

## **RENIFORM NEMATODE (*ROTYLENCHULUS RENIFORMIS*): A BIOSECURITY THREAT TO COTTON, VEGETABLE AND HORTICULTURAL INDUSTRIES IN TROPICAL AND SUBTROPICAL REGIONS OF AUSTRALIA**

Reniform nematode (*Rotylenchulus reniformis*) is a destructive pest of many crops and is widely distributed in tropical and subtropical regions of the world. Although it has a limited distribution in Australia, biosecurity authorities have done little to limit its spread, and so it is currently threatening the cotton industry and several important horticultural and vegetable crops. Thus, reniform nematode deserves much more attention than it is currently receiving.

### **Worldwide distribution and host range**

Reniform nematode is found in all tropical, subtropical, and warm temperate zones of the world: South America, North America, the Caribbean, Africa, southern Europe, the Middle East, Asia, the Pacific, and Australia. More than 300 plant species are known to host the nematode, with cotton, cowpea, soybean, pineapple, papaya, tea, and vegetables such tomato, sweetpotato, okra, squash, and lettuce being some of the most common hosts.

### **Life history**

The life cycle commences when a second-stage juvenile (J2) emerges from an egg that has been laid on the root surface. The J2 develops into an immature female which then penetrates the root and establishes a feeding site within the root. Most of the female's body remains outside the root, with the posterior part swelling and becoming kidney shaped. Thus, the common name 'reniform' is used because it means 'shaped like a kidney'. The male, which remains outside the root, inseminates the female and she then produces 40-100 eggs which are deposited into a gelatinous matrix on the root surface. The life cycle is very short, sometimes being completed in less than three weeks.



Developing females of reniform nematode (stained purple) feeding on a root (top) and mature females with egg masses (bottom). Photograph from Tamil Nadu Agricultural University.

### **Economic importance**

Reniform nematode is an economically important pest of many crops, but the following is a brief overview of the damage it causes to several widely grown crops.

Reniform nematode is widespread on **cotton** in southern USA and Brazil and has replaced root-knot nematode as the major nematode pest in Alabama, Louisiana, and Mississippi. The nematode has a devastating effect on cotton, often reducing yields by as much as 50%. It also increases the severity of seedling diseases caused by *Rhizoctonia solani*, *Berkeleyomyces basicola* and several *Fusarium* species.

Reniform nematode is the major nematode pest of **pineapple** in Hawaii and the Philippines, and also causes problems in the Caribbean, Mexico, and Thailand. When roots are heavily infested, secondary root formation is inhibited and root systems may be so poorly developed that the plants collapse and die.

Although root-knot nematode is the most damaging nematode pest of **vegetables** in the tropics and subtropics, reniform nematode also limits production in many countries. However, its importance is often overlooked because the two nematodes often occur together and it is easier to diagnose root symptoms caused by root-knot nematode. When non-volatile nematicides were applied at a site in the USA that was only infested with reniform nematode, yields of okra, tomato, lettuce, and squash increased by 19%, 15%, 57% and 69%, respectively (Heald 1978).

### **Distribution of reniform nematodes in Australia**

Two species of reniform nematode occur in Australia (*Rotylenchulus reniformis* and *R. parvus*) but *R. parvus* has never been shown to cause damage to any crop. *R. reniformis* is a much more destructive pest and it is currently found in Queensland, the Northern Territory, and northern parts of WA.

In the 1980s, *R. reniformis* was largely restricted to north Queensland and was causing yield losses on pineapples in areas north of Townsville. Although no formal surveys have been undertaken, results from diagnostic samples indicate that it has gradually moved south in the last 30 years. The nematode was initially found in soil samples from vegetables in Bowen, and then in samples from sweetpotato and cotton in central Queensland. In recent years, it has also been detected on a few vegetable farms in Bundaberg.

The vegetable industry and the Queensland government biosecurity agency have not attempted to assess the distribution of *R. reniformis* or limit its spread. In contrast, scientists in the Queensland Department of Agriculture and Fisheries have undertaken surveys for the cotton industry and have shown that reniform nematode is confined to the Theodore and Emerald regions in central Queensland. The nematode has not been detected in cotton fields sampled at other locations (e.g. Moura, Darling Downs, St George, Dirranbandi, Thallon, Macintyre Valley, and Moree).

*R. reniformis* is widespread in cotton crops in the Dawson Valley and yield losses up to 40% have been reported. Although research on control measures is being undertaken, the 'Come Clean Go Clean' principles of good farm hygiene are being implemented by the cotton industry in an attempt to limit the spread of the nematode.

### **The future**

Although root-knot nematode is the most important nematode pest of most crops in tropical and subtropical regions of Australia, *R. reniformis* is waiting in the wings. The infested area is gradually expanding and the nematode is already causing problems on some cotton and sweetpotato farms. In the next few years, yield losses are likely to be seen in major vegetable production areas such as Bundaberg, and because the nematode is being moved south and the climate is warming, farms in northern NSW are also threatened. Thus, growers in any of these regions who wish to protect their business from a pest that has proven very difficult to manage need to establish on-farm biosecurity measures to prevent the introduction of reniform nematode.

### **Literature cited and further reading**

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