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Seasonal Variation of a *Meloidogyne exigua* Population in a Coffee Plantation[1]

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Minas Gerais, Brazil, has defined dry (May–October) and wet (November–April) seasons. During the dry season, less than 250 mm of total precipitation is common; the wet season is characterized by more than 1,000 mm of rain. Rainfall is known to affect nematode population (3,8,9), and seasonal changes may result in alterations in nematode populations. In a preliminary survey, we estimated that at least 20% of the coffee plantations in southern Minas Gerais were infested with *Meloidogyne exigua* Goeldi, 1887. However, nothing was known about the seasonal population changes of the nematodes. Knowledge of such changes is needed for future survey and control work.

To obtain such data, we selected for study a 15-year-old plantation planted with *Coffea arabica* L. cv. Mundo Novo. The plantation was known to be heavily infested with *M. exigua* and received no irrigation water.

Three soil samples (300–400 cm^3) and three root samples (5–10 g) were collected from around each of five trees every 2–3 weeks from June 1980 until June 1981. The samples, collected from a depth of 0–20 cm, were stored at 9–12 C for less than 3 days and then processed. Soil samples (200 cm^3 in 1 liter of water) were passed through 150-mesh and 400-mesh screens to collect the nematodes. Root samples (3 g) were gently washed, cut into 1–2 cm pieces, blended in 300 ml of water for 15 seconds, and passed through the same sieves. Both samples were further extracted by Jenkins modification of the centrifugation–sugar flotation method (7) and analyzed for eggs, larvae, and females of *M. exigua*. Daily precipitation during the study was recorded by automatic rain gauge.

The distribution and frequency of precipitation during the course of the study are shown in Fig. 1; total dry season rainfall was 200 mm, and total wet season rainfall was 1,190 mm. The number of larvae per 100 cm^3 of soil and the number of larvae, females, and eggs per gram of root at each sampling time are shown in Fig. 2.

Dry season (May–September): The number of larvae in the soil was low during the final 3 months of the dry season but increased rapidly during the transition period (late September to early October) (Fig. 2A). During the middle of the dry season (June–July), the numbers of eggs in roots were at their maximum (Fig. 2D); maximum numbers of larvae in root samples (Fig. 2B) occurred soon thereafter, indicating that larvae had completed their development in eggs and that eggs were capable of hatching. The high number of larvae associated with root samples during the dry season

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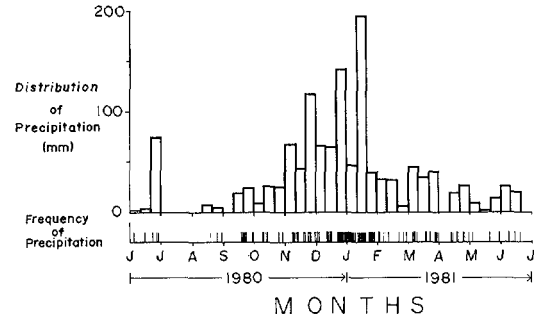

FIG. 1. Frequency and amount of precipitation during June 1980–June 1981 at a coffee plantation in southern Minas Gerais, Brazil.

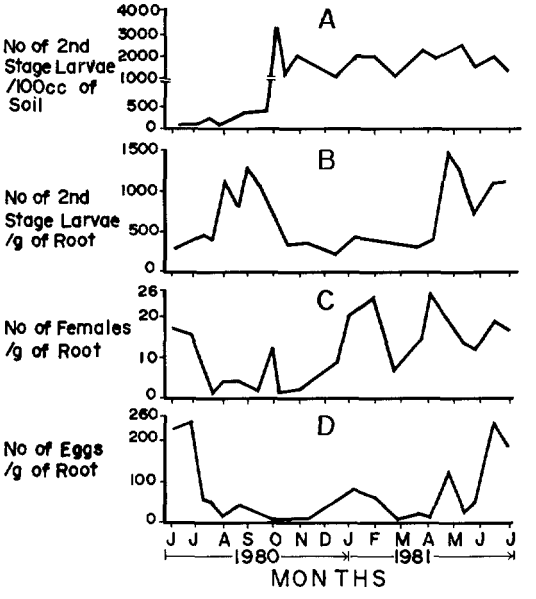

FIG. 2. Population fluctuation of *Meloidogyne exigua* at a coffee plantation in southern Minas Gerais, Brazil. A) Larvae in soil. B) Larvae in roots. C) Females in roots. D) Eggs in roots.

could mean that fully developed eggs hatched immediately upon imbibing water during the extraction process. Alternatively, it could indicate that eggs had hatched in gelatinous egg masses but had not moved into the dry soil. The low numbers of females in roots at the end of the dry season (Fig. 2C) suggest that few larvae infect roots during the dry season.

Wet season (October–April): The number of larvae in the soil increased rapidly at onset of the rainy season and remained relatively high and constant during the wet season (Fig. 2A). At the same time, the numbers of larvae in root samples were relatively low and constant (Fig. 2B) suggesting that hatching and migration into the soil occurs soon after development is complete. At the start of the wet season, there were few females remaining in the roots. However, as the season progressed, their numbers rapidly increased (Fig. 2C). This suggests that most infections occurred shortly after the beginning of the rainy season.

Populations of eggs and females fluctuated from month to month, but the number of second-stage larvae in the soil was high and stable during the rainy season. Thus, surveys for *M. exigua* infestations in this region of the world should be conducted during the wet season.

During the late stages of the dry period (August–September), the nematodes probably survive as second-stage larvae in gelatinous egg mass. There was a negative correlation between the amount of precipitation and the number of second-stage larvae in root samples during June 1980–June 1981 ($r = -0.438$, $P = 0.05$).

Our data suggest that larval populations in soil increase following the initiation of the wet season (mid-September) (Fig. 2A). This time coincides with the initiation of host plant root growth (1,2).

It has been suggested that the best time to apply a carbamate nematicide is under conditions of adequate soil water and temperature (4,5,10). In another report (6), we concluded that *M. exigua* larvae were more sensitive than eggs to nonfumigant nematicides. Since the greatest populations of second-stage larvae occur in the soil during the rainy season, we suggest that, in this region, the best time to apply nonfumigant chemicals is at the beginning of the rainy season (October–November) when newly hatched larvae are abundant in the soil and root tips are initiating growth. The 6-month interval before harvest reduces risk of chemical residues.

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