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THE LIFE CYCLE OF *XIPHINEMA VUITTENEZI* (NEMATODA) FROM SLOVAKIA

by
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Summary. In a laboratory study at 18°-22 °C, a Slovakian population of *Xiphinema vuittenezi* developed from egg to adult in six months, equivalent to 3360 day degrees above a minimum daily threshold of 5 °C. Female longevity on *Vitis vinifera* was slightly more than 24 months. It is estimated that between month 3 and month 18 individual female has a reproductive capacity of 152 to 160 progeny. Its life cycle will then complete in one year or longer, under central Europe natural conditions.

Xiphinema vuittenezi is widely distributed in vineyards and orchards in central Europe (Brown and Taylor, 1987). Its life cycle has never been studied under controlled conditions and the only data available on its reproduction refer to studies carried out in England either in the field or in an unheated insectary (Flegg, 1966; 1968).

Xiphinema vuittenezi is widespread in Slovakia (Liskova *et al.*, 1995, Lamberti *et al.*, 1999) and therefore a study was conducted under controlled conditions in Bari, Italy, to establish life span and reproductive potential of a Slovakian population.

Materials and methods

A population identified as *X. vuittenezi* Luc, Lima, Weischer *et* Flegg was collected from the rhizosphere of grapevine (*Vitis* sp.) in a vineyard near Kosice and maintained for three months in a glasshouse at 24-26 °C in pots planted with *Vitis vinifera* L. in pasteurized soil.

Nematodes were extracted from soil by decanting and sieving and recovered in Petri dishes through nylon sieves, after four hours. Non-gravid females were hand picked and individually deposited on the roots of herbaceous cuttings of *V. vinifera* planted in pasteurized sand contained in 25 ml clay pots without drainage holes. Fourteen pots were then placed in trays filled with wet peat and covered with porous cellophane, to minimize moisture fluctuation, and maintained on a shelf in a room at 18-22 °C and natural light day length.

After one month the sand in each pot was carefully moved to allow direct observation of roots with a stereo-microscope and assess symptoms of nematode feeding (root-tip necrosis and galls); roots were then covered again with the same sand. The operation was repeated at 60 and 90 days after nematode inoculation.

Six months after placing single females on grapevine roots, nematodes were recovered from each pot by wet sieving. The progeny were counted and developmental stages were determined. The original female, when recovered,

was placed again on the roots of a new grape cutting in a new pot. This procedure was repeated every six months, until no female or progeny were recovered from the remaining pots in which an individual female had been placed at month 24; this occurred at month 30, when the study was discontinued.

Results

One month after individual female inoculation the presence of root-tip necrosis was the evidence that nematode feeding had occurred. After further 30 days there was extensive galling on the root-tips.

Eggs were first observed in the uteri of *X. vuittenezi* females three month after commencing the study and at month 6 many juveniles of each stage were recovered.

At this time 14 females had produced a mean of 32 juveniles (Table I) (0-57) and developmental stages recovered were 2 J_1 (6.2%), 8 J_2 (25%), 11 J_3 (34.4%), 11 J_4 (34.4%) and all females were gravid with 1 to 4 eggs (Table II).

A period of intense reproduction occurred between months 6 and 12 (Table I). All the 14 original females were recovered together with a mean of 105 (76-168) juvenile progeny. Developmental stages were J_1 23%, J_2 29% and J_3 and J_4 24% each.

Between months 12 and 18 reproduction dropped suddenly. Only 12 original non gravid females were recovered and only ten of them produced progeny: a mean of six juveniles (2-16).

After 24 months no progeny were recovered and the remaining eight originals females were traslucent and inactive. No females, nor progeny were recovered at month 30.

Discussion

From the data in the experiment it is calculated that development from egg to adult takes ca. six months, equivalent to 3360 day degrees above a minimum daily threshold temperature of 5 °C. This low basal temperature was selected because of the winter soil temperature occurring in Slovakia, from where the population was collected. The longevity of female *X. vuittenezi* on *V. vinifera* was slightly more than 24 months, which is equivalent to ca. 13,440 day degrees and their reproductive span was ca. 18

TABLE I - *Total reproductive capacity of individual female* of *Xiphinema vuittenezi*.

Pot n°	Number of juveniles					
	Months					
	6	12	18	24	30	Tot.
1	25	82	–	–	–	107
2	30	122	–	–	–	152
3	56	82	–	–	–	138
4	45	94	–	–	–	139
5	42	131	16	–	–	189
6	24	135	3	–	–	162
7	12	105	10	–	–	127
8	34	114	4	–	–	152
9	25	107	2	–	–	134
10	36	91	7	–	–	134
11	36	84	7	–	–	127
12	57	168	9	–	–	234
13	27	76	2	–	–	105
14	0	85	4	–	–	89
Mean	32	105	6	–	–	142

TABLE II - *Mean number of developmental stages of* X. vuittenezi *at 6 month intervals from individual females on* Vitis vinifera.

Month	Mean number of eggs/uteri	Mean number of developmental stages			
		J_1	J_2	J_3	J_4
6	2.7	2	8	11	11
12	2.0	24	31	25	25
18	0	2	2	2	2
24	0	0	0	0	0

months, equivalent to 10,080 day degrees. Between months 3 and 18, females produced a mean total of 142 progeny each equivalent to 59 day degrees above 5 °C for each progeny. Assuming losses of 5 to 10% during extraction procedures, the total reproductive capacity of an individual female *X. vuittenezi* is estimated to be 150 to 160 progeny.

The cumulative total reproductive capacity of *X. vuittenezi* correlated with observation times shows an increasing reproductive capacity from month 6 to month 24 with a siquificant (P = 0.01) coefficient (Fig. 1).

This study points to the relative long time needed for *X. vuittenezi* to complete its life cycle and confirms the once-yearly reproduction hypothesis of Flegg (1966). In this respect *X. vuittenezi* differs from some other longidorid species most of which complete their life cycle within 2 to 4 months (Brown and Coiro, 1983 and 1985; Coiro *et al.*, 1999).

In England several longidorid species require 1 to 3 years to complete their life cycle and all their life stages are capable of overwintering (Flegg, 1968). Similarly, *X. vuittenezi*, which at a temperature range of 18-22 °C takes 6 to 7 months to develop from egg to adult would under natural conditions in Slovakia, hatch in early summer, overwinter as different development stages or as females and become adult and lay eggs at the beginning at the following summer.

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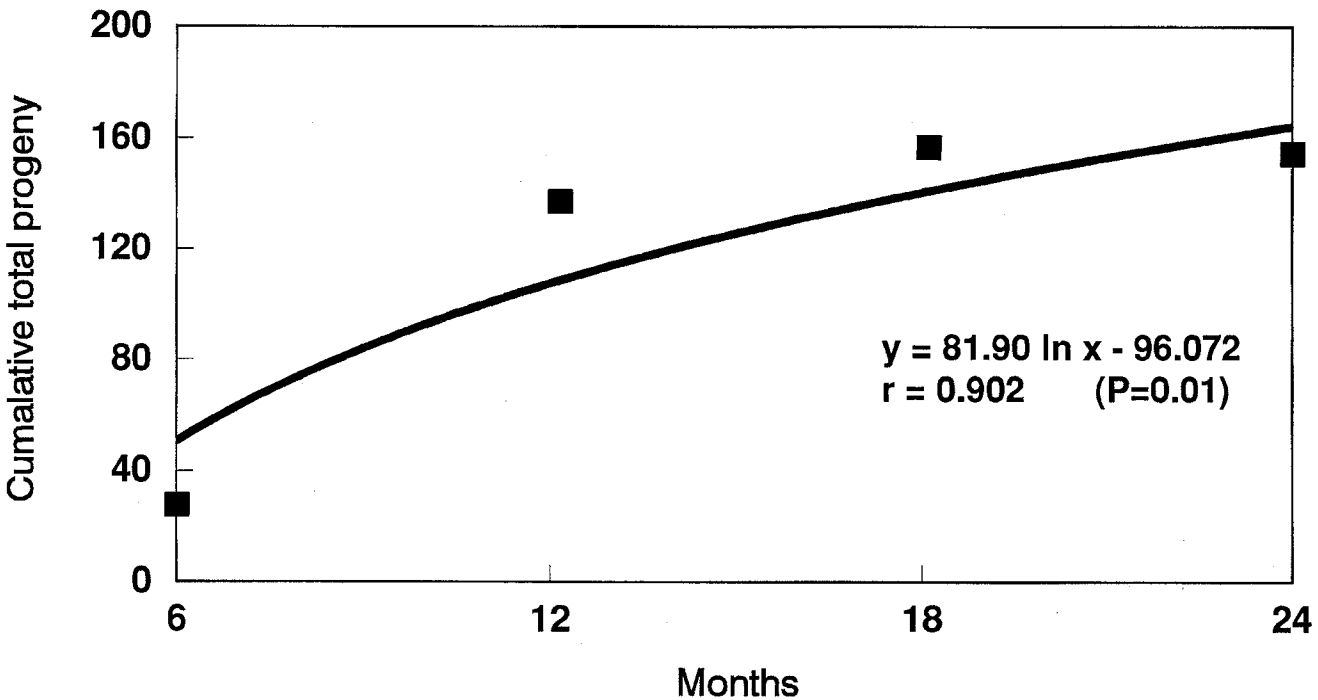

Fig. 1 - Relation between cumulative total progeny production and observation times for *Xiphinema vuittenezi*.

Literature cited

BROWN D. J. F. and COIRO M. I., 1983. The total reproductive capacity and longevity of individual female *Xiphinema diversicaudatum* (Nematoda: Dorylaimida). *Nematol. medit.*, *11*: 87-92.

BROWN D. J. F. and COIRO M. I., 1985. The reproductive capacity and longevity of *Xiphinema index* (Nematoda: Dorylaimida) from three populations on selected host plants. *Révue Nématol.*, *8*: 171-173.

BROWN D. J. F. and TAYLOR C. E., 1987. Comments on the occurrence and geographical distribution of longidorid nematodes in Europe and the Mediterranean region. *Nematol. medit.*, *15*: 333-373.

COIRO M. I., LAMBERTI F., SABOVA M., AGOSTINELLI A., VALOCKA B. and SASANELLI N., 1999. The life cycle of a population of *Xiphinema diversicaudatum* from Slovakia (Nematoda). *Nematol. medit.*, *27*: 277-280.

FLEGG J. J. M., 1966. Once-yearly reproduction in *Xiphinema vuittenezi*. *Nature, London*, *212*: 741.

FLEGG J. J. M., 1968. Life-cycle studies of some *Xiphinema* and *Longidorus* species in southeastern England. *Nematologica*, *14*: 197-210.

LAMBERTI F., SABOVA M., DE LUCA F., MOLINARI S., AGOSTINELLI A., COIRO M. I. and VALOCKA B., 1999. Phenotypic variation and genetic characterization of *Xiphinema* populations from Slovakia (Nematoda: Dorylaimida) *Nematol. medit.*, *27*: 261-275.

LISKOVA M., BROWN D. J. F. and TAYLOR C. E., 1995. The occurrence and distribution of Longidoridae and Trichodoridae in the Slovak Republic. *Russian J. Nematol.*, *3*: 49-60.

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