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OOS-VRYSTAATSE STANDPROEF ONDER AANVULLENDE BESPROEIING IN REITZ

THE POTATO LEAF MINER: ORIGIN OF THE FIRST FLY INFESTATIONS OF THE SEASON

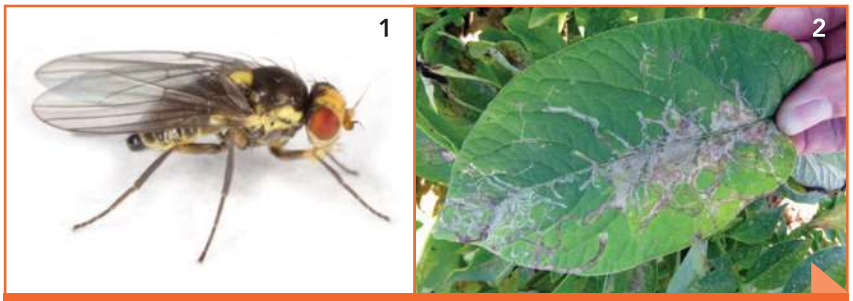
Tegnologiese ontwikkeling: Gebruik van QR-kodes | Effect of fungicide application on potato cultivars at Cedara | Engagement with New Era farmers in Limpopo

The potato leaf miner: Origin of the first fly infestations of the season

By Dr Diedrich Visser, ARC-Vegetables, Industrial and Medicinal Plants, and Dr Pia Addison, Dr Antoinette Malan and Thabu Mugala, all from the Department of Conservation Ecology and Entomology, Stellenbosch University

The potato leaf miner, *Liriomyza huidobrensis* (*L. huidobrensis*), is one of the key potato pests in South Africa. Originally from South America, it was first detected in South Africa in 2000. The adult leaf miner is a minute fly (2 to 3 mm in length) (*image 1*), while the immature stage is an even smaller maggot that feeds inside leaves, causing the characteristic leaf mines (*image 2*).

The leaf miner usually occurs in such high numbers in potato fields that the majority of leaves are infested, resulting in premature dieback of foliage. Although tubers are not attacked, the dieback of foliage may cause up to 70% yield loss. Control with insecticides gives varying results; infestations may stay high up to the end of the season.



The potato leaf miner, L. huidobrensis, (image 1) and the characteristic leaf mines left by L. huidobrensis (image 2).

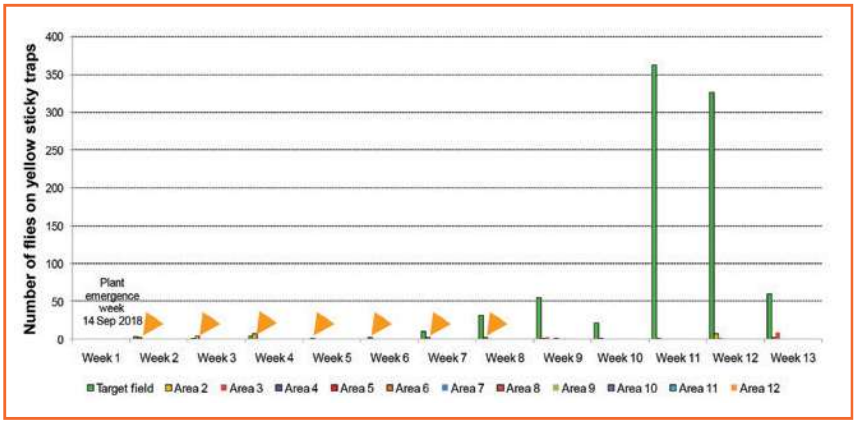
The field trial layout to determine where the first leaf miner flies originated from. The red lines indicate the transects, and the small yellow boxes the positions of the yellow sticky traps. The new field and previously harvested field are indicated.

To address the problem of seemingly uncontrollable fly numbers in potato fields, an investigation was initiated to study aspects of the ecology of the leaf miner, and to identify the origin of leaf miners that infest newly planted fields.

The first leaf miners in potato fields, sometimes occurring in high numbers soon after plant emergence, remained a mystery since their arrival in South Africa. Conventionally it was believed that the surrounding field sustained a leaf miner population on uncultivated plants and weeds. What made this scenario plausible was the fact that it was known that the leaf miner had a wide host range, and that many unrelated plants might act as host plants.

In the winter rainfall region these implicated 'sources of leaf miners', however, could not be located, and in the summer rainfall seasons, most plants and weeds in the

Figure 1: Record of leaf miners caught in different areas in 2018.



The number of leaf miner flies caught per week on yellow sticky traps in and around the new field (green bars) in 2018. The orange arrows indicate the leaf miner numbers in the previously harvested field (Area 2). No leaf miners were caught in any other area around the new field (indicated as Areas 3 to 12) during the early season up to week nine.

surrounding areas die off during the winter months.

The Roodeplaat trial

In the summer rainfall area, a trial was performed on the Roodeplaat campus of the Agricultural Research Council (ARC) to investigate the occurrence of leaf miner flies in and around a potato field. Yellow sticky traps were installed in transects from the middle of a newly planted field outwards in four different directions (*image 3*). The traps were placed at 25, 50 and 100 m from the new field. The traps furthest away were located in fallow areas, in virgin veld with weeds and trees, and in a previously harvested field.

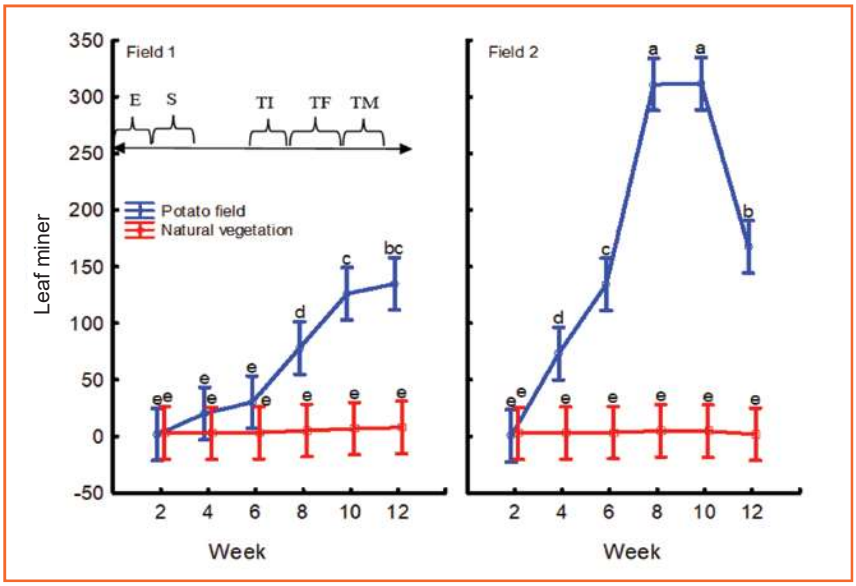
The 13 traps were inspected on a weekly basis for any signs of leaf miner flies that would be attracted and caught on their sticky surfaces. Records were kept to establish where the first leaf miners would appear, as well as their emergence in the new field.

Our results showed that the only flies that appeared in the early season (first seven weeks after emergence) were found in the previously harvested and new field (*Figure 1*). None of the other traps caught any flies during the early season. The origin of the first flies was therefore not from the surrounding areas, but from the previously harvested field.

The traps that were installed in the other areas around the new potato field started to show fly activity only after senescence, and after more than 600 flies were caught per trap per week in the new field. This indicated that when a field is saturated with flies later in the season, and during senescence, they will move outwards from the infested field to infest nearby fields.

In follow-up trials during the next three years, traps were placed in new fields and spaced out in fallow areas in the proximity of the new fields. Some of these areas included potato fields that were harvested the previous season. As was found in the first year, flies were only caught in the new field and in fields that were harvested the previous season – no flies were caught in the other fallow areas.

Figure 2: Mean number of adult leaf miners caught on yellow sticky traps throughout two growing seasons (Field 1 – winter, Field 2 – summer) in two potato fields and adjoining vegetation in the Western Cape Province (Sandveld).



The Sandveld trial

In winter rainfall regions, a similar study was conducted in the Sandveld area at two sites in the manner described. The natural vegetation surrounding the potato fields consisted of daisies, Saldanha Pincushion, Graafwater shrubs and *Helichrysum* species. Monitoring took place at the beginning of the winter growing season (June to October) and summer growing season (October to January).

Additional host plants were confirmed by incubating infested leaves in the laboratory and identifying emerging flies.

It was found that leaf miner populations increased during the summer crop development period, but numbers remained low during winter monitoring periods (*Figure 2*). Leaf damage was regularly spotted

two weeks after plant emergence, with 100% of leaves infested during tuber maturity. Infestation percentage was very similar in summer and winter months, with damage emerging slightly sooner in summer.

Numbers of leaf miners on sticky traps in the surrounding natural vegetation were insignificant, indicating that this is not a major habitat for leaf miners to overwinter or shelter in the Sandveld. It is therefore more likely that leaf miners populate potato fields from within infested fields, as is the case in the summer rainfall region.

Several additional host plants were identified in areas of the Western Cape, including common beans, tomatoes, *Chrysanthemum* plants, onions, *Amaranthus*, field mustard, wild cabbage, *Chenopodium* plants, black nightshade, tropical soda apple and hairy fleabane.

In conclusion

The first leaf miner flies of the early season originate from previously harvested potato fields, and not from the surrounding field.

Other factors that must still be investigated include how far the leaf miner might fly to reach new fields, and to what extent other crops, e.g. tomato, might play as sources for leaf miners that infest newly planted potato fields.

Reports of leaf miners 'migrating' in large numbers with wind currents could not be verified with information from literature searchers. The latter scenario is a possible subject for future research.

Despite the availability of various registered insecticides, the potato leaf miner remains one of the most important potato pests in South Africa. The finding in this study, i.e. that leaf miner infestations originate from pupae in previously harvested fields, may now be used to focus on possible additional control options against the pupae.

If severe leaf miner infestations can be limited by eliminating a large portion of the pupae, control through insecticides may become more effective to reduce the fast build-up in fields during the late season. Possible control options against leaf miner pupae will be discussed in a next article in *CHIPS*.

For more information, contact Dr Diedrich Visser at DVisser@arc.agric.za or cell 082 416 3340.