Outbreak of the Potato Leafminer
Comparisons between Israel and South Africa

(Diedrich Visser, ARC-Roodeplaat and Dr Phyllis Weintraub, Gilat Research Station, Israel)

Presence of the potato leafminer, *(Liriomyza huidobrensis)* was first reported in South Africa during the summer of 1999/2000. During that time it was responsible for losses of millions of rands to the potato industry. Yields dropped from above 40 tons/ha to below 15 tons/ha. Some farmers nearly went out of business because of the impact of this pest on their annual yields.

However, during the following summer (2000/2001), the damage caused by the fly decreased to some extent, enabling most farmers to obtain reasonable yields. What caused the sudden appearance of this pest? And why were the extreme losses in the first year not repeated during the second? These questions will most probably never be answered satisfactorily, but to broaden our views relating to this pest, we have examined the situation in Israel and tried to compare it to the situation in South Africa.

Introduction of the potato leafminer into Israel

Events surrounding the outbreak of the leafminer in Israel closely resemble that in South Africa. As in South Africa, the American leafminer *(Liriomyza trifolii)*, also occurs in Israel. However, just as in South Africa, they suddenly found themselves with a new devastating leafminer that could not be controlled chemically. The first outbreak occurred in 1992 in the Jordan Valley on chrysanthemums and was first reported on potatoes in 1993. Researchers suspected that the leafminer could have entered Israel a year or two before the first outbreak. This is also possible for the Sandveld, because some farmers confirmed that they noticed this leafminer years before the devastating outbreak in 1999. It is thus possible that a resistant, or partially resistant, population found its way to the Sandveld; probably became totally resistant over a short period following excessive application of various insecticides. Researchers in Israel also suspect that an already resistant population entered their country from Europe. The actual route of introduction, however, may never be known for either country.

Change in pest status

After its introduction to potatoes in Israel in 1993, the potato leafminer caused heavy yield losses of around 30%. Population densities in potato fields increased yearly up to 1998, after which a drastic decline occurred.

Very characteristic leaf damage of the potato leafminer (Photo: Dr. Weintraub)

Currently the potato leafminer is not considered a serious pest on potatoes in Israel. A similar situation is emerging in the Sandveld region. In the first year of introduction (1999), the leafminer caused extensive yield losses to almost all potato plantings in that region. During the following summer, damage levels lowered dramatically with only the odd farmer still reporting losses. What has caused this sudden decline in pest status?

There are three main reasons why pest numbers reach the economic (damage) threshold for a given crop: Firstly, the environmental conditions (weather); secondly, the absence of natural enemies in that ecosystem; and thirdly, the inability of direct control measures (spraying programs) to lower that pest's numbers.

Weather conditions

The influence of weather conditions on the survival of the potato leafminer is not always as simple as it seems. As with all insects, temperature affects their development: extreme heat and cold kill, cool temperatures slow development, and moderate to warm temperatures provide optimum developmental rates. The leafminer evolved in the relatively cool foothills of the Andes Mountains of South America and is sensitive to hot and dry conditions. However, other factors also change with the seasons, i.e. humidity and the presence of parasitoids. It is mentioned in the literature from Peru that parasitoids reproduce much slower during the colder months. The apparent increase in leafminer numbers during the cooler months could therefore be attributed both to the fact that this is the temperature of their "native" habitat and to the absence of parasitoids effective at cooler temperatures. To use temperature as a prediction of what will be expected is therefore overly simplistic – it can, however, be used as an indication of what can be expected. It is also noteworthy that the drastic decline in pest status of the leafminer in Israel followed an abnormally hot summer. Scientists also differ in opinion on the influence of humidity on the survival of the potato leafminer. Humidity can become an important factor when potatoes are under irrigation.

Researchers in Morocco and Chili men-

tioned that the potato leafminer prefers high humidities. However, more leafminers were found under relatively low ambient humidities in celery fields in Israel. It is possible that relative humidity could play a role, but then only as one of a complex of factors.

Natural enemies

When the pest appeared for the first time in both countries or rather, when heavy damage levels were first noticed, farmers tried to control the pest with their regular insecticides. When this did not have the desired effect, they started experimenting with all possible products. Neither chemical companies nor researchers had effective solutions. During this time the farmers were used (and sometimes misused) as guinea pigs by agents trying to prove that they had the wonder chemical that would solve the problem. Needless to say, most of these insecticides were ineffective. By the time the farmers realized this, they had unknowingly destroyed most of the natural enemy complex that normally keeps the leafminer in check. Thus, the destruction of this complex could have added to the abnormally fast increase in leafminer numbers. One of the most important parasitoids of the potato leafminer, *(Diglyphus* sp.), was found in both South Africa and Israel at the time of introduction of the leafminer. We therefore know that this natural enemy had been present, and that it was most probably eliminated by the wide spectrum of insecticides used against the leafminer.

Insecticides

When farmers realized that most insecticides were ineffective against adult leafminers, attempts were made to identify those chemicals used in other parts of the world with proven efficacy. Only two insecticides were commonly used on a worldwide scale against Liriomyza, abamectin and cyromazine. When farmers started using these two insecticides as recommended by Novartis (Syngenta), the situation seemed to improve. It was, however, only during the following year in the Sandveld that good control was reported with these two insecticides. Abamectin and cyromazine are translaminar insecticides; that is, unlike conventional insecticides, they penetrate through the leaf and affect the leafminer larvae. Therefore, they must be used differently than conventional insecticides; they need to be applied early when the leafminers are still in the larval stages in the leaf. Abamectin, cyromazine, and more recently spinosad, are the insecticides of choice in Israel for control of the leafminer.

Next issue

In the next issue of Chips we will discuss the use of insecticides, parasitoids and other control strategies against the potato leafminer in both South Africa and Israel. We will try to report on what works and what does not, and will also discuss research work conducted by Dr Weintraub at the Gilat Research Station in Israel. This will include studies on application timing of abamectin and cyromazine (Agrimec and Patron) and their effects on parasitoids. We will also look at the potential of neem as an insecticide against the potato leafminer. Farmers are invited to contact Diedrich Visser at (012) 841 9700 if there are still aspects relating to the leafminer that need clarifying. We shall then try to incorporate these questions in our next article in the next issue of *Chips*.