NEMATODES AND MAIZE GROWTH IN NIGERIA

I. POPULATION DYNAMICS OF PRATYLENCHUS BRACHYURUS IN AND ABOUT THE ROOTS OF MAIZE AND ITS EFFECTS ON MAIZE PRODUCTION AT IBADAN

BY

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Populations of Pratylenchus brachyurus increased significantly under maize and were most abundant during the rainy season from June through October. Populations reached their peak in soil around maize in June (299-435/100 g); in roots of maize in July (10,333-11,213/100 g); and in soils around weeds in October (3-4/100 g). Populations were low but detectable in soils at the peak of the dry season (December-January) and multiplied rapidly on maize from March to July. Populations under weeds were significantly lower than those under maize throughout the experiment and those within maize roots were also significantly higher than in soils under maize. Reduction in crop yield after three consecutive cropping seasons coincided with an increase in nematode populations both within and around maize roots.

Pratylenchus brachyurus (Godfrey) is widely distributed in tropical and subtropical parts of the world (Krusberg & Co., 1958; Ayala, 1968; Good et al., 1958; De Guiran, 1965; Luc., 1968), but little information is available about the damage it causes and its population dynamics. Jensen et al. (1959) showed that it damaged sugar cane in Hawaii and Luc (1968) said it was most dangerous to pineapples in Ivory Coast. According to Caveness (1967), Pratylenchus spp. could reduce yield of maize significantly in Nigeria. This has stimulated interest in Pratylenchus spp. in this country. This paper reports the results of a 3-year study of P. brachyurus on maize and is the first in a series investigating the necessity and possibilities of controlling them.

MATERIALS AND METHODS

Soils from seven localities in Ibadan were sampled for Pratylenchus spp. between December 1968 and March 1969. In February 1969, a plot 19 m by 7.3 m naturally infested with P. brachyurus located in the Crop Collection Garden of the Department of Agricultural Biology in an open area was selected for experiments. The soil type is Iwo series loamy sand derived from coarse grained granites and gneiss (Smyth & Montgomery, 1962). Maize and weed plots were arranged in a randomized block design replicated four times.
Two crops of maize were grown annually. The plants were spaced 33 cm within rows. The distance between rows was 1 m. In 1969 an early crop was sown in February and harvested in July; a late crop sown in August was harvested in January 1970. In 1970 early maize was sown in April and harvested in August and late maize sown in September and harvested in February. In 1971, maize was sown only in February and harvested in August. The maize plots were treated yearly with farm yard manure.

The dominant weed species in the weed plots were *Tridax procumbens* L.; *Spigelia anthelmia* L.; *Indigofera hirsuta* L.; *Pueraria phaseoloides* (Roxb.) Benth; *Talinum triangulare* (Tacq.) Willd.; *Hibiscus esculentus* L.; and *Ageratum conyzoides* L.

Soil and maize roots were collected monthly to a depth of 12 cm using a hand trowel. Four maize plants selected at random were uprooted in each plot. Roots of each plant and 500 g soil were collected from the rhizospheres. The roots were thoroughly washed, cut into small pieces and a sub-sample of 50 g fresh weight per plant were extracted for 4 days, using the Baermann funnel technique. Soils were processed by the combined Cobb's sieving technique and Baermann funnel methods. Nematodes were killed with gentle heat and preserved in T.A.F. (Goodey, 1963) for counting.

**RESULTS**

Within maize roots, population peaks occurred in July and November both in 1969 and in 1970, corresponding to the two cropping seasons (Fig. 1C). The soil populations under maize followed roughly the same pattern with peaks in June and November. Nematode populations in soil around weeds had a single peak per year in October (Fig. 1A).

There were differences between nematode populations within maize roots, in soil under maize and in soil under weeds. Populations in maize soil were significantly higher than populations in soils under weeds (F. value = 77+ - 6097+; F - tabulated = 23.46).

Annual populations within maize roots were lowest during the first year of cropping and highest in the second year. In soils around maize, annual populations increased only slightly in the third year, but those under weeds were remarkably stable.

**TABLE I**

*Maize yield record for 1969 and 1970 early seasons*

<table>
<thead>
<tr>
<th>Season</th>
<th>Date Planted</th>
<th>Date Harvested</th>
<th>Mean weight of dry grain per plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early, 1969</td>
<td>8/2/69</td>
<td>30/7/69</td>
<td>49 g*</td>
</tr>
<tr>
<td>Early, 1970</td>
<td>16/4/70</td>
<td>24/8/70</td>
<td>35 g*</td>
</tr>
<tr>
<td>Difference in yield</td>
<td></td>
<td></td>
<td>14 g per plant</td>
</tr>
<tr>
<td>% reduction in yield</td>
<td></td>
<td></td>
<td>28.5 %</td>
</tr>
</tbody>
</table>

* Mean of 36 plants.