

POTATO PROTECTION

EFFECTIVE

varietal and crop solutions



If a specific risk factor has been identified, the first thing to do is to choose the right parcel, as well as the right variety, and to use only certified plants.

Here is a set of measures to be taken in a potato crop as well as in the preceding crops, in order to have a hope of significantly reducing the population of an existing pest, or of preventing the arrival of a new one.

For seed potatoes, it is absolutely crucial that the field is free from any cyst nematodes. Both species of cyst nematodes, *Globodera rostochiensis* and *G. pallida*, are on the EU's list of quarantine pests and must be declared and controlled. Soil analysis to detect the presence of nematodes in the field is therefore a prerequisite.

For ware potatoes, it is not necessary to carry out any soil analysis prior to planting. However, it is advisable to choose a parcel that has not been used to grow potatoes for at least five years, in order to limit the risk.

Nematodes may be transported from one field to another through soil sticking to machinery. In high-risk regions, equipment should therefore be cleaned. Care should also be taken not to bring in any soil from potato processing plants.

If a farmer has a choice between several fields, he must assess the level of risk from wireworms and slugs for each of them, based on various factors that encourage or discourage their respective

development (history, previous crop, soil type, etc.). It is always beneficial to plant potatoes in a clean parcel, free of weeds, which are a potential source of food for soil and airborne pests.

Longer rotations with winter and spring crops can limit the development of ground pests. This is more effective for pests such as cyst nematodes, that are specific to Solanaceae, than for polyphagous pests such as wireworms. In general, it is recommended to adopt a five year minimum rotation system.

To reduce the wireworm risk, farmers should avoid choosing fields that were in long-term grass or fallow the year before, or even two rotations before; their stabilised soil, where good cover preserved soil freshness, moisture and softness, provides favourable conditions for the development of wireworm larvae. However, fields in an annual crop rotation system can also be favourable to the preservation or even the development of large wireworm populations (including *Agriotes sordidus*).

Soil cultivation is a crucial control measure

Shallow cultivation in the summer, with very early elimination of stubble straight after harvesting the previous crop, repeated at least twice, disturbs slugs' habitat (*see insert*).

Wireworm eggs and very young larvae are not very mobile and stay on the soil surface; they are very sensitive to desiccation and disturbance by machinery. They can be eliminated by very early cultivation (tined stubble ploughing for greater depth), but this only affects a small proportion of the population produced by late egg laying. The later surface tillage takes place, the smaller the impact it has on wireworm larvae.

However, summer cultivation can encourage Colorado beetles: when the superficial crust of the soil is broken, in July, it allows first generation larvae to penetrate more easily into the soil for the pupation process.

« It is advisable to choose a parcel that has not been used to grow potatoes for at least five years »

Which variety?

In high-risk regions, where potatoes have been grown in a field for many years or are part of a very short rotation, it is highly recommended to plant a potato variety chosen for its resistance to both cyst nematode species, or if that is not possible, at least to the dominant one, rather than purely for its productivity and market. Using certified plants provides a guarantee against contaminating a parasite-free parcel.

When slugs are a potential risk, regardless of the actual level of infestation, an unpalatable variety such as Nicola should be chosen, and varieties known to be very palatable, such as Monalisa, should be avoided. The latter is also much appreciated by wireworms, although no palatability scale has been established for that particular pest.



Long term grass or fallow immediately before, or even two rotations before, encourages the development of wireworms.

Intercropping season: solarisation or ad hoc covers?

Solarisation, a technique used to sanitise soil, should be used exclusively in very sunny, maritime and Mediterranean regions, and in small fields. It consists in covering the soil with a transparent plastic film for at least five weeks. Sun rays raise soil temperature above 40°C down to a depth of up to 30 cm; this destroys nematodes, fungi and weed seeds.

The compulsory green covers imposed at the intercropping season to trap nitrates may encourage pests; they provide them with a source of food and protection against heat, which encourages them to stay where they are. It is the case particularly for slugs.

If a parcel is contaminated with *Globodera*, summer planting of mids of a resistant variety helps to significantly reduce the level of larvae contamination in the soil. Planted at the beginning of July and left in place for two months, they help to reduce the population of nematode larvae more than if the soil is left bare. According to a trial carried out by ARVALIS in 2014 in collaboration with the Chambre d'agriculture and Nord-Pas-de-Calais FREDON (regional federation for the control of harmful organisms), it reduces it by 90%.

Other trials carried out in 2014 and 2016 (with the regional services' and the Directorate General for Food's agreement) showed that this reduction was greater when a resistant variety was planted than when the soil was left bare (considered as a non-host crop). Repeating this operation over several years can help to very significantly reduce the population.

« A 90% reduction in the nematode larvae population is achieved by planting mids of a resistant variety at the beginning of July and leaving them for two months »



Irrigation is a risk factor

Crop control fits in particularly well with potato moths' behaviour. This moth is occasionally a pest in South-Eastern France. It takes advantage of shrinkage cracks in the soil, caused by gravity irrigation that leaves the soil dry and cracking at the top of the mound to lay eggs on the tubers that this exposes. It is therefore important to reform the mounds if cracks appear. If possible, sprinkler irrigation is preferable as it keeps the whole mound moist, although after irrigation, vigilance is key when the mound dries. In addition, moths fly mainly at night, and at harvest time their population is large. That is why unearthed potatoes should never be left in the field overnight, or moths will rush to lay eggs on them. Irrigation aggravates the risk of attack from other pests too. It also keeps wireworm larvae in the mound, close to the growing tubers at a time when they could be tempted to move deeper into the soil

to look for cooler conditions. By maintaining a warm and humid microclimate on the surface, irrigation also encourages slug activity. After the haulm has been destroyed, the soil dries up and slugs reach down to the tubers.

Early harvesting helps to avoid significant later attacks from end of season wireworms (from August onwards) and slugs (mainly after the haulm has been destroyed) on the maturing tubers.

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February 2017

Taking advantage of the intercropping season to control slugs

Soil cultivation has three beneficial effects: it dries the soil and mounds, which disturbs the slugs' environment, it brings up to the surface some of the eggs and young slugs that then die through desiccation (and not from disturbance from the machinery) and it destroys vegetation that is a potential source of food.

A compulsory green cover between two crops thwarts the possibility of repeating soil cultivation. However, choosing an appropriate species to sow during the intercropping season can limit slug populations. Some research work has indeed shown that slugs do not tend to consume certain plant species such as black oats, common vetch, phacelia and white mustard, and this type of cover reduces their growth and fertility. To be effective, those measures must be implemented as often as possible during the rotation.