

# Effect of foliar fertilisers on clover flea (*Sminthurus viridis* (Collembola: Sminthuridae)) feeding and survival

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## Introduction

- Clover flea is an intermittent pest of white clover in pastures in New Zealand, which can cause severe damage to white clover foliage particularly in northern regions of the North Island.
- As there are few options available for control of clover flea, current strategies rely on the use of insect growth regulators and organophosphate insecticides.
- Farmers in Northland have observed fewer problems with clover flea on paddocks they treat with foliar fertilisers.



## Aim

To investigate whether or not foliar fertilisers influence the behaviour and survival of clover flea using bioassay techniques.

## Method

### Bioassay 1

• Five clover flea of mixed age were confined in an arena (Figure 1) containing a single white clover leaf that had been sprayed to run off with Nitrosol<sup>®</sup> (10% solution), Plant Plasma<sup>®</sup> (10% solution) or distilled water (Controls) prior to clover flea addition.

### Bioassay 2

• Five clover flea were confined in an arena containing either a single clover leaf that had been dipped in Nitrosol<sup>®</sup> (10% solution), Plant Plasma<sup>®</sup> (10% solution) or distilled water, or, in an arena with a distilled water treated leaf and a Nitrosol<sup>®</sup> or Plant Plasma<sup>®</sup>-treated leaf.

### Environmental conditions used in bioassays

• 10 replicates of each treatment were kept in a 15°C controlled environment room at 16:8 h light:dark for 7 days.

• On day 7, clover flea feeding damage to leaves was scored on a scale of 0–5 where 0=no feeding and 5=severe feeding and the number of live clover flea remaining was recorded.

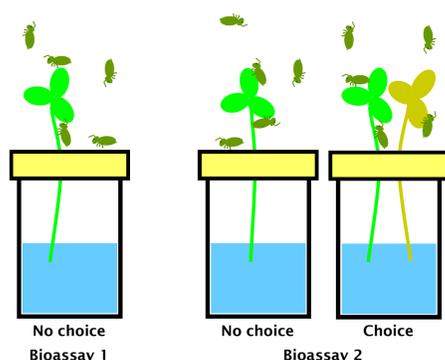


Figure 1: Arenas used in both bioassays identical to those described in Eden *et al.* (2005)

## Findings

- In bioassay 1, less clover flea feeding was observed on white clover foliage treated with Plant Plasma<sup>®</sup> and Nitrosol<sup>®</sup> compared with the water treated control ( $P < 0.01$ ) in a no-choice situation (Table 1).
- In bioassay 2, less clover flea feeding was observed on white clover foliage treated with Plant Plasma<sup>®</sup> and Nitrosol<sup>®</sup> ( $P < 0.001$ ) in both choice and no choice tests (Tables 1 and 2).
- In bioassay 2 clover flea survival was reduced in the presence of white clover treated with Plant Plasma<sup>®</sup> and Nitrosol<sup>®</sup> ( $P < 0.01$ ) in the no-choice treatments (Table 1).

Table 1: Mean clover flea feeding scores and number of clover flea remaining after seven days exposure to untreated (Control), Nitrosol<sup>®</sup> or Plant Plasma<sup>®</sup> treated white clover leaves in no-choice treatments in bioassays 1 and 2.

	Bioassay 1		Bioassay 2	
	Feeding score	Clover flea remaining	Feeding score	Clover flea remaining
Control	4.2	2.3	4.6	3.7
Nitrosol <sup>®</sup>	2.9	1.3	2.2	2.4
Plant Plasma <sup>®</sup>	2.6	1.8	3.2	1.5
Control + Nitrosol <sup>®</sup>	-	-	-	2.6
Control + Plant Plasma <sup>®</sup>	-	-	-	2.9
LSD (5%)	1.0	1.2	0.75	1.1

Table 2: Mean difference in clover flea feeding scores after seven days on untreated (Control), Nitrosol<sup>®</sup> or Plant Plasma<sup>®</sup> treated white clover leaves in choice tests carried out in bioassay 2.

Treatment	Feeding score		Mean Difference
	Control	Treated	
Control + Nitrosol <sup>®</sup>	4.4	1.9	2.5
Control + Plant Plasma <sup>®</sup>	4.5	2.1	2.4
LSD (5%)	0.96		
LSE (5%) <sup>1</sup>	-	-	0.67

The least significant error (LSE) is used to check whether any one mean difference is significantly different to zero. (e.g. 2.5 shows that there is a significantly more clover flea feeding damage on the Control leaf compared to the Nitrosol<sup>®</sup> treated leaf as  $2.5 > 0.67$ ).

## Conclusion

- Clover flea feeding activity and survival declined in the presence of foliar fertilisers.
- Further laboratory and field investigations into clover flea feeding, behaviour and survival in the presence of plant material treated with Nitrosol<sup>®</sup> and Plant Plasma<sup>®</sup> need to be undertaken due to the preliminary nature of the work described.

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### Reference

Eden TM, Wilson DJ, Hackell DL 2005. Assays to determine the predatory ability of *Pergamasus* against clover flea. New Zealand Plant Protection 58: 131-134.