THE OCCURRENCE OF BIOTYPES OF THE CEREAL CYST NEMATODE (*HETERODERA AVENAE*) IN THE LIGHT SOILS OF RAJASTHAN AND HARYANA, INDIA

BY

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The existence of variability in the cereal cyst nematode, *Heterodera avenae* Woll. in India is confirmed. Tentatively five biotypes have been identified using an assortment of cereals and grasses; the distribution of the biotypes in the light soils of Rajasthan and Haryana is plotted. These biotypes do not appear to be identical to those in Denmark, The Netherlands, Britain, Germany and Australia. They have been designated as 1, 2, 3, 4 and 5 of which biotype 3 is the most common in India. The possibilities of the existence of more biotypes is also indicated.

Prasad *et al.* (1959) first reported cereal cyst nematode as a pest of wheat and barley crops from certain places in Rajasthan. Further observations revealed the nematode to be well established in Sikar, Jaipur, Alwar and Jhunjhunu districts of Rajasthan and Mohindergarh district of Haryana. The pest attacks barley, wheat, oats, maize and some grasses, but it is the barley crop that suffers most injury.

Variation in the pathogenicity of the cereal cyst nematode has been clearly demonstrated by European workers (Andersen, 1959; Cotten, 1967; Kort *et al.*, 1964; Fiddian & Kimber, 1964; Neabert, 1967 and Lucke, 1969). The varieties Prior, A.Q. 1127, A.Q. 253 and Research, shown to be resistant by Bhatnagar *et al.* (1965) in their field tests against *Heterodera avenae*, under Indian conditions, were found to be susceptible in many infested fields in Rajasthan (Mathur, 1968). This suggested the existence of biotypes. The studies described hereunder were conducted to ascertain the number of biotypes present and their distribution in India.

MATERIALS AND METHODS

Green house tests

During 1967-72, soil samples were collected from 76 infested sites in Rajasthan annually in October and stored out of doors in large cement pots. In 1971-72, five populations from Haryana were also included in the tests. After a month each soil
lot was thoroughly mixed and numbers of larvae per ml of soil sample were determined according to standard methods (Goodey, 1970). Porous non-glazed clay pots 30 cm long and 8 cm internal diameter, very similar to the drainpipes used by Andersen (1961) for testing the populations in Denmark, were filled with infested soil (>7.3 eggs/ml soil) and seeds of various cereal varieties used in biotype differentiation by European workers were sown in them. The names of selected indicator varieties of cereals and grasses along with their source are given in Table I. These tests were replicated three times. Three seedlings were raised in each pot. The pots were watered when necessary and during the growth period the plants were dressed with a granular mixed fertilizer. All replications were examined for the development of cysts on roots about 14 weeks after planting. The above ground parts of the plants were out off and the clay pots were water-soaked in a tray. The roots were then carefully washed to remove adhering soil and the number of immature white cysts on the roots was counted using overhead lighting.

**Table I**

*Sources of selected host varieties used in H. avenae biotype tests*

<table>
<thead>
<tr>
<th>Differential variety</th>
<th>Seed source</th>
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<tbody>
<tr>
<td>Oat Sun II, barley Herta, barley Pajbjerg Drost, Barley No. 191, Morocco C.I. 3902 and Marocaine 079 C.I. 8334, Spring rye Petkus, Lolium perenne, Dactylis glomerata, Avena sterilis (1967-68)</td>
<td>Mr. A. van Essen, Wageningen, The Netherlands</td>
</tr>
<tr>
<td>Barley Elbo, Amsel, S-28-3, Oats-Sun II, Silva and U.S. 4575</td>
<td>Dr. E. Lucke, Hannover, West Germany</td>
</tr>
<tr>
<td><em>Lolium perenne</em>, <em>Dactylis glomerata</em>, <em>Avena sterilis</em> (1968-69)</td>
<td>Dr. S. Andersen, Copenhagen, Denmark</td>
</tr>
<tr>
<td>R.S. 17 barley, R.S. 31-1 wheat and R.D.B. 1 barley</td>
<td>Government Agricultural Research Station, Durgapura, Jaipur, India.</td>
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</tbody>
</table>

In 1967-69, the test plants were Sun II oats, Barley 191, Pajbjerg Drost barley, RS 17 barley, RS 31-1 wheat, Herta barley, *Avena sterilis*, *Lolium perenne*, *Dactylis glomerata* and Petkus spring rye. During 1969-72, *Avena sterilis* and Petkus spring rye were left out. In 1971-72, six indicator plants (Oats U.S. 4575 and Silva and barley Amsel, S-28-3, Volba and Elbo) from W. Germany and barley RDB 1 were added.

**Field tests**

During 1970-71, six rows of barley varieties, Morocco C.I. 3902 and Marocaine 079 C.I. 8334, which showed resistance against all the tested populations in 1967-70