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Nematology Laboratory, Phytopathology Unit,
Department of Agricultural Biology,
University of Ibadan, Ibadan, Nigeria

DEY SEASON SURVIVAL OF *PRATYLENCHUS* SPP. IN MAIZE FIELDS IN WESTERN NIGERIA

by

OLUFUNKE A. EGUNJOBI and E. I. BOLAJI

In most parts of Africa, populations of plant parasitic nematodes decrease during the dry season but numbers rapidly increase in the presence of suitable host crops during the wet, cooler months (Shoemaker and Ledger, 1968; Egunjobi, 1974; Ballaux *et al.*, 1975). In Nigeria, some *Meloidogyne* species survive the adverse dry season on weed hosts (Odihirin, 1974; Fawole, 1972), and Egunjobi (1974) suggested that populations of *Pratylenchus brachyurus* (Godfrey) similarly aestivate in weed hosts and also in dead roots of harvested maize crops or as eggs in the soil. This paper is an account of investigations in Western Nigeria to establish the importance to the survival of *Pratylenchus* spp. during the dry season of dead, dry maize roots and some weed species in harvested maize plots.

MATERIALS AND METHODS

Dead roots of maize remaining after harvest in July, 1974 were collected in September after the land had been ploughed. The roots were stored in the laboratory at 25°C for 10 weeks before extracting nematodes. The roots were washed thoroughly, cut into small pieces and four 10 g replicated samples were comminuted for 15 sec in a blender and nematodes extracted over a period of 8 days by the method of Whitehead and Hemmings (1965). Nematode suspensions were decanted daily and the collection trays refilled daily with fresh

water. The *Pratylenchus* spp. (Predominantly *P. brachyurus*) were determined daily.

Soil, weed roots and dead maize roots were sampled at 2 week intervals during the dry season, November 1974 to March, 1975, from a sandy loam in which a late season maize crop had been grown between August and November, 1974.

The vertical distribution in the soil of *Pratylenchus* spp. was investigated at the peak of the dry season, January, 1975, to assess vertical migration as a means of surviving this adverse period (Wallace, 1973; Oteifa *et al.*, 1963). Soil samples were collected at random from five locations in the field and at depths of 0-10, 10-20 and 20-30 cm, using a 5 cm diameter soil auger. Nematodes were extracted from 100 g subsamples.

A bioassay test was designed to investigate the significance of dead maize roots as source of inoculum of *Pratylenchus* spp. Ten 2 litre plastic pots with perforated bases were filled with autoclaved sandy loam soil. In each of 5 pots, 100 g chopped dead maize roots were thoroughly mixed with the soil; the remaining 5 pots were left untreated as controls. In each pot, 4 maize seeds (cv. Bulk 3) were sown and 10 days later, the number of seedlings was reduced to 2 of uniform size per pot. The pots were kept out of doors and watered daily. Plant height, leaf area and stem diameter were measured weekly, starting 10 days after seed sowing. *Pratylenchus* spp. were extracted from soil and maize roots sampled after 6 weeks growth when the experiment was terminated.

RESULTS AND DISCUSSION

Maize roots remaining in the soil after harvest appear to provide a reservoir of *Pratylenchus* spp. From 100 g root samples collected from the soil 4 months after the crop had been harvested, 51 adults and 14 juvenile *Pratylenchus* spp. were recovered. In a previous investigation in 1972, a total of 560 *Pratylenchus* nematodes per 100 g dead maize roots were recovered: 120 adults, 280 L_2 and 160 L_3 and L_4. Although samples were not examined for eggs, the emergence of L_2s in large numbers on the eighth day of the extraction procedure suggested fresh egg hatch. Thus *Pratylenchus* spp. are also likely to survive as eggs, as well as motile stages, in dead maize roots during the dry season. Kable and Mai (1968) found *P. penetrans* in senescent grass roots in orchards in north-eastern USA and, in South Africa,

Koen (1967) found that *P. brachyurus* overwintered mainly in organic material.

Sampling at 2 monthly intervals from November until the following March showed that more *Pratylenchus* nematodes were present in 100 g maize roots than in the equivalent weight of soil on each sampling occasion (Fig. 1). In both instances, population densities decreased to their lowest level in January, and soil populations remained at a low level although those from roots increased from about 20 nematodes/100 g root to 580/100 g root in March. Large numbers of *Pratylenchus* were found in weed species in December and in February and March (Fig. 1). More than 50% of the *Pratylenchus* populations were recovered from three weed species, *Axonopus compressus* P. Beauv., *Amaranthus viridis* L. and *Commelina nudiflora* L. out of 24 species examined, of which 12 were infested. Larvae were not detected in the samples until January, after which they became relatively numerous and by March, comprised 58%, 85% and 99% of the total *Pratylenchus* recovered respectively from maize roots, soil and weeds. This increase coincided with an increase in soil moisture due to the onset of the rains (Fig. 1). Meagher (1970) attributed a substantial increase in a population of *P. minyus* which had survived 15 months in air-dried soil to egg hatch after wetting, because rainfall and low temperatures favour egg hatch. Similarly for our results, it could tentatively be concluded that initial rainfall in February, prior to sowing early season maize, resulted in the accumulation of large numbers of *Pratylenchus* in the soil, resulting in invasion of the maize and rapid increase in numbers during the wet, growing season (Egunjobi, 1974).

The vertical distribution of *Pratylenchus* in the soil during the dry season (Fig. 2c and f) was similar to that observed for *P. brachyurus* in South Africa (Koen, 1967). Further studies are desirable before conclusions can be reached about vertical migration as a means of avoiding the adverse effects of the dry season.

Chopped maize roots added to autoclaved soil provided a *Pratylenchus* inoculum for maize seedlings and caused substantial reductions in growth, compared with untreated controls (Fig. 2a, b, c). Maize roots left in the soil after the crop is harvested are likely to be an important source of infestation for the early maize crop.

These series of investigations clearly point to the removal of old maize roots and weeds as an important contribution to any cultural sanitation programme for the maize crop in Western Nigeria.

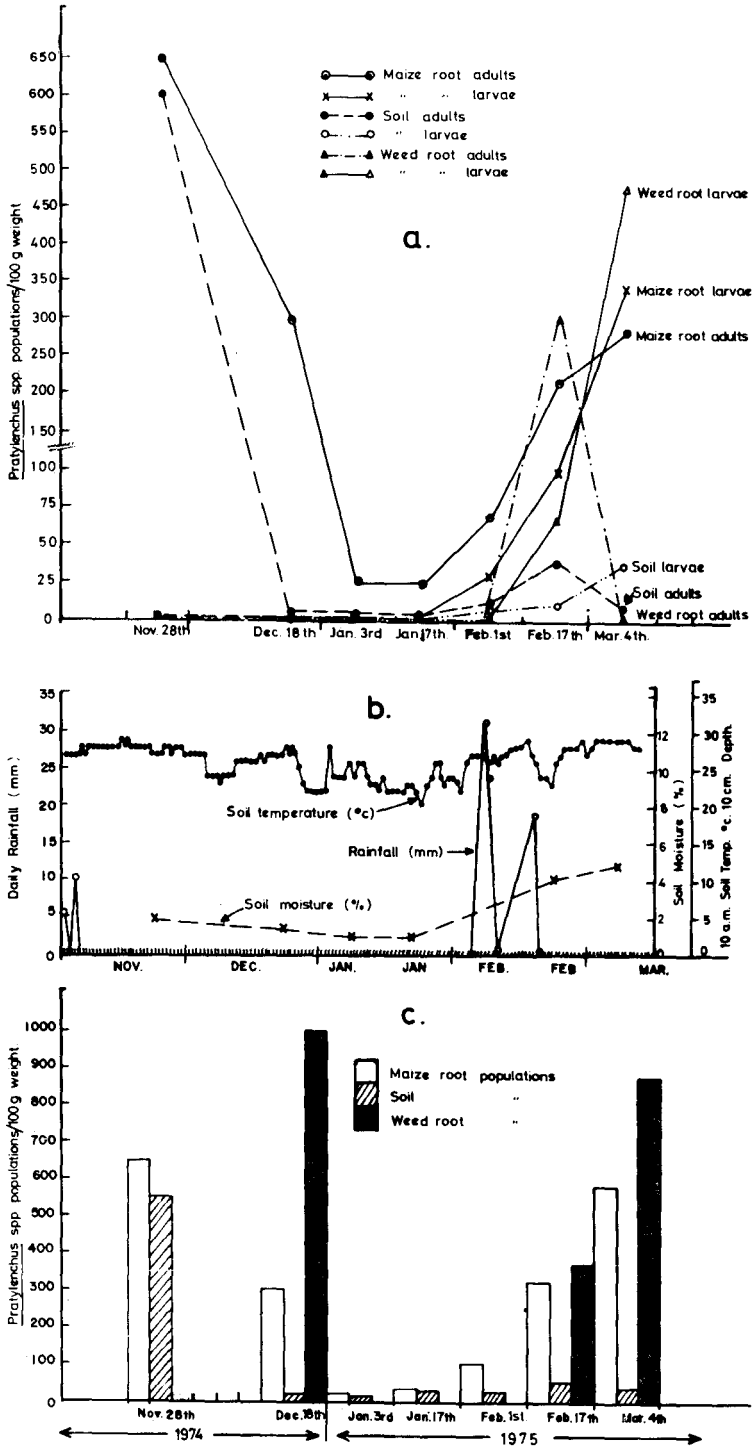

Fig. 1 - Comparative populations of adults and larvae of *Pratylenchus* spp. in soils, dead maize roots and fresh roots of weeds (a) in relation to soil temperature, rainfall and soil moisture (b) and of total *Pratylenchus* spp., in the three habitats (c).

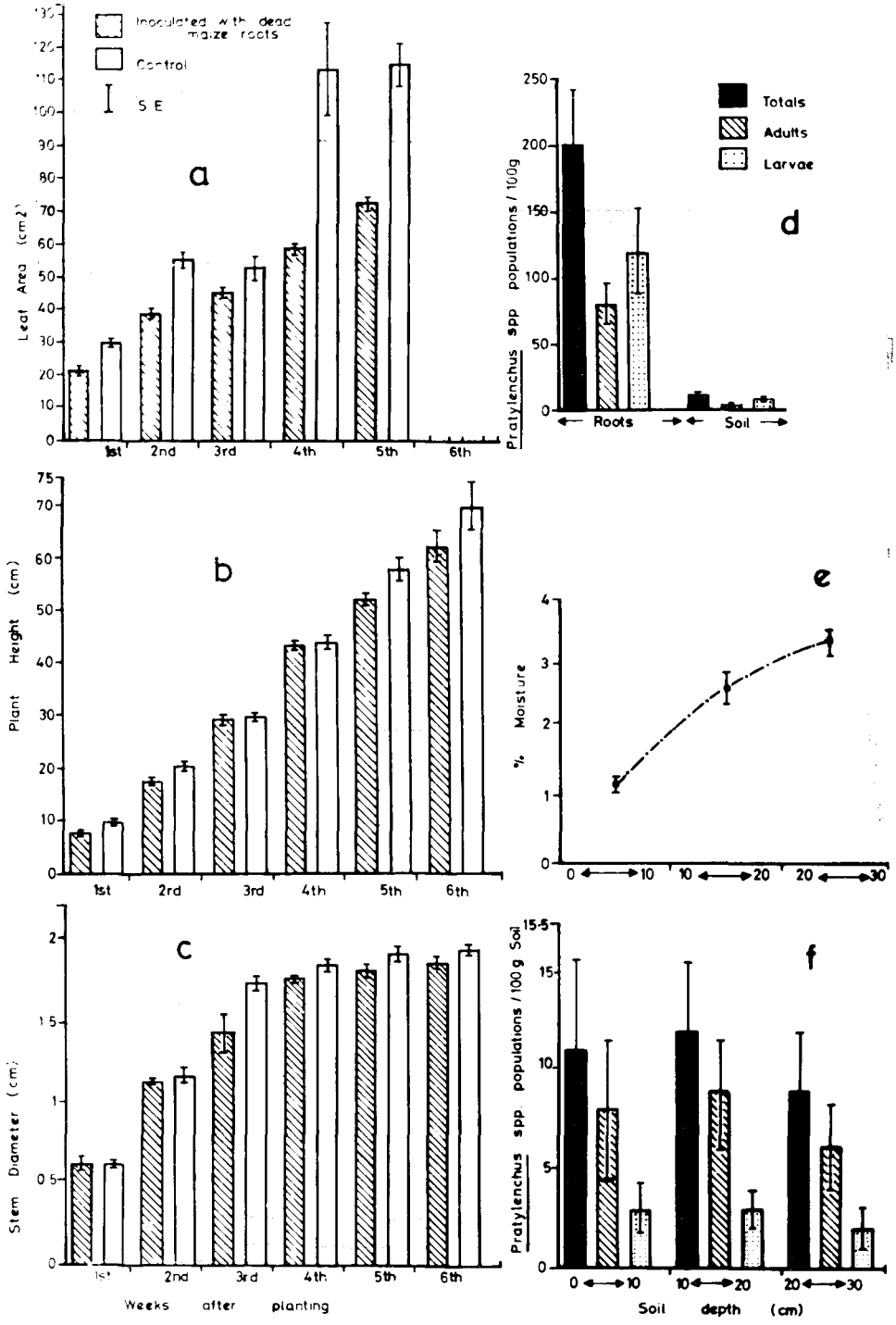

Fig. 2 - Comparative weekly data of maize growth indices (a, b, and c), of *Pratylenchus* spp. populations in roots and soil (d) and vertical distribution of *Pratylenchus* spp. (f) as related to soil moisture in % dry weight (e).

SUMMARY

In an attempt to evaluate their role as dry season habitats of *Pratylenchus* spp., remnants of old maize roots from a ploughed old maize field were examined for nematodes 4 months after harvest. Fortnight samples from another old maize plot under weed fallow, of weed roots, senescent roots of old maize stumps and soil from maize rhizosphere were also examined. Results indicated that maize roots left in soils after harvest as well as weeds such as *Axonopus compressus, Amaranthus viridis* and *Commelina nudiflora* constitute important dry season habitats for *Pratylenchus* spp. All motile stages of the nematode were recovered from all habitats examined. Evidences presented suggest that they also survive as eggs. Results from a bioassay test indicated that senescent maize roots in old maize plots serve as a reservoir of *Pratylenchus* spp. Removal of old maize roots and weeds is therefore considered important in any cultural sanitation programme for maize crop.

RIASSUNTO

Sopravvivenza di Pratylenchus *spp. in stoppie di Mais nella Nigeria occidentale*

È stato accertato che sia le radici di Mais rimaste in campo per 4 mesi dopo il raccolto, che le radici di piante erbacee infestanti, *Axonopus compressus, Amaranthus viridis* e *Commelina nudiflora* costituiscono un'importante riserva d'inoculo per alcune specie di nematodi del genere *Pratylenchus*. Tutti gli stadi attivi di questi nematodi sono stati estratti dalle radici suddette, nei cui tessuti essi sono in grado di sopravvivere allo stadio di uovo. La rimozione delle stoppie delle precedenti colture di Mais, seguita da un accurato diserbo, costituisce un'efficace pratica colturale per ridurre il livello d'inoculo di questi nematodi fitoparassiti nel terreno e per prevenire gravi attacchi alle colture successive.

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