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## XIPHINEMA SPECIES IN IRANIAN VINEYARDS

by

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Grapes are an important domestic crop in Iran and are grown mainly for raisins or for the fresh market, together with a limited quantity for wine production. Over 134,000 hectares of grapevines were grown in 1974 (Plan and Budget Organization, 1976) with an average yield of 8.9 tonnes per hectare. The present investigation was undertaken to ascertain whether plant-parasitic nematodes might be one of the factors responsible for the low yield. Dagger nematodes, *Xiphinema* spp., in general, are regarded as the most important nematode pathogens of grapevines which may cause direct damage to the plant or transmit viruses, and accordingly, investigations were largely confined to this genus.

### *Methods*

Soil samples were collected from 170 vineyards in many grape-producing areas of Iran, but mostly in the central provinces of Isfahan and of Markazi and Teheran (Table I). Of each vineyard one sample was taken at 30-60 cm depth from the rhizosphere of grapevines which, in many cases, were showing poor growth or disease symptoms.

Nematodes were extracted from 250 ml soil samples by a combination of the sieving and centrifugal flotation methods. The approximate number of *Xiphinema* per sample was determined.

## Results

Dagger nematodes were identified from 80% of the vineyards examined. Although ten *Xiphinema* species have been recorded for Iran (Sturhan, 1975), only three were found in association with grapevine. Their occurrence and the highest counts per soil sample are given in Table I.

In 66 of the samples two or three *Xiphinema* species were present. The following combinations were observed: *X. index* + *X. pachtaicum* (54), *X. index* + *X. vuittenezi* (4), *X. pachtaicum* + *X. vuittenezi* (1), *X. index* + *X. vuittenezi* + *X. pachtaicum* (7).

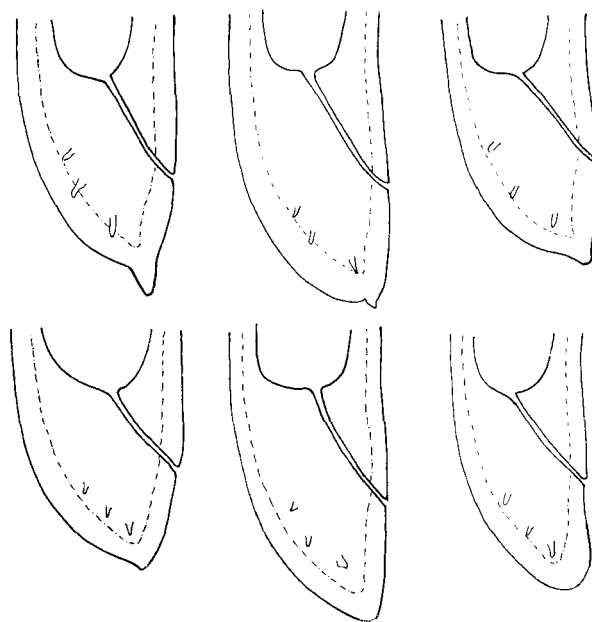


Fig. 1 - Variation in tail shape of *Xiphinema index* females from Iranian vineyards.

### *Xiphinema index* Thorne et Allen

proved to be the most prevalent dagger nematode; it was found in 62% of all samples. This species previously had been reported from Iran (Southey, 1973), where it occurs on cultivated soils and in natural woodland (Sturhan in Weischer, 1974); wild grapevines are common

at some of those sites, e.g. in the Caspian forests. The extent of infestation of the vineyards sampled was 10 - 500 nematodes per 250 ml soil (Table I).

In spite of the widespread distribution of this species in Iran, only two cases were encountered, at well separated sites (Isfahan and Moghan), of grapevines with leaf symptoms characteristic of fanleaf virus disease, which is transmitted by *X. index* (Hewitt *et al.* 1958).

Morphometric characters of the *X. index* specimens isolated from Iranian vineyards are within the range recorded for the species. However, a remarkable variation in tail shape was observed (Fig. 1), which is comparable to that recorded for South African specimens by Heyns (1971). Among the 105 populations examined from throughout the country only a single male was found in a population from Tiran (Isfahan province).

Table I - *Distribution and population density of Xiphinema spp. per 250 ml soil sample collected from eight grape growing provinces of Iran.*

Provinces	Samples collected	<i>X. index</i>		<i>X. pachtaicum</i>		<i>X. vuittenezi</i>	
		Samples infested	Highest count	Samples infested	Highest count	Samples infested	Highest count
Azarbaijan (west)	2	2	170	2	160	0	—
Azarbaijan (east)	4	1	50	4	1550	2	100
Kermanshahan	1	0	—	0	—	0	—
Lorestan	3	0	—	3	1360	0	—
Markazi and Teheran	66	43	500	60	780	9	100
Isfahan	86	56	300	24	120	6	110
Khorasan	4	2	10	1	20	0	—
Baloochestan and Sistan	4	1	18	1	220	0	—
Total	170	105	10 - 500	95	20 - 1550	17	100 - 110

*Xiphinema pachtaicum* (Tulaganov) Kirjanova (= *X. mediterraneum* Martelli *et* Lamberti) was found in 56% of the vineyards examined. In the Markazi and Teheran province this species was more common than *X. index* and present in 90% of all samples. The maximum population level observed was 1550 specimens per 250 ml soil sample (Table I).

*X. pachtaicum* often has been found parasitizing roots of grapevine and other plants in Europe, Israel and other areas. Little is known about its role as a plant pathogen, and it has not been reported as a virus vector.

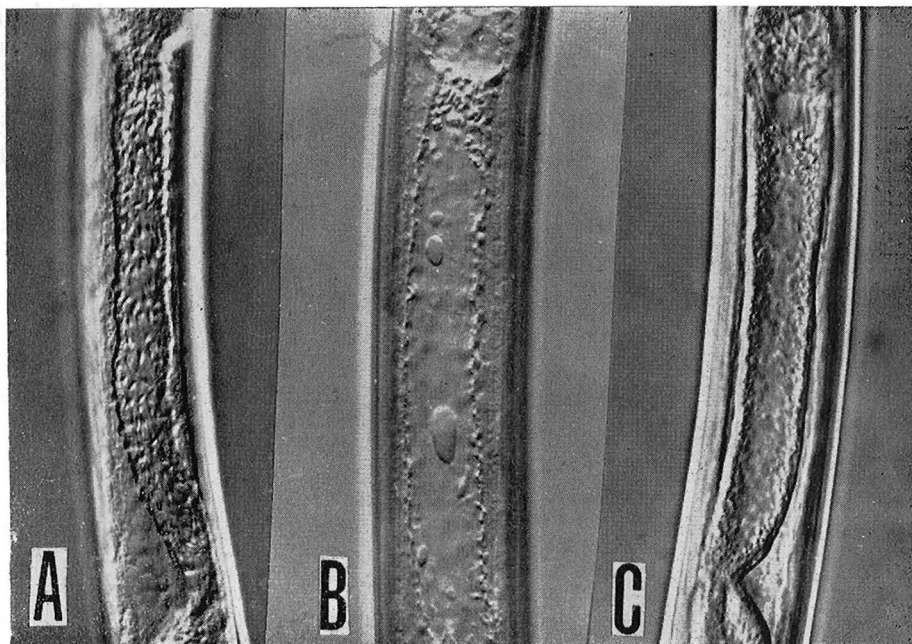


Fig. 2 - Spines in the uteri of females of *Xiphinema vuittenezi*: A, many spines in the entire tubular portion of the anterior uterus; B, spines concentrated in the «organ Z» region; C, small scattered spines.

*Xiphinema vuittenezi* Luc, Lima, Weischer *et* Flegg

was the rarest *Xiphinema* species found in the rhizosphere of grapevines in Iran. Only 10% of the samples were infested. Populations of *X. vuittenezi* were relatively low in number, and only in a few cases were more than 100 specimens recovered from 250 ml soil samples.

This dagger nematode has been found associated with grapevine roots in several European countries, but there is no substantial evidence that it can cause damage to the plant. According to Martelli (1974), *X. vuittenezi* may transmit grapevine chrome mosaic, but this species appears to be only of minor importance as a virus-vector as almost all transmission experiments with it failed.

Morphometric characters of collected nematodes correspond with original data (Luc *et al.*, 1964). The tail shape varied from having a completely rounded tip without a terminal peg to short conical-digitate. In the females of all Iranian populations, distinct spines were observed in the long tubular portion of the uteri, between the enlarged distal portion and the ovijector (Fig. 2). The spindle-shaped structures of variable number and size have not been recorded previously for *X. vuittenezi*, but have also been observed in paratype females of this species and in other European specimens. These characters together with the composition of the cuticle, in which the outer layers are distinctly thicker than the inner, proved to be a valuable additional diagnostic character for this *Xiphinema* species.

### Conclusions

The present study has shown that *Xiphinema* species are widespread in Iranian vineyards and that there appear to be differences in the frequency of occurrence of the three species found within the separate regions (cp. Table I). Since only one sample and little soil could be examined from each vineyard visited, the actual infestation of vineyards in Iran is expected to be considerably higher than indicated from the results presented here.

Among the *Xiphinema* species observed, *X. index* is known to be highly pathogenic to grapevine and to act as an important vector of some grapevine viruses. From experience in other countries, it may be concluded that this nematode species may be one of the factors responsible for the low yield of grapes in Iran, whereas the other two *Xiphinema* species found are probably only of minor importance.

Other plant-parasitic nematodes, such as *Pratylenchus* and *Meloidogyne* species, were sometimes found in large numbers in the rhizosphere and in roots of debilitated grapevines in Iranian vineyards and also have to be considered as grapevine pathogens, although they may be only of local importance. Of the other genera of virus-transmitting nematodes, *Longidorus* and *Paratrichodorus* sometimes were found associated with grapevines in different parts of Iran.

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## S U M M A R Y

One hundred-seventy vineyards in eight grape growing provinces of Iran were sampled. Dagger nematodes, *Xiphinema* spp., were found in 80% of them. Of the three species observed, *X. index* was present in 62%, *X. pachtaicum* in 56% and *X. vuittenezi* in 10% of all vineyards examined, with the highest infestation per 250 ml soil sample being 500, 1550 and 110 specimens, respectively. In two localities symptoms of fanleaf disease were observed. Both *X. index* and *X. vuittenezi* exhibited great variation in tail shape. Spines observed in the uteri of *X. vuittenezi* and the composition of the cuticle proved to be valuable diagnostic characters which have not previously been recorded for this species.

## R I A S S U N T O

*Specie di Xiphinema in vigneti Iranian.*

Sono stati raccolti campioni di terreno in 170 vigneti dislocati in otto zone viticole dell'Iran. Specie di *Xiphinema* sono risultate presenti nell'82% di essi. Delle tre specie osservate *X. index* era presente nel 62% dei vigneti, *X. pachtaicum* nel 56% e *X. vuittenezi* nel 10%. In due località sono state osservati sintomi di « fanleaf ». Sia *X. index* che *X. vuittenezi* presentavano grande variabilità nella forma della coda. La presenza di spine nell'utero di *X. vuittenezi* e la composizione della sua cuticola sembrano essere importanti caratteri diagnostici finora non segnalati.

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