

Short note

The distribution of the sugar beet nematode (*Heterodera schachtii*) in the Ukraine

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At a canola meeting in Kiev, Ukraine conducted by the Ministry of Agricultural Politics an increase of the canola growing areas to 1.5 million ha by the end of this decade was announced. Such an increase in canola yield is expected to satisfy the rising demands of canola by food-producing, cattle-breeding, petrochemical and pharmaceutical industries. In order to achieve this aim, it is necessary to develop a sustainable management system for the protection of canola from the sugar beet cyst nematode *Heterodera schachtii*, which is potentially a serious pest of canola in the Ukraine.

It is well known that *H. schachtii* has a wide host range, including sugar beet, garden beet, canola, radish, mustards, broccoli, cauliflower, cabbage and turnip (Decker, 1972; Cooke, 1993; Whitehead, 1997; Shurtleff & Averre, 2000). *Heterodera schachtii* populations have been shown to increase to levels causing severe yield losses (Cotten, 1988; Decker & Dowe, 1990a, b) when good hosts e.g. sugar beet and canola are used in a crop rotation. The main reason for this study was to identify the areas of proposed canola production most at risk from *H. schachtii* infection. Information on the current distribution of *H. schachtii* is essential for advice and control recommendations.

A soil survey was conducted as has previously been described (Guskova *et al.*, 1981; Sigareva, 1986). Samples were collected to a depth of 15-20 cm up to 10 sub-samples (each 50 cm³) ha⁻¹, combined, mixed and a representative sample of 250 cm³ was finally selected. Samples were placed immediately in strong plastic bags, labelled and transported to the laboratory for subsequent analysis.

Cysts were extracted using a Fenwick can (Fenwick, 1940) and counted using a stereomi-

croscope after appropriate preparation (Kirjanova & Krall, 1969). Cysts, vulval cone mounts, eggs and juveniles were identified using light microscopy. The number of juveniles and eggs extracted from cysts 100 cm⁻³ soil was used as an index of the density of the soil population. Areas found to be infected with *H. schachtii* were mapped.

To determine the causes of severe *H. schachtii* infected soils, information on previous cultural practices and crop rotations applied over the last 10 years was collected.

During 2000-2001, 5745 ha were surveyed in the traditional sugar beet growing areas planned for canola cultivation. *Heterodera schachtii* was identified in the following regions: Vinnitsa, Zhitomir, Kiev, Kirovograd and Khmel'nits'kyi from a total of 4835 ha. The majority of the infected area (3709 ha) had low population densities of *H. schachtii* (Table 1).

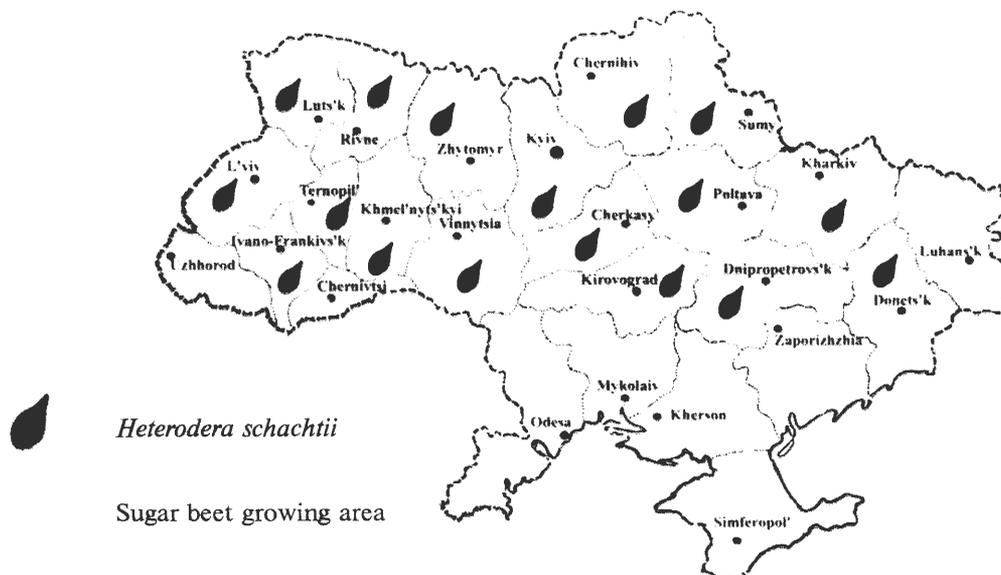
At low (<100 eggs and juveniles 100 cm⁻³ soil) population densities, infected sugar beet plants were evident only in the afternoon when they expressed wilting symptoms and the respective yield was 12%. At moderate levels of nematode infection, infected plants were lighter in colour due to chlorotic leaf symptoms (estimated yield loss 12-50%). The most distinct symptoms of the disease were observed at the highest levels of nematode infection when most plant parts were characterized by stunting and dead outer leaves (estimated yield loss > 50%). The roots of severely infected plants had a "bearded" appearance due to the excessive development of fibrous roots following nematode infection. Severe disease symptoms resulted in plant mortality.

Examination of cultural practices and the crop rotation history of fields demonstrated that the increase in *H. schachtii* population densities re

Table 1. Levels of soil infection by the sugar beet nematode *H. schachtii* in a survey of sugar beet growing areas in the Ukraine.

Region	Surveyed area (ha)	Area infected by <i>Heterodera schachtii</i> (ha)			
		Total	Level of soil infection*		
			Low	Moderate	High
Vinnitsa	3560	2828	2020	207	601
Zhitomir	100	100	100	0	0
Kiev	400	400	400	0	0
Kirovograd	663	485	485	0	0
Khmel'nitskyi	1022	1022	704	110	208
Total	5745	4835	3709	317	809

* low - 1-100; moderate - 101-300; high - > 300 eggs and juveniles /100 cm³ of soil.

**Fig. 1.** The distribution of the *Heterodera schachtii* in the Ukraine.

sulted from sugar beet monoculture without crop rotation and non-effective control of weed hosts.

In most of the surveyed farms, sugar beet was rotated with pea and wheat. However, where sugar beet and cruciferous crops were rotated only once per year, *H. schachtii* densities reached the greatest level and yield was severely affected.

In the Ukraine, *H. schachtii* was first detected in a small number of fields in the Kiev region in 1923. It was suspected that the nematode had been transported with imported seed material from Germany (Korab, 1924). Another survey conducted in 1930 revealed that the *H. schachtii* infected area was approximately 108 000 ha.

In subsequent years, random surveys were carried out mainly in farms with low yields of sugar beet. Consequently *H. schachtii* was found in 16 regions that comprised all the sugarbeet growing areas of the Ukraine (Zinov'yev & Volodchenko, 1972; Sigareva, 1988; Sosenko, 1998; Sigareva *et al.*, 1999).

Assuming the results of previous studies and of the current work, it is concluded that the sugar beet nematode has currently spread to 17 regions of Ukraine (Fig. 1). *Heterodera schachtii* is now detected in home-yard plots (Sosenko, 1998). This may be due to the recent reformation of Ukrainian agriculture that resulted in changes of land

ownership leading to the increased spread of *H. schachtii*.

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