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RESULTS OF A SURVEY ON INFESTATION BY *BURSAPHELENCHUS* SPP. IN PINE FORESTS IN UKRAINE

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The survey on *Bursaphelenchus* spp. and other xylobiotic nematodes in pine forests in Ukraine was carried out. The dominant species was *B. mucronatus*, while two other identified species, *B. eggersi* and *B. sexdentati*, were classified as common and rare, respectively. The large number of *B. mucronatus* was hypothesized to have a possible role in pine trees wilting in Polesye region. *Bursaphelenchus xylophilus* was not found in Ukraina.

Key words: *Bursaphelenchus* spp., infestation risk, pine wilt disease, xylobiotic nematodes

INTRODUCTION

Pine wood nematode (PWN) *Bursaphelenchus xylophilus* (Steiner et Buhrer) Nickle (Aphelenchida, Parasitaphelenchidae), causal agent of pine wilt disease (PWD), is a quarantine organism in Europe that was first identified in Portugal in 1999 (Mota et al., 1999, Sousa et al., 2001). Pine wood nematode is a parasitic nematode that develops in the wood of many coniferous species, but mainly in *Pinus* spp. (Kiyohara and Tokushige 1971; Mamiya 1972). The rapid proliferation of the pathogen in a tree results in a disruption of water flow and eventually causes plant death within several days from the time of infestation. PWN is transmitted from infested trees to new hosts by long-horn beetles *Monochamus* spp. (*Coleoptera, Cerambycidae*) either during oviposition or maturation feeding (Mamiya and Enda 1972; Wingfield 1983; Linit 1988, 1990; Sousa et al., 2001; Naves et al. 2007). The pine wood nematode *Bursaphelenchus xylophilus* is one of the most dangerous phytoparasitic nematodes at present, which causes dying of the whole forest stands in the South-Eastern Asia. It belongs to the ecological group of xylobiotic nematodes.

The distinctive feature of xylobiotic nematodes is their adaptation to living in weakened, dying tree trunks. The habitat conditions in this environment are more stable, the processes of wood saprobiotic decomposition are considerably slower, as well as the ontogenesis. It may be due to these habitat peculiarities that the xylobiotic habitats became a refuge for many primitively organized forms of nematodes (Paramonov, 1970).

The second peculiarity of typical xylobiotic nematodes is their narrow adaptation and close relations to particular species of carrier insects. It is possible that exactly these

features of environment formed fauna of xylobiotic nematodes as a separate group (Vaysher and Braun, 2001).

Xylobiotic nematodes were studied first by German scientists. Nematodes of decaying wood were studied by Körner, nematodes of bark beetles, capricorn beetles and weevils – by Fuchs and Ruhm (Blinova, 1982).

Fuchs, who described about 100 new nematode species, is considered to be one of the founders of entomohelminthology. He studied the representatives of the genera *Parasitorhabditis, Rhabdontolaimus, Panagrolaimus, Poikilolaimus, Cryptaphelenchus, Bursaphelenchus, Ectaphelenchus, Parasitaphelenchus* and distinguished *Aphelenchoidea* superfamily. He was the first who described the nematodes of the genus *Bursaphelenchus*, pointing out that their larval stages develop in the bark beetles' abdominal cavity, and their adult stages – in mines of the host insect (Blinova et al., 1972).

The studies of nematodes as hidden forest pests expanded in the 1970s in the Soviet literature. These nematodes were studied by Blinova, Kakuliya, Devdariani and others (Blinova et al, 1972).

According to Blinova (1982), the nematofauna associated with xylobiotic beetles is represented by 3 orders: *Rhabditida, Tylenchida, Trichosyringida*. The most numerous group of nematodes found in xylobiotic insects (35.90% of the general species number) includes mainly ectoparasitic species of entomonematodes from the *Aphelenchoidea* superfamily. The second-ranked is *Rhabditoidea* (21.30%), represented almost exclusively by nematodes of the genus *Parasitorhabditis*, parasitizing in the intestine, Malpighian tubules and body cavity of bark beetles. The representatives of *Neotylenchoidea* make up 16.90% of the species found, most part of which are cavity parasites. The fourth most numerous group of species (14.70%) comprises mainly predator species from the *Diplogasteroidea* superfamily that use insects only for distribution purposes and localize on their body covers. *Cephaloboidea* form 11.20% of the general species number. These are mainly representatives of the genus *Panagrolaimus* – saprobiotic group, distinguished by close biological relations with xylobiotic beetles and transition to parasitic way of life (*Panagrolaimus spondyli*).

The purpose of our research was to survey the pine forests in order to find the *Bursaphelenchus xylophilus* (Steiner et Buhrer) Nickle and the nematode species associated to it, and also to define the role of tree dwelling nematodes in the process of coniferous forests wilting in the Polesye region in Ukraine.

MATERIAL AND METHODS

The survey was carried out from 2002-2010, within the framework of the thesis, in forestry enterprises in Kyiv and Chernihiv areas of the Polesye region. The wood samples were obtained in the areas of drying forest plantations and in timber-yards (Fig.1). The total of 161 samples of wood and 240 specimens of beetles – sawyers of the genus *Monochamus* were taken and studied. In order to understand the significance of the separate nematode species in the pine wood nematode complex structure we used the occurrence rate and domination indices. The species inhabiting more than 50% of wood samples were considered dominant, 5–50% – common, and less than 5% – rare. The systematics of Andrassy, 1984 was used for identification of nematodes of the order Rhabditida as well as Siddiqui's system (Siddiqui, 1980) for the orders Tylenchida and Aphelenchida.

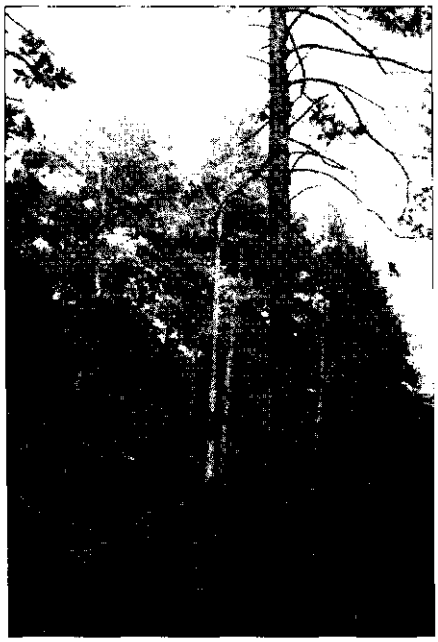

Fig. 1 Wilted pine trees in state forest enterprise the "Kyivskoe" forest district is "Dachnoe" (photo Korma A., Kyiv area, 2003)

RESULTS AND DISCUSSION

The detected nematodes belong to 23 genera (*Plectus* Bastian, *Bunonema* Jagerskiold, *Caenorhabditis* (Osche) Dougherty, *Protorhabditis* (Osche) Dougherty, *Parasitorhabditis* (Fuchs) Ruhm, *Diplogasteroides* de Man, *Rhabdontolaimus* (Fuchs) Paramonov et Turlygina, *Neodiplogaster* Cobb, *Tridontus* Khera, *Cephalobus* Bastian, *Panagrolaimus* Fuchs, *Panagrobelus* Thorne, *Pseudhalenchus* Tarjan, *Nothotylenchus* Thorne, *Parasitylenchus* Micoletzky, *Allantonema* Leuckart, *Deladenus* Thorne, *Laimaphelenchus* Fuchs, *Seinura* Fuchs, *Ektaphelenchus* (Fuchs) Skrjabin et al., *Cryptaphelenchus* (Fuchs) Ruhm, *Parasitaphelenchus* Fuchs, *Bursaphelenchus* Fuchs), 15 families and 4 orders: Araeolaimida, Rhabditida, Tylenchida and Aphelenchida.

The dominant nematode species in wood samples of pine trees was *Bursphelenchus mucronatus* Mamiya et Enda. It occurred in 54% of the examined common pine wood samples. The same nematode species was found in 50 specimens of the surveyed beetles. The other two representatives of this genus, *Bursaphelenchus eggersi* Rühm (Rühm, 1956) and *Bursaphelenchus sexdentati* (Rühm) Hunt., were found to be common and rare, respectively.

The average number of *B. mucronatus* in 100 g of wood was 138.60 specimens, the maximum number reached 2124 specimens. All wood samples were taken from trees affected by xylobiotic beetles. High occurrence rate of *B.mucronatus* shows that this species occupies the favorable ecological niche: tree xylem, practically devoid of the limiting factor – competitor phytonematode species. Intensive reproduction of these nematodes takes place in the vegetating plant, where they can feed on the resin ducts living cells.

We hypothesise that the large number of *B. mucronatus* could be the reason of pine tree plantations wilting, which is the statement that needs further investigations.

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