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## OCCURRENCE AND DISTRIBUTION OF *XIPHINEMA* SPECIES IN VINEYARDS OF THE HERAKLION PROVINCE, CRETE (GREECE)

by  
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**Summary.** In the Heraklion province of Crete (Greece) 130 vineyards were surveyed for plant-parasitic nematodes of the genus *Xiphinema*. Of the three species recorded the most common was *X. pachtaicum* (Tulaganov) Kirjanova, found in 65% of the samples. *X. index* Thorne et Allen and *X. italiae* Meyl, known virus vectors of grapevine fanleaf virus, were detected in 27% and 8% of the samples respectively. The close similarity in the appearance of galls induced by *X. index* and phylloxera (*Viteus vitifoliae* Fitch) is also noted.

Crete is an important viticulture region of Greece, with 50,000 ha of vineyards and is the main region of sultanina raisin production. Phylloxera (*Viteus vitifoliae* Fitch) appeared in the island only a few years ago and virus diseases have imposed drastic replanting programmes throughout the island. Because the occurrence and spread of virus-vector nematodes are important in relation to the development of phytosanitary regulations in replanting programme, a *Xiphinema* survey was undertaken in the Heraklion province, in May 1988, and the results are reported here.

### Material and methods

Roots and soil samples were collected from 130 vineyards throughout the province of Heraklion (Figs. 1 and 2a). In each vineyard one representative sample was taken at 20-40 cm depth in the rhizosphere of grapevines mainly showing fanleaf symptoms. Nematodes were extracted and fixed in 4% formaldehyde, and 2-3 g of roots were removed from each sample to establish the extent of damage to the root system caused by nematodes and/or phylloxera feeding.

### Results

Dagger (*Xiphinema* spp.) nematodes were recorded in 81% of the vineyards inspected. The distribution of *Xiphinema* in the Heraklion province is shown (Fig. 1). These species were found: *X. pachtaicum* (Tulaganov) Kirjanova, *X. index* Thorne et Allen and *X. italiae* Meyl. Two or three species were often present in the same sample.

*Xiphinema pachtaicum* (Fig. 2c and d) occurred in 65% of the samples and in numbers ranging from 60-1230 specimens/500 ml of soil. Because it is well adapted to drier soil conditions and has a wide host range, *X. pachtaicum* is the most common and widely distributed species of the genus in the mediterranean region (Lamberti, 1981). Although it is a cosmopolitan species little is known about its role as a pathogen and so far it has not been recorded as a virus vector.

Morphometric characters of females of *X. pachtaicum* from Crete are within the range recorded for the species by Martelli and Lamberti (1967) and Lamberti and Siddiqi (1977). Male of the species is extremely rare. Two males of *X. pachtaicum* from Sardinia have been described (Lamberti and Martelli, 1971) and 4 specimens from Israel (Cohn, 1969). Among 69 populations examined in our survey only a single male was found in a population from Dafnes, with the following characteristics: L = 1.74 mm; a = 64; b = 6.7; c = 54; c' = 1.76; body width = 27 µm; tail length = 32 µm; odontostyle = 90 µm; odontophore = 45 µm; total stylet = 135 µm; spicules = 32 µm; anterior end to guiding ring = 80 µm.

*Xiphinema index* (Fig. 2g, h) was found in 27% of the samples, often together with *X. pachtaicum* and twice with *X. italiae*. Because it is a vector of grapevine fanleaf virus (GFV), *X. index* is regarded as a serious pest in most grapevine growing areas. In eight cases in our survey *X. index* occurred in association with grapevine plants infected by a chromogenic strain (yellow mosaic) of GFV (Fig. 2i). Distribution of the species is closely related to the fact that grapevine is one of its few hosts.

Parasitized grapevine roots from samples with high nematode population densities (500-800 specimens/500 ml of soil) were damaged by *X. index* feeding, which causes

both mechanical and physiological injury. The infected roots showed necrosis and terminal swellings (Fig. 2j).

Phylloxera and *X. index* feeding induced the formation of galls (Fig. 2b, j). These galls have a similar outward appearance which is confusing and does not always allow for straight forward diagnosis. In Cretan vines exposed to phylloxera and/or *X. index*, galls were localized mainly at the root tip, although in phylloxera infested roots small swellings along the axis were frequently observed. The apical galls induced by *X. index* and *V. vitifoliae* looked similar, both being hook-shaped and with a rough and warty surface (Fig. 2b). However, the general appearance of the affected root system differed considerably, because *X. in-*

*dex* induced the proliferation of lateral rootlets above the galls, which conferred to the root a typical coralloid aspect (Fig. 2j), whereas phylloxera did not.

Morphometric characters of *X. index* specimens isolated from Cretan vineyards are within the range recorded for the species (Siddiqi, 1974).

*Xiphinema italiae* (Fig. 2c and f) has mostly been recorded throughout most of the Mediterranean basin and also in some south-eastern European countries. It is commonly found in the rhizosphere of grapevine, citrus, olive, mulberry and conifers in central and southern Italy (Martelli and Lamberti, 1967). In our survey *X. italiae* was found in 8% of samples, coexisting with *X. index* and *X. pachtaicum*. Only twice has it been found as a pure popu-

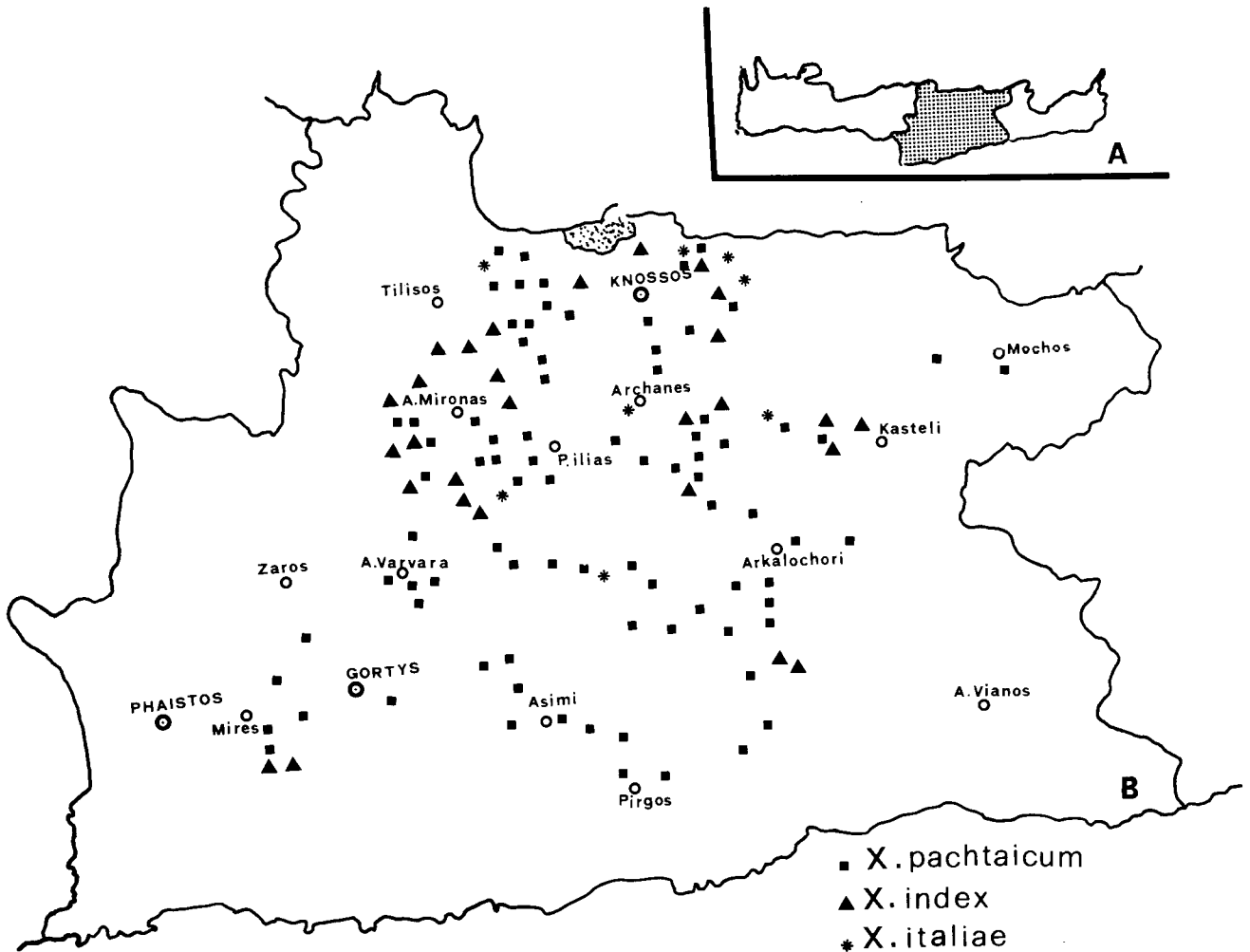
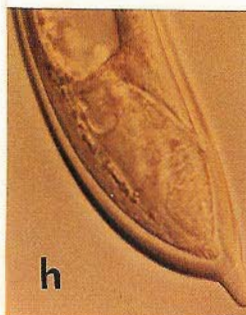
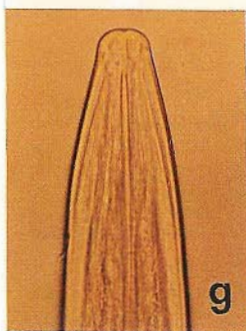
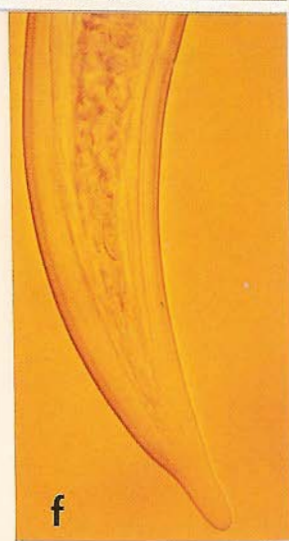
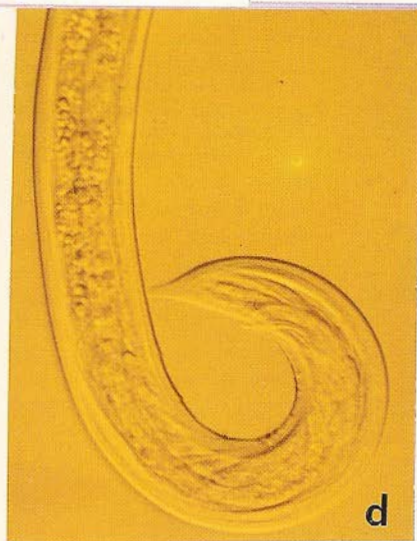
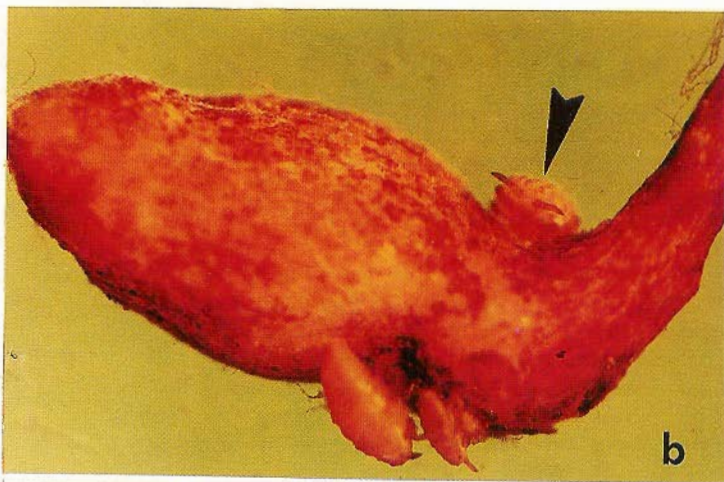


Fig. 1 - Sampled area of Crete (A) and distribution of *Xiphinema* spp. in the Heraklion province (B).

Fig. 2 (front page) - a) Geographical distribution of sampling area. b) Hook-shaped apical gall caused by phylloxera (arrowed) invasion. c,d) Tail ends of female and male of *Xiphinema pachtaicum*. e,f) Head and tail ends of *X. italiae*. g,h) Head and tail ends of *X. index*. i) Symptoms of *Vitis Vinifera* (cv. sultanina) plants infested by a chromogenic strain (yellow mosaic) from *X. index*-infested Cretan vineyard. j) Apical gall with lateral root proliferation induced by *X. index*.



lation. *X. italiae*, which has been shown to act as vector of GFV in Israel (Cohn *et al.*, 1970), has also been reported from grapevine plantations in Algeria, Spain and Portugal (Lamberti, 1981). Morphometric characters of *X. italiae* specimens collected in Crete correspond well with the known range of variability reported for this species (Cohn, 1977).

*Xiphinema pachtaicum*, *X. index* and *X. italiae* have already been reported from Greece (Hirschmann *et al.*, 1966; Koliopoulos and Vovlas, 1977; Terlidou, 1967).

The results of the present study, which show that *Xiphinema* species are widespread in the Heraklion province, must be taken in account in any development of phytosanitary regulations for replanting vineyards in the island of Crete.

In addition, all strategies against GFV decided in replanting programmes require an exact knowledge of the nematological situation regarding *X. index*.

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