

The potato cyst nematode, *Globodera rostochiensis*, in the Ukraine

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Summary. It is estimated that *G. rostochiensis*, first recorded in the Ukraine in the early 1960s, has spread and now occurs in an area of 6000 hectares in 12 of the 14 regions in which potato production is a major arable enterprise. Chemical control of the nematode has proved to be ineffective and several regions with the largest nematode populations. Several potato cultivars have been bred in the Ukraine which are resistant and/or tolerant to *G. rostochiensis* and are effective at reducing the crop damage caused by the nematode.

Key words: control, distribution, *Globodera rostochiensis*, pathotype, resistance, tolerance.

The Ukraine is a major producer of ware potatoes. During several decades, potatoes were grown on State governed collective farms but from the early 1990s production moved to smaller private-sector farms.

The first report of *Globodera rostochiensis* Woll. associated with potatoes in the Ukraine was made in 1963, when it was recovered from soil samples collected in fields at the Research Station, Cernovtsy region, Ukraine. The seed potatoes from various regions of the former Soviet Union are investigated at this centre for their resistance to potato wart (*Synchytrium endobioticum*) disease. Cysts of *G. rostochiensis* were recovered from soil samples collected from 50 experimental plots in which potatoes from Byelorussia and several Baltic and other republics had been grown (Nikitin, 1969). Subsequently, in 1967 these plots were treated with chloropicrin to eliminate *Globodera*.

Phytosanitary regulations were implemented in an attempt to prevent the distribution of the nematode to commercial potato growing areas in the Ukraine (Nikitin, 1972a).

The occurrence and distribution of *Globodera rostochiensis*

A survey was initiated in the Ukraine to identify the occurrence and distribution of *G. rostochiensis* in regions where ware potatoes are produced (Nikitin, 1972b). Preliminary results revealed that the nematode has already spread to the some of these areas.

The initial survey was extended and samples have

subsequently been collected each year and examined for the presence of *G. rostochiensis*. Data collected by the State Quarantine Organization of the Ukraine during 1975-1995 revealed that the area of land where cultivated potatoes were infested with *G. rostochiensis* had increased over thirty-fold during that period (Fig. 1A). However, the major spread of the nematode is associated with a change from potato production in collective farms to small private farms (Fig. 1B). On these private farms 57 - 90% of fields are infested with *G. rostochiensis* (Sigarjova & Miroshnik, 1994). Currently, it is estimated that *G. rostochiensis* has been spread and now occurs in an area of 6000 hectares in 12 of the 14 regions in which potato production is a major arable enterprise (Fig. 2). Only the potato-producing areas of the Chernovtsy and Poltava regions were found free of *Globodera* infestation.

The occurrence of *G. rostochiensis* in the different regions reveals two distinct patterns. In the Uzhgorod, Vinnitsa, Ternopol, Khmelnytskyi, Cherkassy and Kiev regions the occurrence of *Globodera* populations was comparatively low and have remained relatively constant with time. However, in the Lvov, Lutsk, Rovno, Zhitomir, Chernigov and Sumy regions the occurrence of *G. rostochiensis* populations has increased annually.

Prior to this time many of the potato varieties grown in these latter regions were very susceptible to *G. rostochiensis* and were grown at the same sites each year. The average population densities recorded in these regions were more than 200 cysts per plant, multiplication rates (Pf/Pi) were 10-20 fold and

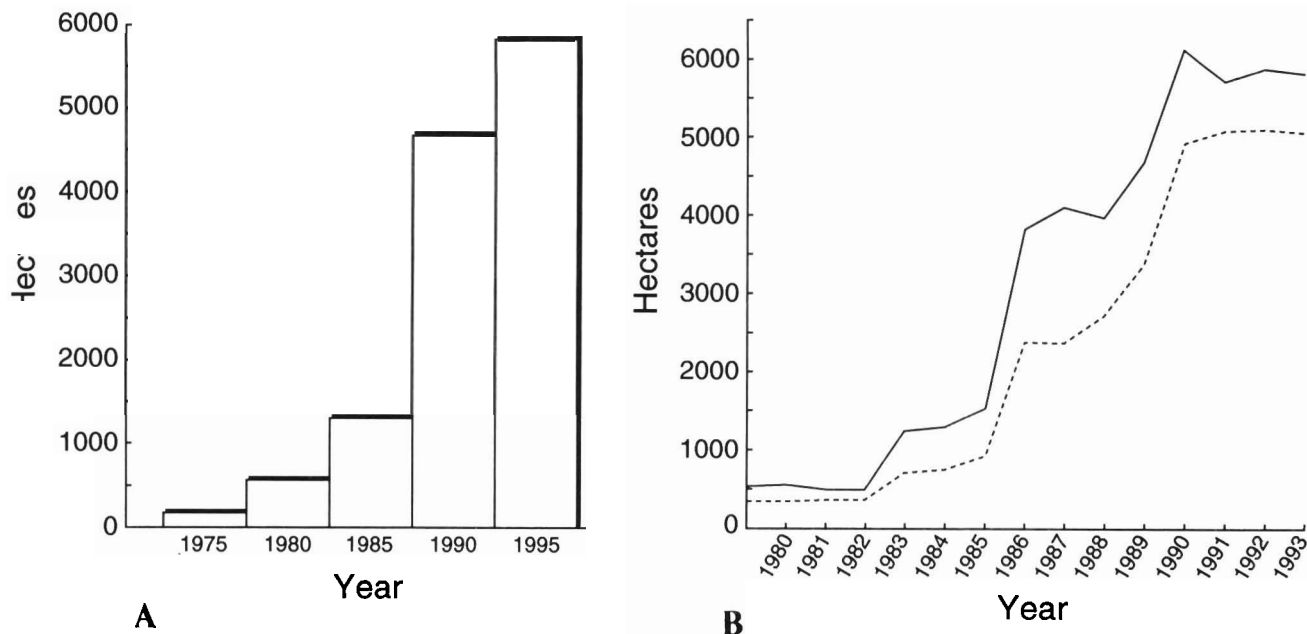


Fig. 1. The occurrence of *Globodera rostochiensis* in the Ukraine. A: The increase in area infested with *G.rostochiensis* between 1975 and 1995; B: The total area of land in the Ukraine infested with *G. rostochiensis* (solid line) and the proportion of infested land in the private-sector (hatched line).

average yield losses were 65%, when initial population levels were 100-200 eggs per 1 g soil (unpublished data).

Control of *Globodera rostochiensis*

Chemical Control. Control of *G. rostochiensis* by the use of nematicides is expensive and harmful to the environment. Chemical control of *G. rostochiensis* proved ineffective in the Ukraine and resulted in soils becoming polluted with high levels of nitrates (Miroshnik & Kotova, 1994). Also, many of the fields with the largest nematode populations are within the "Chernobyl zone" where the application of nematicides is not permitted.

Agronomic measures. In 1986 crop rotations were introduced to prevent annual cropping at the same sites and, as important, to prevent further spread of the nematode to new sites. Subsequently, there has been a substantial reduction in the spread of the nematode although the pattern of spread varies by region.

The most appropriate and sustainable strategy for reducing crop damage caused by *G. rostochiensis* is the use of tolerant and, more especially, resistant potato varieties. Research was focused on identifying potato cultivars resistant to *G. rostochiensis*. Initially several Russian, Belorussian and Baltic varieties were introduced which were resistant to the nematode (Bondar & Gladkaja, 1989). Subsequently, several

varieties have been bred in the Ukraine which are resistant to *G. rostochiensis*, pathotype Ro1.

Potato cultivars bred in the Ukraine, and several from Germany and the Netherlands have been assessed for their tolerance/resistance to *G.rostochiensis* in the Ukraine. Three Ukrainian bred cultivars, Prolisok, Vodograj and Bereginja gave good control of the nematode, suppressing the population levels by about 80%, and these cultivars were also highly tolerant and gave the largest plant yield weights. A fourth cultivar, Dobrotchin, which was bred in the Ukraine was highly tolerant but was less resistant than the other three cultivars to the nematode. The different cultivars reduced nematode population levels at infested sites to between and 58% of the initial levels, and individual plant yields increased by 80 - 395 g (unpublished data). The three Ukrainian varieties which provided effective control of *G. rostochiensis* and large plant yield responses are now widely used in areas and sites with high population levels of the nematode.

Future trends

In the neighbouring countries, Poland and Hungary, *G. pallida* is present and this species occurs in most potato growing regions in Europe (Brzeski & Rogala, 1984; Rainiss, 1987; Kühn, 1988; Potocek & Perlova, 1991). Currently, this nematode species has not been discovered in the Ukraine and strict quarantine controls have been introduced in an



Fig. 2. The potato producing regions in the Ukraine and the occurrence of *Globodera rostochiensis*.

attempt to prevent its introduction. However, *G. pallida* may already be present in potato growing regions in the Ukraine, but at population levels below the detection threshold.

Potato varieties are currently being bred in the Ukraine to incorporate levels of resistance to *G. pallida*. Also, these and other new potato varieties bred in the Ukraine are being assessed for desirable commercial characteristics in combination with high levels of resistance against *G. rostochiensis* and its associated different pathotypes.

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Мирошник Т.Г. Картофельная цистообразующая нематода *Globodera rostochiensis* на Украине.

Резюме. Проведенные исследования показывают, что *G. rostochiensis*, впервые отмеченная на Украине в начале 60-х годов, в настоящее время обнаружена на 6000 га в 12 из 14 областей - основных регионов возделывания картофеля в республике. Борьба с этой нематодой при помощи химических средств оказалась малоэффективной в областях с высокой численностью. Несколько сортов картофеля, выведенных в результате селекции на Украине, оказались устойчивыми и/или толерантными к *G. rostochiensis* и могут быть использованы в борьбе с нематодой.
