Invasion of wheat roots by Pratylenchus thornei Sher & Allen under field conditions, as well as in the absence of other microorganisms, caused lysis of cells, cavities, and eventually, destruction of the cortex.

The number of \( P. \) thornei in roots increased exponentially with time. There was a significant linear regression between the logarithm of the number of nematodes in the inoculum and the logarithm of the number that invaded wheat roots \((P<0.005)\). In a clay loam, the number of \( P. \) thornei decreased rapidly during storage in the absence of a host for 5 weeks and then more slowly for 50 weeks. This decline was more rapid at 30°C than at 10 or 20°C while at 40°C there were no survivors after 2 weeks. Air drying the soil from 19.5 to 5.0% w/w moisture killed 78.7% of the \( P. \) thornei present.

Wheat is susceptible to several root, crown, and foot diseases (Butler, 1961), the most important of which are caused by fungi. Wheat is also a recorded host of about twenty-six nematodes belonging to eleven different genera (Goodey, Franklin & Hooper, 1965). Of greatest economic importance are probably Anguina tritici (cf. Winslow, 1960) and in Australia, Heterodera avenae (cf. Millikan, 1938). However, Pratylenchus pratensis (cf. Steiner, 1927; Goffart, 1942; Oostenbrink, s'Jacob & Kuiper, 1956; Decker, 1961), \( P. \) thornei (cf. Sher & Allen, 1953; Thorne, 1961) and some other migratory nematodes, especially Tylenchorhynchus spp. (Langdon, Struble & Young, 1961), have often been reported in, or around, the roots of wheat.

Rhizoctonia solani and the root lesion nematode \( P. \) neglectus (syn. \( P. \) minus Sher & Allen) were closely and consistently associated in natural infection of wheat in Canada (Benedict & Mountain, 1956). The resulting disease resembled purple or bare patch, a disease of wheat described from New South Wales by Hynes (1937) and attributed to \( R. \) solani.

\( P. \) neglectus, \( P. \) zeae and/or \( P. \) thornei have been found associated with wheat plants in several states of Australia (Millikan, 1940; Colbran & McCulloch, 1965; Goss in litt.; Fisher, in litt.). This paper reports the results of studies on the infection of wheat roots by \( P. \) thornei and the consequent histological changes, on the reproduction by the nematode within wheat roots, and on the survival of \( P. \) thornei in the absence of a host.
EXPERIMENTAL

Histological changes in infested roots

Wheat seedlings (var. Gabo, TR118, Spica) were grown in soil containing about 1,000 *P. thornei* per 250 ml soil and when 6 to 8 weeks old, seminal and adventitious roots were collected. So that the nematodes in these roots could be detected, whole roots were immersed in Fleming's Fixative for 30 min at 50°C (Godfrey, 1929), transferred to chrom-acetic fixative overnight, dehydrated in a series of alcohols, and cleared in cedar wood oil. Pieces of root which contained nematodes were either mounted in Canada balsam or embedded in wax. From these latter pieces, transverse sections 12 μ thick were cut, and stained with safranin and light green (Johansen, 1940).

A second series of sections was prepared from roots infested with *P. thornei* in the absence of other microorganisms. To do this, wheat seeds were immersed in 50% ethanol for 3 min under reduced pressure, transferred to 0.1% silver nitrate for 3 min, rinsed three times in sterile water, and sown in sterile sand wetted with nutrient solution (White, 1943) and contained in a Büchner funnel fitted with a sintered glass bottom.

To obtain surface-sterilised nematodes, infested wheat roots were cut into 1 cm lengths, wrapped in tissue and cheesecloth, and placed in a solution containing 0.02% ethoxyethyl mercury chloride, 0.1% dihydrostreptomycin sulphate and 0.1% novobiocin (Townshend, 1963a). Filtered air was then bubbled through the solution and, after 2 days, active nematodes had passed from the root pieces through the cheesecloth and into the antibiotic solution. The number of nematodes in this solution was estimated. By passing a measured quantity of the suspension through a sterile 'Millipore' filter disc of pore size 8 μ, a known number of nematodes could be collected on the filter disc. Seedlings were inoculated by placing a filter disc, on which an appropriate number of nematodes had collected, in the sand. When it was no longer possible to contain the seedlings growing in the Büchner funnel under the glass cover, the cover was removed and the funnel filled with sand made water repellent by treatment with Gensil 70 * to prevent aerial contamination (Fig. 1).

Roots were collected 4 weeks after inoculation, stained in Fleming's fixative, and sections prepared for examination as previously described.

When examined after 6 weeks, some roots grown under field conditions contained few *P. thornei*. Others contained many nematodes which were usually in the cortex and lying parallel to the long axis of the root. At first, parenchyma cells of the cortex around a nematode were intact and the contents of these cells stained with safranin. Later, as the cytoplasm was withdrawn, the cell walls disintegrated and cavities were formed in the cortex. When the cortex was destroyed, the epidermis sloughed off and the exposed but uninvaded stele often became

* From General Silicones Pty. Ltd.