CropSeed Confidential Report No. 69

Red-legged earth mite - a quarantine pest of asparagus

A report prepared for
The New Zealand Asparagus Council

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1 EXECUTIVE SUMMARY

Red-legged earth mite (RLEM) would have a major impact on American agriculture if it was introduced. The USDA - Animal and Plant Health Inspection Service requires that vegetables exported to the U.S.A. be grown in areas free of the pest.

Factors affecting the probability that areas of New Zealand will be infested by RLEM are climate, soil type and plant assemblages.

RLEM is readily controlled with pesticides, but dichlorvos is the only pesticide registered for RLEM control and it must be applied carefully if it is to be effective.

It is likely to take several years of research before we know enough to convince the USDA of the actual risks of produce being infested with RLEM.

We do not understand the dynamics of reinfestation of treated asparagus plots after chemical treatment.

A draft RLEM management protocol has been developed for use by the industry (Appendix). This pest is critical for trade with the USA and all practical steps should be taken to ensure that it does not occur on asparagus entering the USA.

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2 INTRODUCTION

Red-legged earth mite (RLEM) is native to South Africa. Little is known of it in South Africa and it seldom becomes a pest. It is very widely spread in parts of Australia that have warm, dry summers and is a major pest of pasture legumes (Ridsdill-Smith 1991). It first appeared in New Zealand in Hawke's Bay in about 1940 (Dumbleton 1947). Since then it has spread to several points on the coastal strip around the North Island.

It is seldom a pest except perhaps in pasture in summer dry coastal areas. When it does reach outbreak levels it can attack a range of crops. It will turn asparagus silver and stop it growing, and make daffodils unsaleable by damaging their appearance.

The mite is regarded as a serious quarantine pest by the USA. If it became established in the productive summer dry parts of the USA, such as the Central Valley of California, it could have devastating effects.

With the support of the New Zealand Asparagus Council, we have begun a research programme to investigate

(a) factors associated with RLEM infestation

(b) techniques for sampling the pest efficiently

(c) measures to prevent its wider spread and reduce its occurrence infests

(d) postharvest management

3 POPULATION BIOLOGY

3.1 Eggs

RLEM has two types of egg. The normal egg is very small, orange and laid on plants. It hatches in one to two weeks. The diapausing egg is not laid but retained in the body. The onset of warm, dry weather will initiate production of the diapausing eggs. When the females die, the bodies lie in the surface soil protecting a small number of diapausing eggs.

3.2 Breaking diapause

In Australia when the weather starts to cool and rains come, the diapausing eggs hatch and the cycle begins again.

3.3 Observations 1992/93

We monitored three sites in Hawke's Bay and one in the Rangitikei from September to July. Over December, mite numbers decreased to very low levels but did not disappear completely until late December/early January. Small numbers were again present in March. In July, numbers were still low.

There are several possible explanations for these observations. The summer may not have been hot and dry enough to cause the mites to produce diapausing eggs, and so the populations have been kept low naturally by climatic factors. Alternatively, the lack of a warm period may have meant that rains have not broken diapause yet. We are further investigating the latter explanation.

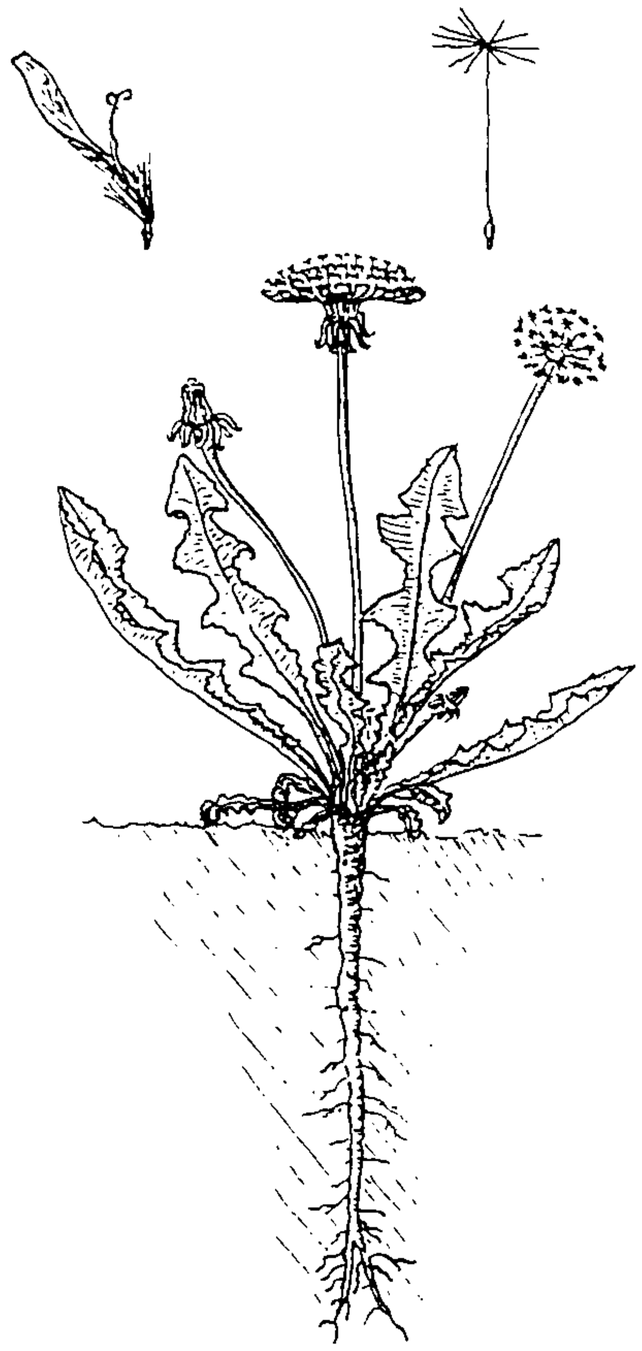
4 PLANT ASSOCIATIONS

To date we have only found RLEM on plants, or on soil close to plants. At low population densities they are most easily found on clover, especially subterranean clover, and a wide range of broadleaves such as ragwort, dandelion, buttercup, clovers, forget-me-not, and twin-cress. At high densities they are found on all available plants, even annual grasses, but not couch.

We have found RLEM on asparagus only where there were broadleaved weeds in the crop.

Most RLEM are found on headlands where there are a variety of plant species for them to live on. It is likely that maintaining vegetation-free zones on the headlands of asparagus paddocks will help to keep crops RLEM-free. How wide a zone is needed to prevent them is unknown at present.

To reduce risk of crop infestation by RLEM it is essential that asparagus crops are kept weed-free.



Dandelion

5 SOIL ASSOCIATIONS

RLEM is only found on a limited range of soil types. In the Rangitikei it only occurred on the Rangitikei Series (recent river alluvium) and on the recent Hokio Sands of the coastal strip. (The soils of the Rangitikei District were described by Cowie et al. 1967.) RLEM has not been found in asparagus planted on Manawatu Sands, the soil series adjacent to but higher and less often flooded than the Rangitikei series (Cowie et al. 1967). On asparagus blocks that include both Rangitikei and Manawatu Sands, RLEM was found only on the former. Just south of the Rangitikei, one block of asparagus on Himatangi soils has had RLEM in the past, but not in the winter/spring 1992/93.

In Hawke's Bay, we have found RLEM only on Pakipaki and Ngatarawa soils, and on very recent alluvium adjacent to rivers. The Pakipaki soils are based on coarse pumice, which limits their ability to hold water and they often have a high peat content that makes them very hard to re-wet once they dry out (Hughes et al. 1939). Ngatarawa soils are underlain by gravels and are equivalent to the Rangitikei sands and are part of the Twyford Series (Hughes et al. 1939).

6 CHEMICAL CONTROL

6.1 Background

Chemical control of RLEM offers an opportunity to reduce the spread of the pest. In Australia endosulfan and Supracide are being developed for RLEM control in pasture. In New Zealand, Hallmark and dichlorvos are registered for use on asparagus.

When we selected pesticides for evaluation against RLEM we restricted the list to those that might be supported for this market by the appropriate proprietor, or had some feature indicating they would be especially useful. For pesticide companies, the field vegetable pest control market is small and many are reluctant to support chemicals in a new use pattern if such a label extension is not part of the strategic plan for the product. Showing that a chemical will work is not enough to make a company interested; this must always be borne in mind when evaluating data from chemical control trials.

The first trial we carried out was destroyed in the process of bed management by the owner.

6.2 Methods

Plots were individual ragwort plants. RLEM numbers were assessed three days after treatment. There were six replicates. Treatments are listed in Table 1. Pesticides were applied through a 5 ℓ Gardena sprayer.

6.3 Results and discussion

There is no doubt that RLEM is relatively easy to control with modern synthetic pyrethroids (Hallmark, Fastac, Mavrik) and dichlorvos (Table 1). Which product is further developed for use in asparagus is for the relevant proprietors to decide on a commercial basis. The endosulfan and Supracide being developed in Australia for RLEM control needs to be researched under New Zealand conditions if the proprietors are interested in potential registration.

Table 1: Pesticide treatments.

Trade name	Common name	Rate/ha product	% control
Apollo	clofentizine	400 ml	55
Pentac	drenochlor	650 ml	70
Nuvan	dichlorvos	600 ml	100
Mavrik	taufluvalinate	300 ml	100
Hallmark	esfenvalerate	375 ml	100
Fastac	alphacypermethrin	20 ml	100
"	"	40 ml	100
Pulse	organo-silicone	100 ml	60
	avermectin		65
Sunspray	mineral oil	10 ℓ	50
Naturoil	vegetable oil		45
Counter	terbufos	3 kg	75
Miral	isazophos	20 kg	100
Untreated			0

7 SAMPLING

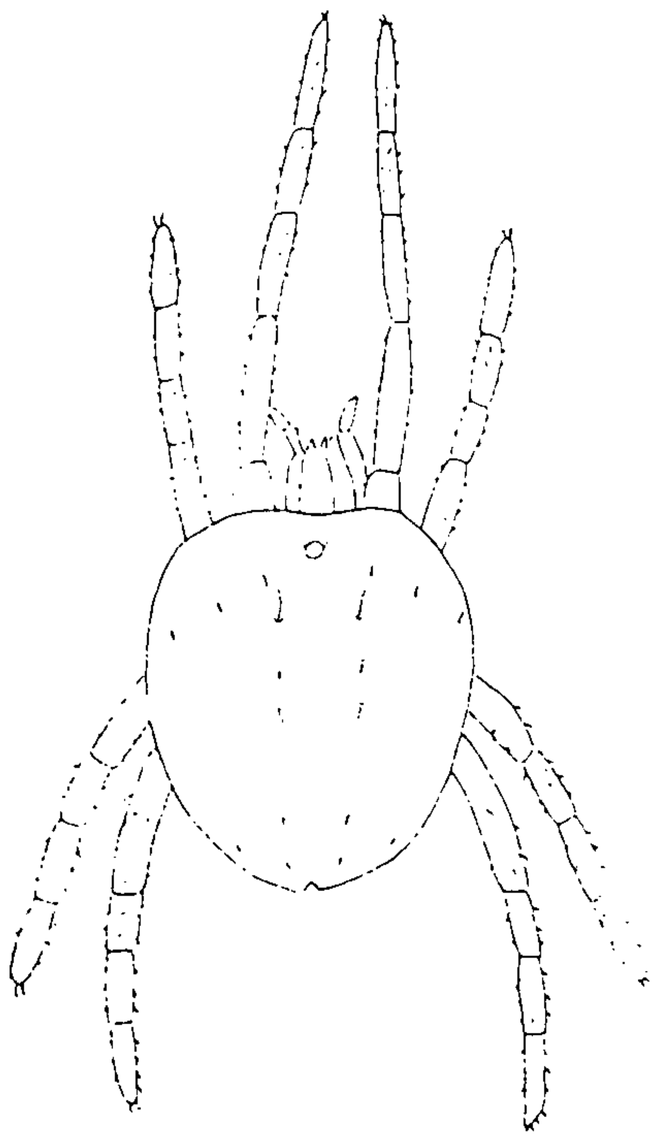
As RLEM is small, sampling relies on an efficient search system. The method we have relied on is hand searching in and around known host plants. This is time-consuming. Searching likely host plants will show if RLEM is present or not, providing the search pattern is extensive enough to cover for the variable distribution of RLEM within the paddock.

We have not evaluated the sweep net method used by MAF. It is likely to be quicker but less reliable.

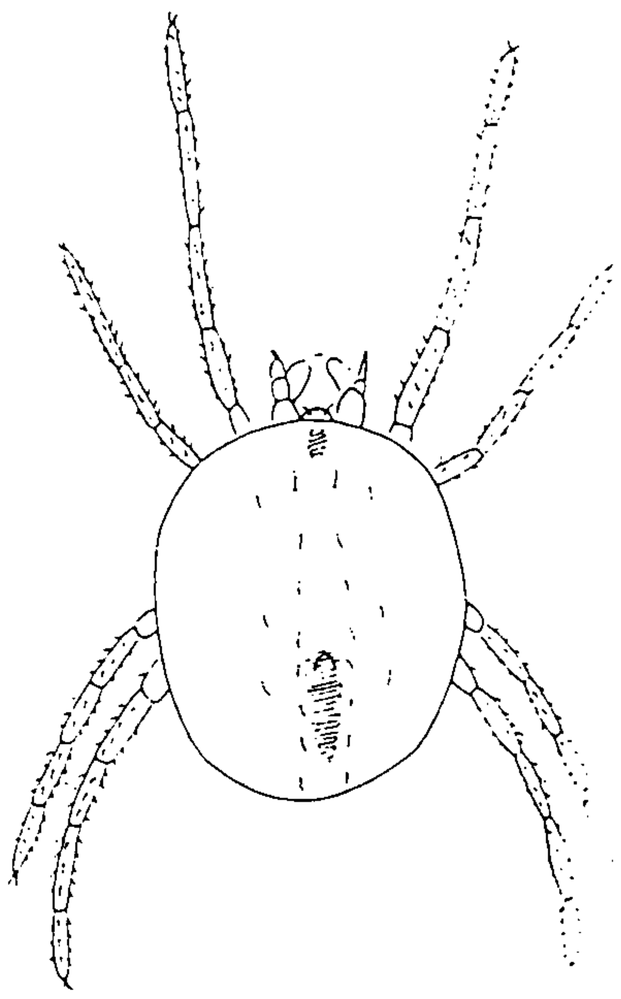
Current research is evaluating the possibility that slices of Granny Smith apples attract RLEM. In one test RLEM were found on slices when hand searching had found only one.

If the apple method works it will facilitate RLEM research once we have calibrated the method against total population numbers. It may make presence/absence assessment more precise.

On one of our study sites blue oat mite appears to have replaced RLEM. To the casual observer they are very similar. Blue oat mite is a lighter colour, has an extra red spot, and moves more slowly than RLEM.



Red-legged earth mite



Blue oat mite

8 DISTRIBUTION

The distribution of RLEM is shown in Figure 4. In general, it has been found only on coastal soils in the North Island and never in the South Island. The two exceptions to this are Rotorua and Taupo. These occurrences may have been on light volcanic soils in a dry season. There is no recent data available on the occurrence of RLEM on these sites.

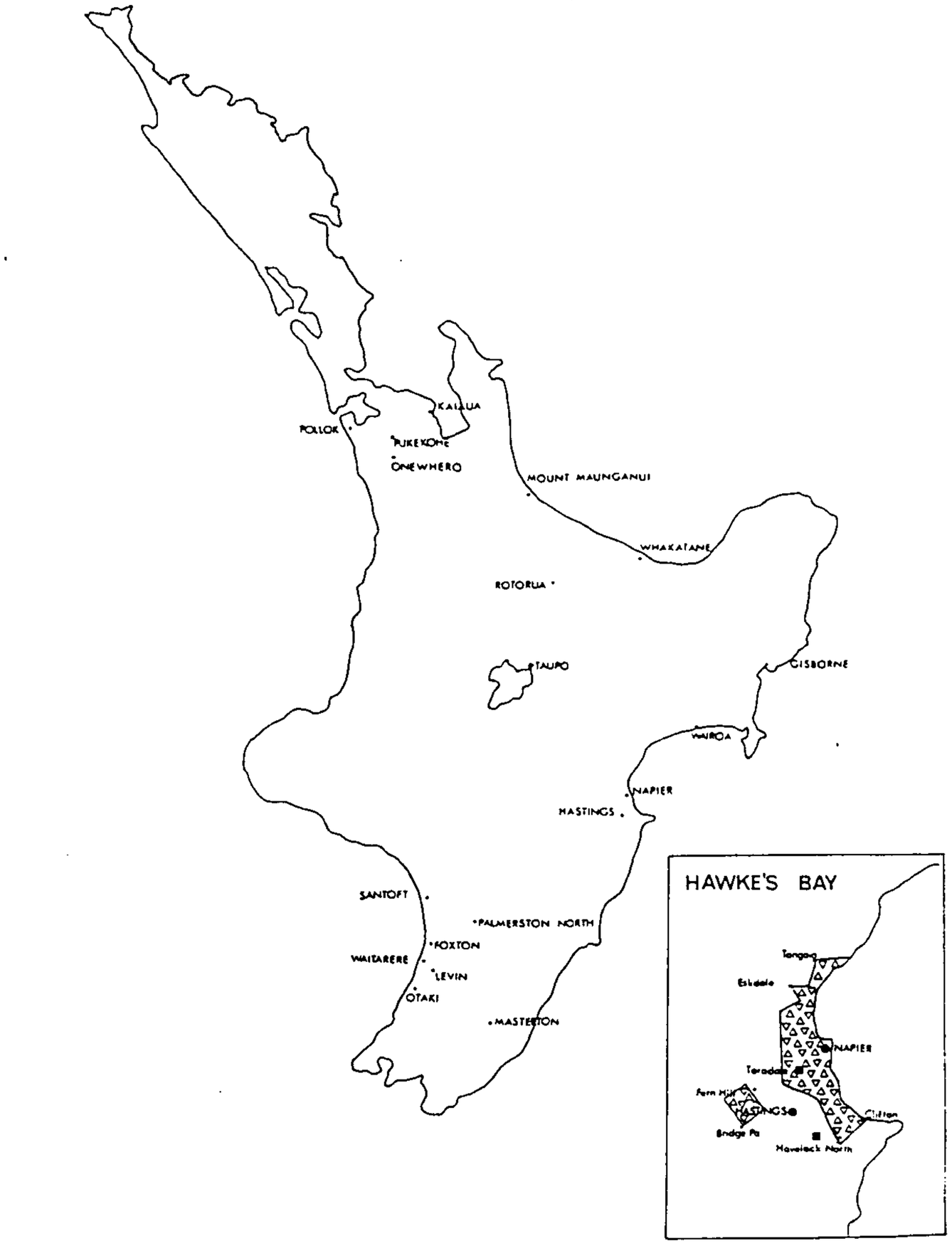


Figure 4: Summary of the distribution of RLEM in New Zealand.

9 DISCUSSION

RLEM is proving more difficult to understand than expected. Control is relatively easy, although there is a very limited range of pesticides registered for use on asparagus. New sampling methods are likely to make both pesticide research and biological studies easier.

It will take several years of research to understand for the relationship between soil, climate and RLEM. In Australia RLEM goes into diapause for about 6 months each year, which does not happen here. This difference is difficult to understand but it may indicate that RLEM is at the limits of its range in New Zealand, as we lack significant areas of mediterranean climate, or it may be that our original population was derived from a different ecological zone in South Africa. This is of practical importance as it means we cannot extrapolate Australian data to New Zealand conditions.

10 ACKNOWLEDGEMENTS

This research has been assisted by the asparagus industry; by financial support, and by allowing access to affected properties. Ciba-Geigy, Shell and Yates have assisted with pesticide research. Ciba-Geigy Australia have advised on sampling methods and treatment schedules.

11 REFERENCES

Carpenter, A; van Epenhuijsen, K. 1993: A systems approach to quarantine entomology using asparagus infestation as a model. *Proceedings of the 45th New Zealand plant protection conference:* in press.

Cowie, J.D.; Fitzgerald, P.; Owens, W. 1967: Soils of the Manawatu-Rangitikei sand country. *New Zealand DSIR soil bureau bulletin 29:* 58 pp and 2 maps.

Dumbleton, L.J. 1947: The red-legged earth mite. *New Zealand journal of agriculture 74:* 9-13.

Hughes, H.A.; Hodgson, L.; Harris, A.C. 1939: Land utilisation report of the Heretaunga Plains. III Soil survey of the Heretaunga Plains. *DSIR bulletin 70:* 18-102 + 2 maps.

Ridsdill-Smith, J. 1992: Proceedings of the National Workshop on red-legged earth mite, lucerne flea and blue oat mite. Department of agriculture, Western Australia.

12 APPENDIX

A draft RLEM management protocol for use by the asparagus industry

This protocol is based on current knowledge and on MAF Policy's latest RLEM directive.

1. Asparagus beds must be kept weed-free.

2. All headlands must be kept weed-free. For the present we recommend at least 5 m cleared ground.

3. After fern removal and before the first growth of spears, all asparagus beds must be surveyed for RLEM using either

   (a) sweep netting
   (b) hand search
   (c) Granny Smith apple baits (still under development).

4. Treatment with an appropriate registered pesticide of both the bare headlands and the asparagus beds. Repeat treatment may be needed within 10-14 days.

5. There are no postharvest treatments available for RLEM. All control must be in the field.

6. There are no useful quality assurance protocols for RLEM that can be used in packhouses. All control must be in the field.

The new protocol exposes the asparagus to great risk. Detection of any trace of RLEM on asparagus by USDA-APHIS is highly likely to cause all trade to and through the USA to cease forthwith. The industry is now very exposed to rapid retaliation by USDA-APHIS if RLEM occurs on produce.

The entomology team at the Levin Research Centre can offer training and support to growers who need help with their RLEM detection programme on a full cost recovery basis.

Contact Kees van Epenhuijsen (06) 3687059, or fax (06) 3683578.

DISTRIBUTION OF RED-LEGGED EARTH MITE IN NEW ZEALAND

SPECIMENS TAKEN AT OR NEAR EACH PLACE NAMED