Nematol. medit. (1996), 24: 215-218

Agricultural Research Institute, Nicosia, Cyprus

THE LIFE CYCLE OF *XIPHINEMA INDEX* IN CYPRUS

by
J. PHILIS

Summary. Studies in two Cyprus vineyards on the life cycle of *Xiphinema index* revealed that at a site in the coastal plain the nematode can complete one generation per year but requires a longer period in the mountainous area, at an altitude of 950 m. Egg laying in the coastal plain occurred from early May to early July and in the mountainous region from late May to the end of July. At both sites, soil temperature at the initiation of egg laying ranged between 16.5 to 19 °C and the maximum numbers of females occurred immediately prior to initiation of egg laying.

Xiphinema index Thorn *et* Allen is widely distributed in viticultural areas throughout the world and because of its economic importance its biology has been investigated in many different regions. In Israel, the life-cycle was reported as nine months at 20-23 °C (Cohn and Mordechai, 1969) with little or no development taking place during the colder period of December to March. Also, they estimated the minimum threshold temperature for reproduction as 16 °C with an optimum temperature of 28 °C (Cohn and Mordechai, 1970). In Victoria, Australia, Harris (1979) estimated that the nematode completed its life-cycle in less than a year, with numbers of adults reaching a peak in the summer and then declining rapidly. In southern Italy, Coiro *et al.* (1987) found that egg production commenced in May and continued throughout the summer until the end of September or early October. These workers estimated that the life-cycle took less than a year at the temperatures prevailing in the field, but a discrete life-cycle was not evident because of the longevity of the females and the extended period of egg laying. In Sardinia, where the climate is similar to that in Cyprus, the life cycle of *X. index* was completed in 12 to 14 months in the field (Prota and Garau, 1973) but from other evidence (Prota *et al.*, 1977) it was calculated that the life cycle could be completed in 9 weeks at 22 °C and that there could be two generations per year.

In Cyprus, *Xiphinema index* is widespread (Philis, 1993) and is frequently associated with grapevine fanleaf virus, of which it is the vector. Field investigations were undertaken to establish the life cycle of the nematode on the island so that suitable cropping methods and adequate control measures could be established.

Materials and methods

Experimental sites were established in two vineyards (*Vitis vinifera* L.), one at Kolossi on the south coastal plain (50 m altitude) and the other at Statos in the western hills (950 m altitude). At Kolossi the crop was 20 year old self-rooted cv. Sultanina growing in clay loam; at Statos the crop was 40 year old self-rooted cv. Local Black growing in clay. At Kolossi the plantation received four supplementary drip irrigations during the summer but a Statos the plantation received only

natural rainfall. Normal cultivations were applied to each plantation, including annual rotavation of the soil to a depth of 15 cm. Soil samples were taken at 4 to 6 weeks intervals during January, 1993 to December 1994 at Kolossi, and from July, 1994 to October 1995 at Statos. Soil samples were collected at each site with an auger to a depth of about 35 cm, from fourteen vines selected at random in each plantation. After thorough mixing of the soil, nematodes were extracted from 200 g sub-samples by a modification of Flegg's (1967) technique, with final recovery being made using 125 µm and 75 µm sieves. Juveniles, young and adult females as well as fecund females were identified and counted, using a stereoscopic microscope. Minimum and maximum soil temperatures were recorded at each site at a depth of 30 cm at 6.30 hrs and between 14.00 and 15.00 hrs, three or four times each week.

Results and discussion

At both sites numbers of females increased gradually from early spring with a peak reached in May-July at Kolossi and in May-August at Statos (Figs. 1, 2). This is in accordance with the growth of the vines which break their overwinter dormancy in April and produce new root growth on which the nematodes can feed. At Kolossi there was a decline in the female population during summer, 1993, but this was more

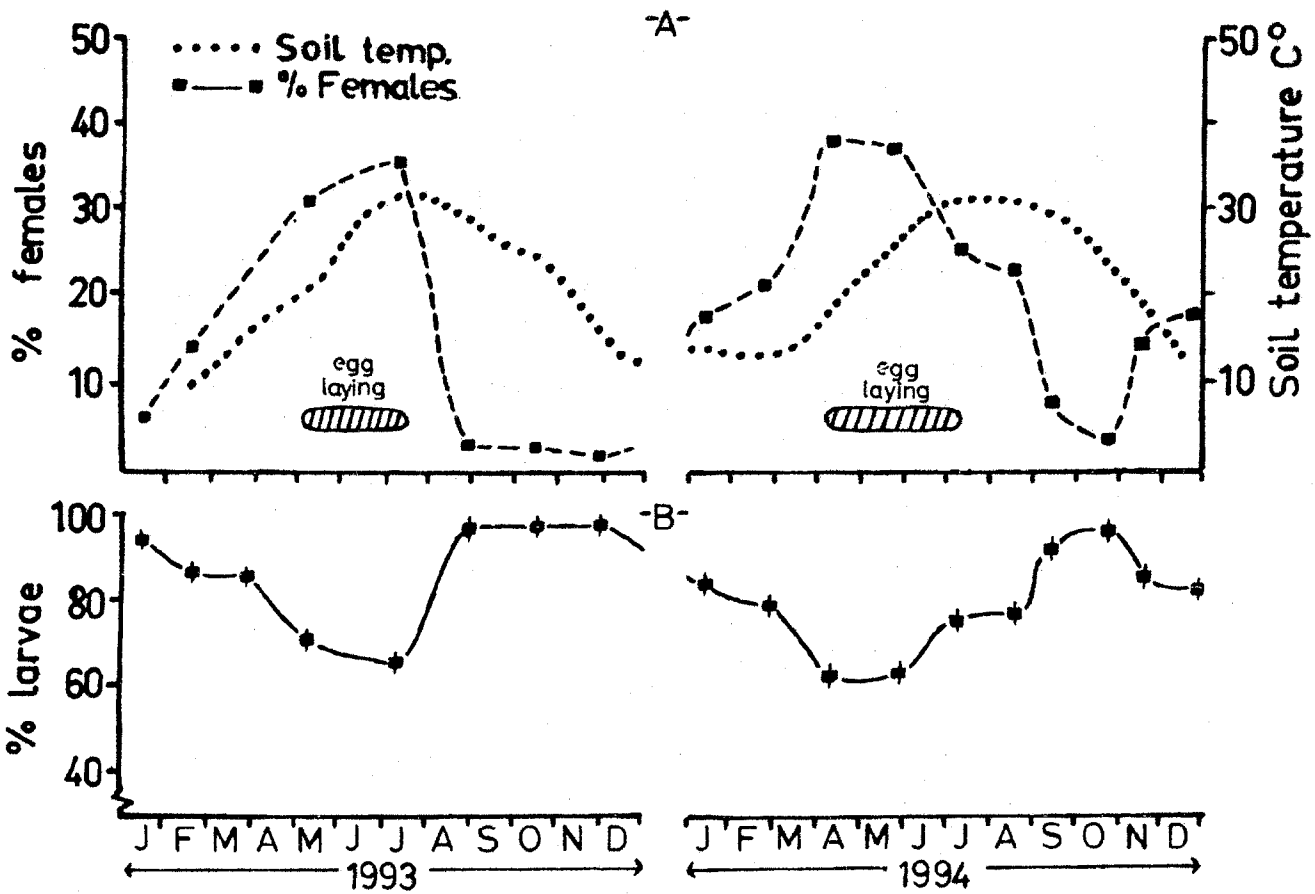

Fig. 1 - Vineyard at Kolossi during 1993 and 1994; A, percentage of females in the total population and the egg laying season of *Xiphinema index* and B, percentage of larvae in the total population.

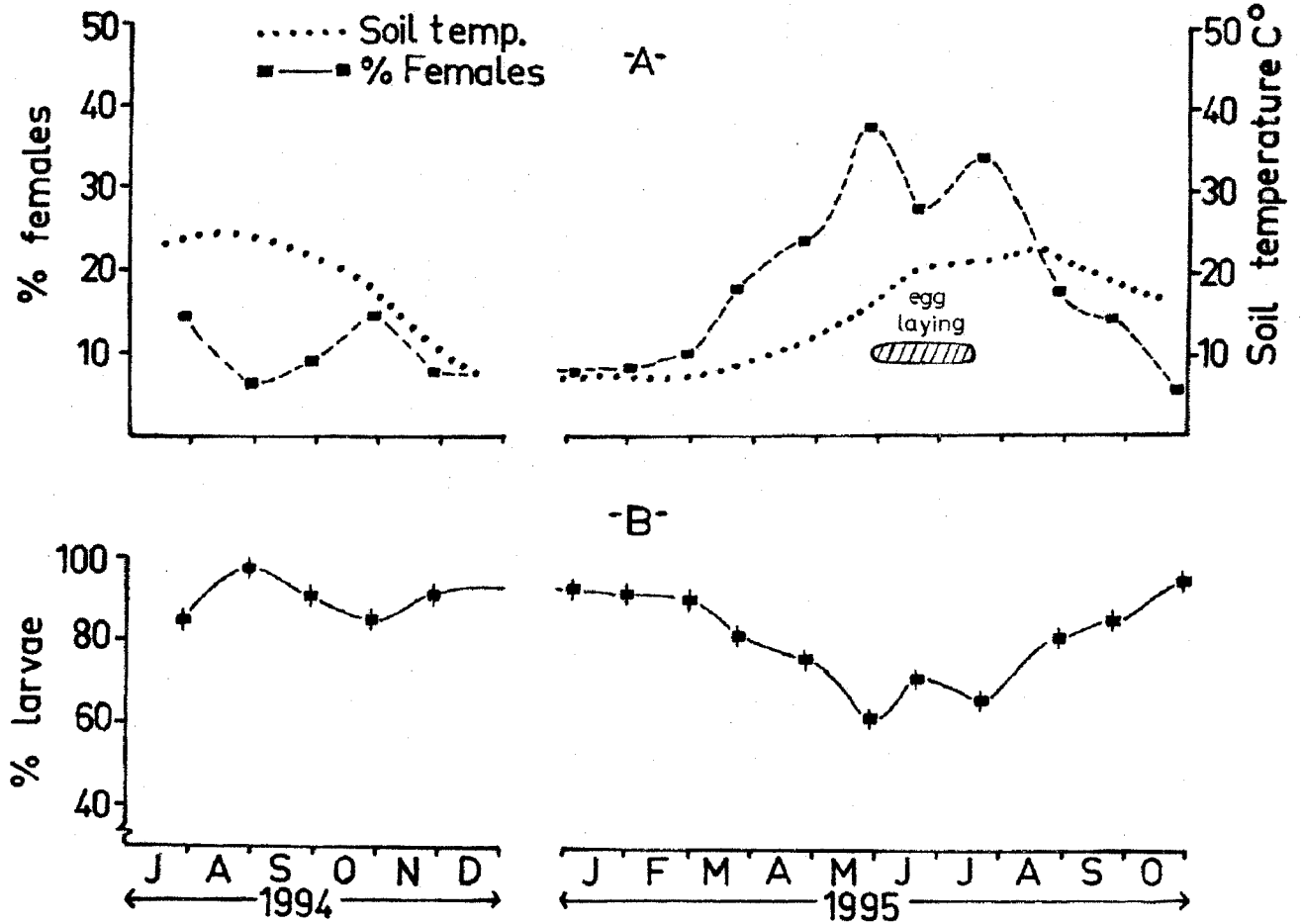

Fig. 2 - Vineyard at Statos during 1994 and 1995: A, percentage of females in the total population and the egg laying season of *X. index* and B, percentage of larvae in the total population.

gradual during summer, 1994 (Fig. 1). At both sites, egg-laying commenced when the soil temperature in the root zone ranged between 16.5 to 19 °C which is in agreement with the minimum threshold temperature for reproduction of 16 °C reported by Cohn and Mordechai (1970). Egg-laying continued from April to July at Kolossi but only from the end of May to the end of July at Statos. At both sites the populations of juveniles fluctuated throughout the year but with maximum numbers reached in the summer.

Each ovogenesis period coincided with increased numbers of adult females while initiation of egg-laying appeared to be correlated with the proportion of females, commencing when this proportion exceeded 30% of the total population. Total populations tended to increase during vine dormancy (Fig. 3), this being in agreement with the findings of Harris (1979). An exception to this was the marked and rather short-lasting increase of the population that occured at Kolossi in August, 1994, presumably associated with the extended period of egg-laying from April to June in that year (Fig. 3). Based on Brown and Coiro's (1985) findings that 730 accumulated day° above a basal tem-

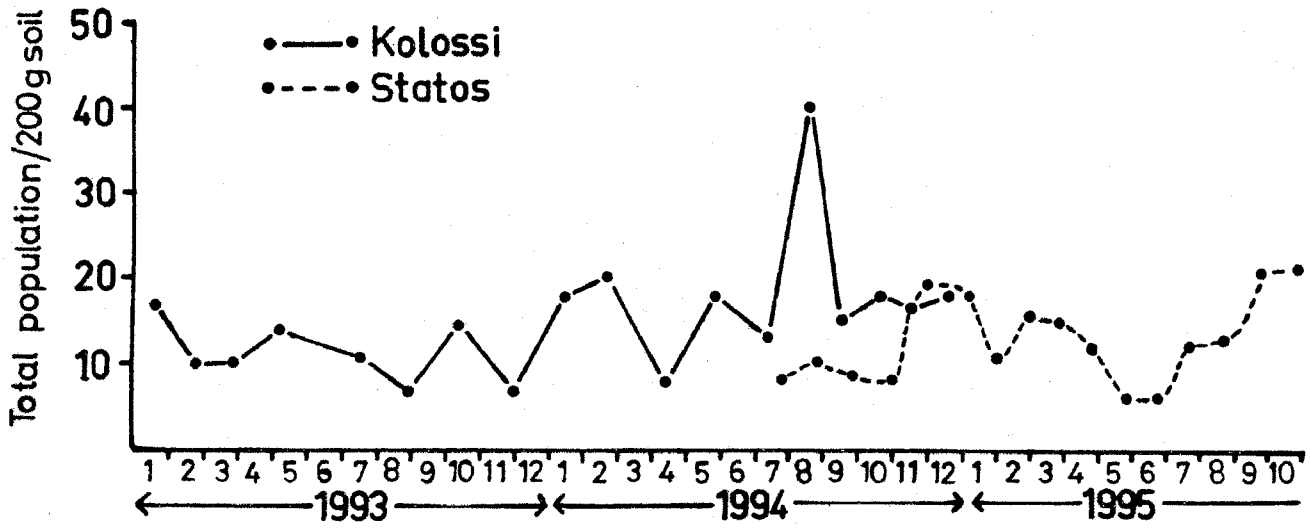

Fig. 3 - Total populations of *X. index* at vineyards in Kolossi and Statos during 1993 to 1995.

perature at 15 °C, are required for *X. index* to complete one generation, it may be estimated that two and one generations can be completed at Kolossi and Statos per year, respectively. However, it is unlikely that ideal conditions for the nematode are experienced at either site, thus it is more likely that a single generation is completed in the plains at Kolossi with more time required by nematodes in the hills at Statos, which is similar to the situation in Sardinia (Prota and Garau, 1973).

Acknowlegements. I thank Dr. C. E. Taylor, Scottish Crop Research Institute, U.K., for reading the manuscript and making constructive comments and suggestions. Thanks are also due to Mr. A. Petrides for technical assistance.

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Accepted for publication on 11 May 1996.