

Potato flea beetles

Epitrix species

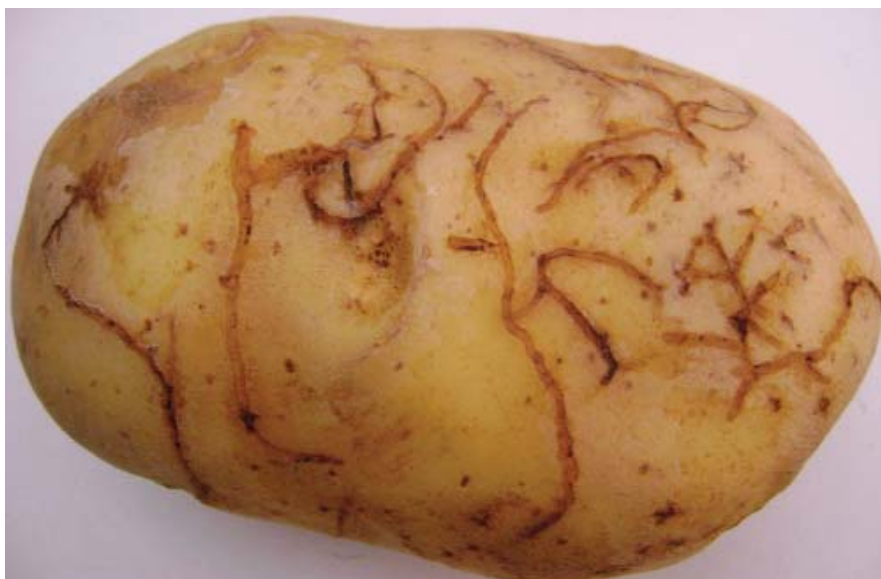


Figure 1. Potato tuber showing feeding damage by the larvae of a potato flea beetle

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What are they?

Flea beetles in the genus *Epitrix* (Coleoptera: Chrysomelidae) are pests of potatoes (*Solanum tuberosum*) in North America. The common name 'flea beetle' derives from the ability of the adults to jump when disturbed. The adult beetles feed on the foliage producing small, scattered shot-holes, which can occasionally be so severe as to depress yield. The larvae feed on the root system and some species also feed on the tubers, which causes the most serious damage. The quality and value of the tubers is lowered and if the feeding damage is severe, it can render the whole crop unmarketable. Identification of *Epitrix* to species level is difficult and the identity of the species damaging tubers in North America has not been routinely confirmed in the past, but *E. tuberosa* Gentner is generally considered to be the main culprit. It produces both superficial serpentine tunnelling on the tuber surface, and deeper holes in the tuber flesh that are still evident after peeling.

Two North American *Epitrix* potato flea beetles, *E. cucumeris* (Harris) and *E. similaris* Gentner, were recorded in mainland Portugal in 2008 (*E. cucumeris* has been known to be present in the Azore Islands since 1979 but no tuber damage has been reported). They were collected from potato fields, where symptoms typical of *Epitrix* tuber damage (superficial lesions/furrows on the tubers) had been found (Fig. 1). This damage was first observed in 2004 in the north of the country (near Porto) but *Epitrix* was not identified as the cause until 2008. By 2008, the pest had spread to all potato growing regions in Portugal. In 2010, *E. similaris* was detected causing damage in several potato crops spread across Galicia, in northern Spain during official surveys (Fig. 2).

Why the concern?

Epitrix potato flea beetles pose a serious threat to potato production in the UK. Potato tubers, or soil attached to the tubers, could carry the pest (as pupae, adults or possibly larvae) over long distances (Fig. 9). The import of potatoes from infested areas in Portugal and Spain provides a potential pathway of introduction to the UK. If *Epitrix* potato flea beetles are accidentally introduced to the UK, they are likely to spread relatively quickly as the adult beetles can fly. Unless detected very early, eradication would be almost impossible because the pests can feed on a wide range of hosts. Once established, control measures would be difficult and costly.

The yield of potato crops is apparently not affected in Portugal but the commercial value of the tubers is greatly reduced. Consignments of affected tubers have been rejected by processors and packers.

Figure 3 shows a comparison between mean daily maximum and minimum temperatures in Lugo, Galicia with those in Suffolk, East Anglia, an important potato growing area. The graph shows that if *E. similis* became established in East Anglia its development rate is likely to be slower than that in Spain due to the cooler spring and summer weather. A similar comparison has been undertaken for *E. tuberis*. This species is a significant pest around Vancouver in Canada. The temperatures there are very similar to those in southern England indicating that this species could establish in the UK.



Figure 2. Locations and regions in which *E. cucumeris* and *E. similis* have been detected in Portugal and Spain

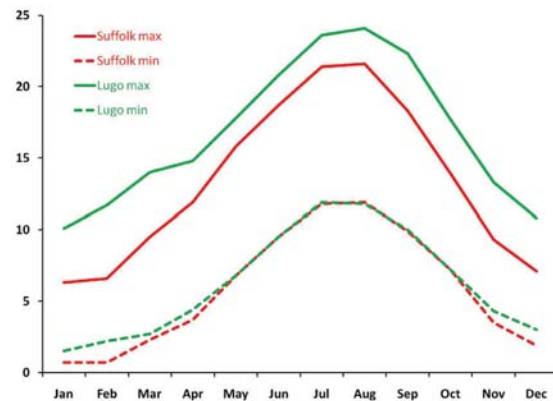


Figure 3. Mean maximum and minimum temperatures in Lugo, Galicia (1971-2000) and Suffolk, (1971-2000)

What are the host plants?

In general, *Epitrix* species complete their development on plants belonging to the family Solanaceae, including potato, tomato (*Solanum lycopersicum*), aubergine (*Solanum melongena*), black nightshade (*Solanum nigrum*), cut-leaved nightshade (*Solanum triflorum*) and thorn apple (*Datura stramonium*). The adults, however, can feed on the foliage of a wide range of unrelated plants including several crops and various common weeds, such as, cabbage (*Brassica oleracea*), cucumber (*Cucumis sativus*), beet (*Beta vulgaris*), lettuce (*Lactuca sativa*), maize (*Zea mays*), beans (*Phaseolus* spp.) and fat hen (*Chenopodium album*).

What does it look like and what are the symptoms?

Most adult *Epitrix* potato flea beetles are similar in appearance, being dark, tiny (1.5-2.0 mm long), oval, convex and hairy (Figs 4, 6 & 7). This makes their specific identification difficult, particularly in the field. It is most likely therefore that they will be discovered by the damage they cause to potato foliage and tubers. There are two native *Epitrix* species (*E. atropae* Foudras and *E. pubescens* (Koch)) in Britain but they do not feed on potato.

Adults chew minute, circular holes (1-1.5 mm diameter) on the leaves, producing a highly conspicuous shot-hole pattern (Figs 4 & 5). The tuber damage found in Portugal consists of shallow sub-epidermic wavy furrows that are removable by peeling the skin (Figs 1 & 8). No larvae have ever been found inside lifted tubers.

What time of year have potato flea beetles been seen?

It appears that both adults and pupae can over winter in the soil and in crop debris, and emerge in spring. Under favourable conditions, as in Portugal, there may be at least three generations per year which could theoretically result in 20,000 individuals from each female in a single season. The first peak in the number of adults is seen in mid-June, the second in mid-August and the third in late September. Eggs are laid in the soil near the base of potato plants and newly hatched larvae move towards the root system and start to feed on the roots and tubers. Pupation occurs in the soil.

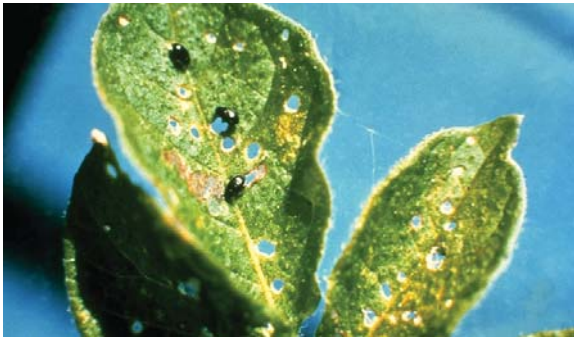


Figure 4. Potato flea beetle adults are about 2 mm in length
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Figure 5. Potato leaves showing characteristic adult 'shot-hole' feeding damage
© Catherine Chatot, Germicopa SAS, France

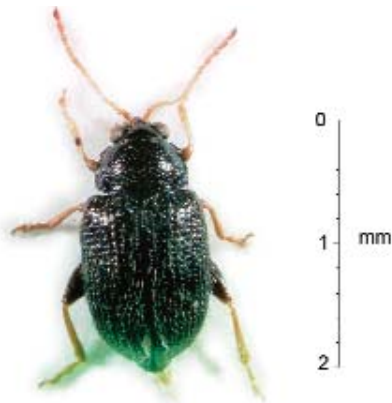


Figure 6. *Epitrix cucumeris* adult
© Jean-François Germain, LNPV Montpellier



Figure 7. *Epitrix similaris* adult
© Jean-François Germain, LNPV Montpellier



Figure 8. Close-up of a tuber showing shallow furrows caused by larval feeding
© Catherine Chatot, Germicopa SAS, France



Figure 9. Potato flea beetle larva on the surface of a potato tuber
© Catherine Chatot, Germicopa SAS, France

How can *Epitrix* potato flea beetles be controlled?

The best and most cost-effective control is to avoid the introduction of this pest

Once introduced, potato flea beetles are likely to be very difficult to eradicate unless they are detected very early and prompt action is taken. This is because they have a wide host range that includes several common weeds and they are very mobile. The most effective way of preventing tuber damage is to avoid introducing these pests into the UK. The two most important pathways for spreading potato flea beetles are, seed potatoes with soil attached and ware potatoes with soil attached. This is because adult beetles, pupae and possibly larvae could be present with the tubers. Imports from Portugal and infested parts of Spain clearly pose a significant risk. Portugal is not believed to be a significant source of seed potatoes for the UK, but the UK has been an important Portuguese export market for ware potatoes, although the quantities imported have been small in recent years. Data from Eurostat indicates that between January and April 2009, only 106 tonnes of Portuguese ware were imported into the UK. Fortunately, imports of ware potatoes in recent years appear to have been mainly washed prior to export and this minimises the risk of potato flea beetles being introduced. The risk posed by Spanish ware is not known because the status of potato flea beetles in Spain remains unclear, although the confirmed presence of *E. similaris* in Galicia is clearly a concern. The UK imports approximately 30,000 tons of ware potatoes from Spain so vigilance is vital, especially given Spain's close proximity to Portugal and the lack of official containment or eradication measures. Spain also has a long history of importing seed potatoes from Portugal.

Official measures in the event of an outbreak

In the event of an outbreak being found in the UK, official statutory action would almost certainly be taken to try and eradicate this very damaging pest. The exact action taken would depend on the particular circumstances of the outbreak but it is likely to involve measures such as the application of insecticide treatments, the destruction of the crop haulm (stems) and the controlled safe disposal of infested tubers.

Control of *Epitrix* potato flea beetles in countries where the pest is present (North America and Portugal)

In North America control normally relies upon the application of a programme of insecticide treatments which can include seed treatments, in-furrow granular insecticides and foliar sprays. Many of the products used in the USA are, however, not available in the EU. The critical element of any successful control programme is to eliminate the first generation of adults before they have laid their eggs in the growing crop. Most farmers in British Columbia follow an Integrated Pest Management (IPM) programme. This involves intensive monitoring of crops for adult beetles with foliar sprays applied when a particular threshold is reached. The alternative to IPM is to apply regular insecticide sprays prophylactically. Prior to the introduction of IPM, potato crops were routinely sprayed 7-10 times with broad-spectrum insecticides to control flea beetle and aphids. Despite these control measures, *E. tuberosa* still causes damage in North America and on occasions, can cause total crop loss.

In Portugal, the worst economic damage occurred in 2008 when whole consignments sent for processing in France, Spain and other countries were rejected. In 2009, growers applied additional early sprays of insecticides (mainly the neonicotinoid insecticide, acetamiprid and the synthetic pyrethroid, bifenthrin) and there were fewer reports of economic tuber damage. Field observations suggest that if 2-3 early insecticide sprays are applied in addition to early the normal Colorado beetle spray programme, the tuber damage is usually kept below 2-3%. However when no insecticide sprays are applied, 80% tuber damage can commonly occur. In the UK, ware crops receive on average only one insecticide spray and if *Epitrix* potato flea beetles were to become established, insecticide inputs would undoubtedly have to increase, especially for crops where market requirements dictate that even low levels of tuber damage are deemed unacceptable. Other important elements of control include the maintenance of an adequate rotation between potato crops (3 years) and the control of volunteers and host weeds during the intervening period.

Keep a good look out

The adult feeding on the foliage and larval feeding damage to the tubers is characteristic. If you see suspicious symptoms or find a beetle that you suspect to be an *Epitrix* potato flea beetle, trap it if possible, and immediately report the finding to your local Fera Plant Health and Seeds Inspector:

Tel: 01904 465625

Email: planthealth.info@fera.gsi.gov.uk

Web: www.defra.gov.uk/fera/plants/plantHealth

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