# REPRODUCTION OF BULGARIAN POPULATION OF *DITYLENCHUS DESTRUCTOR*, ISOLATED FROM CARROT, TO SELECTED CULTIVARS OF POTATO

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**ABSTRACT:**

The effect of *Ditylenchus destructor* Thorne, isolated from carrot in Bulgaria, on five commercial potato cultivars Armada, Adora, Sante, Orfei and Van Gog, was studied in greenhouse. All cultivars tested were poor hosts and no damage was caused to the potato tubers. *Ditylenchus destructor* reproduced on callus tissue initiated from the potato cultivars Armada, Adora, Sante and Van Gog.

*Key words: Ditylenchus destructor, reproduction, potato, carrot*

## Introduction

Potato tuber nematode *Ditylenchus destructor* Thorne is a significant plant parasitic nematode pest of potato (*Solanum tuberosum* L.) in North America and Europe (Perry and Moens 2006). It occurs in many potato producing countries, but its impact is only apparent in temperate zones (Luc et al. 2005). In Bulgaria first reports of *D. destructor* on potato are made by Kovachevski (1942) and Stoyanov (1980). Samaliev (2011) found *D. destructor* in four potato growing regions in Bulgaria (Smloyan, Pazardjik, Plovdiv and Samokov) with an overall frequency of 7% and low density of 3 to 19 nematodes per 100 $cm^3$ soil. Recently, *D. destructor* was found in some carrot fields in Pazardjik and Plovdiv potato growing regions in with carrot losses, although not experimentally determined, reached up to 15-20% (Samaliev, unpublished data).

Although *D. destructor* appears in Bulgaria, no damage with economic significance to potatoes has been reported and *Globodera rostochiensis* (Wollenweber) Behrens, *G. pallida* (Stone) Behrens and *Meloidogyne* spp. are considered the most important pathogenic nematodes on this culture (Samaliev and Stoyanov, 2007). To determine whether Bulgarian population of *D. destructor* isolated from carrot is a potential threat to potato, its reproduction and effect on five commercial potato cultivars was studied in the greenhouse condition.

## Materials and methods

The following procedures were used in a greenhouse experiment. Sound, unblemished seed-tubers of five locally available potato cultivars cv. Armada, Adora, Sante, Orfei and Van Gog and of carrot (*Daucus carota* L. cv. Nantski) were planted in 18 cm/diameter plastic pots filled with steam sterilized sandy loam soil. One tuber was planted per pot; carrot seedlings were thinned to one per pot after emergence. Each pot was regularly irrigated with a hydroponic nutrient (N, P and K - 6.5, 2.7 and 13 %, respectively) dissolved in tap water. Pots were maintained in a greenhouse at 17-24$^oC$. Inoculum of *D. destructor* was obtained from monoxenic cultures on carrot callus tissue (Van der Walt and De Waele, 1989). One week after planting, ten replicates of each potato cultivar and of the carrot were inoculated with 12000 nematodes of mixed life stages by pipetting nematodes in 5 ml aqueous suspensions into 8 holes in the soil around the roots. The pots were laid out in a randomized block design. Seven weeks after inoculation, five replicates were harvested and fresh root weights determined. Nematodes were recovered from two 100 $cm^3$ subsamples/pot (after thorough mixing of the soil from each sample) by Cobb's sieving and decanting technique followed by a modified Baermann funnel method (Hooper, 1986). An incubation method was used to extract the nematodes from roots of potato and carrot (Young, 1954) and counted. Fourteen weeks after inoculation, the remaining four replicates were harvested and treated as described above. In addition, al1 newly-formed potato tubers and carrot root plats were examined for nematode damage

potato and carrot peelings were soaked in water in Petri dishes for 24 h at room temperature and the numbers of nematodes that emerged were counted (Bolton, De Waele and Basson, 1990). Root population data were transformed to $\log_{10}$, before analysis. The experiment was repeated with ten replicates of each potato cultivar and of carrot, and inoculated with 12000 nematodes of mixed life stages one week after planting. After seven weeks, five replicates were harvested and the remainder after fourteen weeks.

Data were analyzed by analysis of variance, using procedures of the SPSS-12 programme, significance being determined at P≤0.05.

**Results and Discussion**

In both greenhouse tests with carrot an average of 83 and 78 *D. destructor* / 100 $cm^3$ soil were found on 7 and 14 weeks after inoculation, until few *D. destructor* (3-24 / 100 $cm^3$ soil), were extracted from variances with potato cultivars. Fourteen weeks after inoculation, in tests 1 and 2 the number of *D. destructor* was from 22 per root (cv. Orfei) to 70 per root (cv. Van Gog). For tests with carrot average of 733-761 *D. destructor* / root were found on 14 weeks after inoculation (Figure 1).

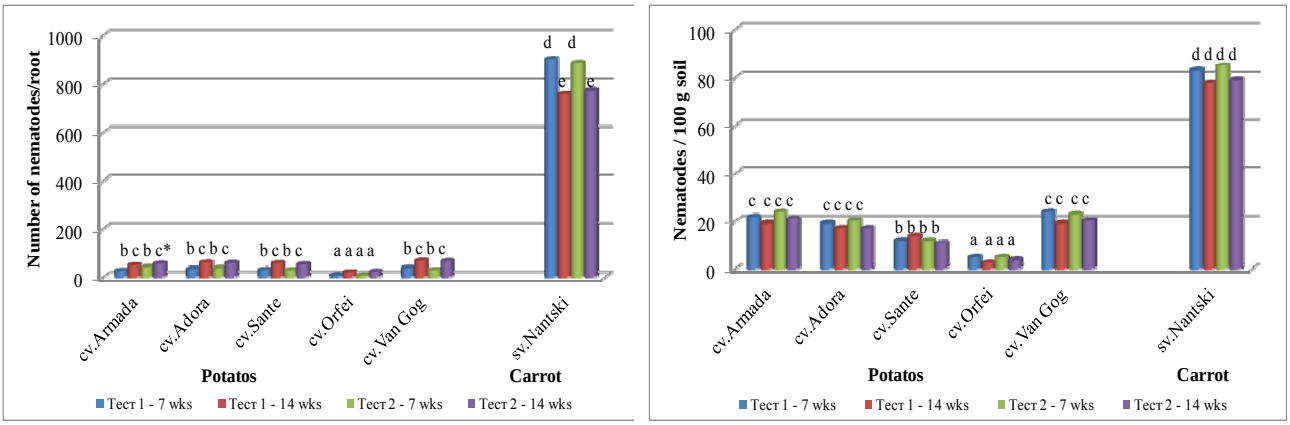


**Fig. 1.** Population densities of *Ditylenchus destructor*, isolated from carrot, on five potato cultivars (Armada, Adora, Sante, Orfei and Van Gog) and carrot cv. Nantski, measured 7 and 14 weeks after inoculation with 12000 nematodes. *The mean values with different letters have significant difference (P≤0.05) according to Duncan's Multiple Range Test.

Fourteen weeks after inoculation, only 40-115 numbers of *D. destructor* per 6 g fresh tissue were extracted from one newly-formed tuber each of the cultivars Armada, Adora, Sante, Orfei and Van Gog. However, no external or internal symptoms such as skin cracking, sub-cutaneous infestation sites or tissue breakdown were observed. At the same times of harvest (14 weeks after inoculation) in the fist test and second test with carrot average of 4071 and 6889 number of *D. Destructor* per 6 g fresh tissue was contained, respectively (Table 2).

The culturing of *D. destructor* on aseptic potato callus tissue has been reported previously (Samaliev and Stoyanov, 2007) and a greater rate of reproduction on callus tissue than on roots of the same plant have been observed (Krusberg and Babineau, 1977). However, our data indicate that under greenhouse conditions all potato cultivars tested were poor hosts of *D. destructor* isolated from carrot and that the nematode caused no damage to the potato tubers. Callus tissues of plants that are resistant to, or are non-hosts of a nematode in nature will frequently support good reproduction of that nematode. Webster and Lowe (1966) suggested that plant growth regulating substances, such as 2,4-D may play a role in making incompatible cells compatible to nematodes in callus tissue cultures.

Since population *D. destructor* isolated from carrot in Bulgaria is morphometrically and morphologically similar to the type population isolated from groundnut (Waele et al., 1989) and potato (Stoyanov, 1980, Samaliev, 2007) this carrot population is considered a race. Races of phytonematodes are defined by their ability to reproduce on certain members of a set of differential hosts (Dropkin, 1988; Sasser and Carter, 1985). Races of *D. destructor* have been reported in the United States (Smart and Darling, 1963) and their existence has been suggested by Duggan and Moore (1962).

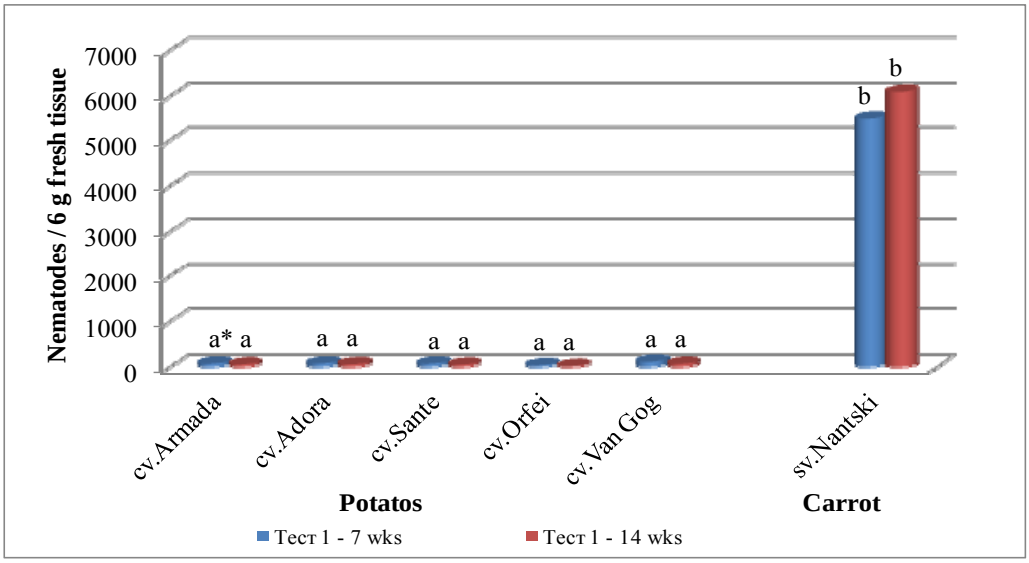


**Fig. 2.** Number of nematodes of *Ditylenchus destructor*, isolated from fresh tissue from newly formed potato tubers from five potato cultivars (Armada, Adora, Sante, Orfei and Van Gog) and carrot cultivar Nantski, measured 14 weeks after inoculation with 12000 nematodes. *The mean values with different letters have significant difference (P≤0.05) according to Duncan's Multiple Range Test.

The discovery of this new race of *D. destructor* is important for the development an effective management strategy, including quarantine measures, crop rotation and breeding for resistance.

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