placed at the base of kāramuramu in the field, the maximum concentration of 1080 detected in the plants was 5 µg kg⁻¹ of plant material. This concentration occurred 7 days after the bait was placed beside the plants, and declined to 2.5 µg 1080 kg⁻¹ plant material after 14 days (Ogilvie et al., 2006). In a similar field trial, Miller et al. (2009) placed a single 0.15% 1080 pellet at the base of puha plants. The highest level of 1080 detected in puha was 15 µg kg⁻¹ of leaf material 3 days after the pellets were placed at the bottom of the plants. Note: in this study 1080 residues were recorded in puha that had been used as controls (i.e. no 1080 pellets placed beside them). The authors could not rule

out that 1080 occurs naturally in puha and are currently undertaking further research to confirm this.

To put these figures in perspective, based on the peak concentration observed in ryegrass (0.08 g kg^{-1}), a 50 kg sheep would need to eat (using an LD_{50} of 0.4 mg kg^{-1}) about 250 kg of grass to have a 50% chance of dying from 1080 (Ogilvie et al., 1998). Using an LD_{50} of 2 mg kg^{-1} for humans, a 70 kg person would need to eat 28 tonnes of kāramuramu or 9.3 tonnes of puha in one sitting to receive an LD_{50} and therefore a 50% chance of dying from 1080 (Miller et al., 2009; Ogilvie et al., 2006). Even to reach the chronic toxicity of $0.05 - 0.1 \text{ mg kg}^{-1} \text{ day}^{-1}$ a person would need to consume 0.7 - 1.4 tonnes of 1080-containing kāramuramu daily (Ogilvie et al., 2006).

A laboratory study by David and Gardiner (1951) showed that broad bean plants could take up fluoroacetate through their roots and subsequently become toxic to aphids feeding on them (i.e. 1080 acted as a systemic insecticide). However, 1080 concentrations in the plants necessary to kill the aphids were approximated 1 mg kg^{-1} of plant tissue, when applied to the plant through a cut tap-root. This is a much higher concentration of 1080 than any reported in field soil samples in the context of using 1080 baits for possum control.

Where fluoroacetate is distributed in plants is likely to vary as available publications report conflicting information. For example, in *Helianthus annuus*, ammonium fluoroacetate metabolites were rapidly translocated to the shoot with little accumulation in the roots (Cooke, 1976). Conversely, sugarcane was found to strongly adsorb monofluoroacetate onto its roots with only minor translocation to leaves and stem (Hilton et al., 1969).

Even where 1080 uptake occurs in plants, most plants are relatively insensitive to the effects of 1080 (Bong et al., 1980). However, duckweeds have been shown to have a high sensitivity, with the growth of *Spirodela polyrrhiza* being totally inhibited by 0.5 mmol of 1080, and total growth inhibition of *S. oligorrhiza* and *Lemma minor* occurring at 1 mmol 1080 (Bong et al., 1980). Oxygen consumption in pea seedling roots was almost completely blocked when exposed to 10 mmol l^{-1} monofluoroacetic acid for more than 6 hours (Polter, 1967).

Plants are capable of metabolising and degrading fluoroacetate (Dichapetalum cymosum - Meyer and Grobbelaar, 1991; peanuts - Preuss and Weinstein, 1969; lettuce - Ward and Huskisson, 1972).

These scientific articles are publicly available for your interest.

You have also asked about the rate of evaporation and the behaviour of the evaporate when airborne.

We regret that we are not able to provide the information you seek as the Department does not hold this information and we have no grounds to believe that the information is held by



other departments or agencies. Therefore, this request is refused under section 18(g)(i) of the Official Information Act.

You are entitled to seek an investigation and review of my decision by writing to an Ombudsman as provided by section 28(3) of the Official Information Act.

Please note that this letter (with your personal details removed) and enclosed documents may be published on the Department's website.

Nāku noa, nā

A handwritten signature in black ink, appearing to read 'Amber Bill'.

Amber Bill
Director Threats
Department of Conservation
Te Papa Atawhai