SEASONAL ACTIVITY, HOST RANGE AND DISTRIBUTION OF *SCLEROTIUM ROLFSII* IN NEW ZEALAND

P.G. BROADHURST

*Crop & Food Research, Mount Albert Research Centre,
Private Bag 92169, Auckland*

Keywords: *Sclerotium rolfii*, seasonal activity, host range, distribution, field crops

The fungus *Sclerotium rolfii* Sacc. (teleomorph *Athelia rolfii* (Curzi) Tu & Kim.; syn. *Corticium rolfii* Curzi), is very common in the Auckland district, attacking a wide range of plants, especially summer crops and bulbs. In warm wet seasons it has been responsible for considerable crop losses (Dingley 1969). Although *S. rolfii* is commonly found associated with onion bulbs in the Pukekohe district during the harvest and curing periods, field losses caused by the fungus are minimal. Recent infections on onion bulbs usually go undetected at the time of grading and bagging, but may become active during storage and transport. *S. rolfii* is considered a notifiable disease organism in the United Kingdom and strict quarantine measures are enforced if it is intercepted on imported produce (Snowdon 1991). Shipments of New Zealand onions with evidence of *S. rolfii* on arrival to the United Kingdom have been rejected on quarantine grounds, causing substantial losses to exporters.

S. rolfii is a warm climate fungus that proliferates after wet weather or irrigation. During warm periods, wet soil, shading and crowding, leading to increased moisture levels at the soil surface, are likely to increase the disease. The time at which the fungus becomes active in the soil is likely to vary between years and between locations depending on seasonal weather conditions. The fungus has been recorded on 35 host plants in New Zealand (Pennycook 1989). It is widely distributed in the North Island, especially in areas in northern regions where continuous cropping is practised (Dingley 1969). It has also been found in the Nelson district of the South Island, but has not been found in Canterbury or in regions further south (M. Braithwaite, MAF, Lincoln, pers. comm.). To provide additional information on the seasonal activity, host range and distribution of *S. rolfii* in New Zealand, a series of field trials and disease surveys were conducted. Methods that provide control of *S. rolfii* have also been discussed.

To determine the seasonal activity of *S. rolfii* in the South Auckland district during September 1992 - October 1993, onion and nerine plants at two locations were checked at regular (1-2 weekly) intervals for the presence of active *S. rolfii* mycelium. One of the locations chosen was an area of land in Pukekohe that had been artificially infested with *S. rolfii* several years previously and subsequently cropped each year with onions; the other location was an area of land in Mangere that had been continuously cropped with nerines for several years and also had a history of severe *S. rolfii* disease. A baiting method similar to that described by Avizohar-Hershenzon and Shacked (1968) was also used to monitor the saprophytic activity of *S. rolfii* in the soil at both of the locations. Carrot pieces were placed in meshed bags and buried just below the soil surface; several bags were buried at each location at regular (1-2 weekly) intervals over the entire 1-year period. After 1-2 weeks of burial in soil, carrot baits were recovered from the bags, washed under tap water to remove any adhering soil, placed on wet brown wrapping-paper and incubated at 25-30°C in high RH. Typical mycelial growth of *S. rolfii* that extended from the baits and onto the brown paper was transferred onto agar plates to confirm the identity of the fungus.

S. rolfii disease surveys were conducted in three major vegetable and field cropping areas; South Auckland, Hawkes Bay, and Canterbury. Plants were examined at about soil level for typical symptoms of *S. rolfii* infection and samples collected.

Proc. 48th N.Z. Plant Protection Conf. 1995: 351-353

Diseased samples were collected and/or received from several properties in South Auckland during the summer months of 1991-93. Surveys were carried out on 10 properties throughout the Hawkes Bay region; twenty-one different types of crops (including bean, beet, carrot, onion, and potato) were examined over a 2 day period during early-February 1993. Surveys were also carried out on 10 properties located throughout the Canterbury region; fourteen different types of crops (including bean, carrot, onion, and potato) were examined over a 2 day period during mid-January 1993. *S. rolfsii* was recovered from samples using the method described above. Representative cultures of *S. rolfsii*, isolated from plants during the surveys, have been deposited in ICMP (International Collection of Microorganisms from Plants, Landcare Research, Auckland) and/or in Herbarium PDD (Landcare Research, Auckland).

Active mycelium of *S. rolfsii* was only found on onion and nerine bulbs at the two locations from November-March. Although the saprophytic activity of the fungus was detected at the Mangere location over a wider period (September-May), *S. rolfsii*-colonised carrot pieces were most frequently recovered during the warmest months (ie. November-March).

S. rolfsii was isolated from several field crops in the South Auckland district, including carrot, potato, onion, and tomato. The fungus was also isolated from cabbage root debris recovered from the surface layers of field soil, and from several other plants in the Auckland region that have not previously been recorded as hosts of the fungus in New Zealand. *S. rolfsii* was isolated from basal bulb rot of *Allium ascalonicum* L., shallot (ICMP 11614); basal stem rot of *Amaranthus powelli* S. Wats., redroot (ICMP 11613); fruit rot of *Cucurbita maxima* Duch., Buttercup squash (PDD 60477 & ICMP 11615); basal stem rot of *Linaria genistifolia* (L.) Mill. Subsp. *dalmatica* (L.) Maire & Petitm. (PDD 60020); basal bulb rot of *Nerine bowdenii* W. Wats. (PDD 60730 & ICMP 11681); basal stem rot of *Plantago lanceolata* L., narrow-leaved plantain (ICMP 11676); foliar blight of *Trifolium* sp., clover (PDD 60021); and basal stem rot of *Zantedeschia elliottiana* x *pentlandii* (ICMP 11692). During surveys in the Hawkes Bay and Canterbury regions, *S. rolfsii* was recovered from field curing onions collected in Hastings, but was not recovered from any samples collected in the Canterbury region (including a sample of field curing onions collected later in April 1993). In early-March 1995, *S. rolfsii* was also found associated with a basal stem rot of field tomatoes in Hastings.

As *S. rolfsii* has a wide host range and can persist on virtually all types of crop debris, crop rotation is not likely to be a very effective or practical control method. To reduce the incidence of *S. rolfsii* on carrot, Punja (1986) suggested that fields containing an average ID of one or more viable sclerotia/300 cm³ of soil should be avoided. The effects of calcium and nitrogen fertilizers, fungicides, and tillage practices on the incidence of *S. rolfsii* in processing carrots have also been investigated (Punja *et al.* 1986). Several fungicides, including quitozene and benodanil, were shown to provide control of *S. rolfsii* on bulbous iris and lilies (Chastagner *et al.* 1990). A number of management measures have been recommended to minimise *S. rolfsii* in New Zealand onion exports to the UK (Dance 1991). Recommendations include; practising effective weed control, maintaining a suitable soil pH (6-7), deep ploughing (25-30 cm) every second year, applying supplementary dressings of calcium and nitrogen, cutting onions only when soil is dry and minimising curing time, use of fungicide sprays, removal of all plant debris after harvest, and replacing shipping container ventilation with either dehumidification, CO₂ enrichment or refrigeration.

As *S. rolfsii* has not been found in Canterbury or in regions further south, the climatic conditions in these regions are most likely unfavourable for the establishment of the fungus. Field crops grown in the Canterbury region (including export onion consignments) could therefore be considered to be sourced from a *S. rolfsii* disease free area.

REFERENCES

- Avizohar-Hershenzon, Z., and Shacked, P., 1968. A baiting method for estimating the saprophytic activity of *Sclerotium rolfsii* in soil. *Phytopathology* 58: 410-413.

- Chastagner, G.A., Staley, J.M., and Riley, K., 1990. Control of *Sclerotium rolfsii* on bulbous iris and lilies with in-furrow fungicide applications. *Acta Horticulture* 266: 457-467.
- Dance, H. M., 1991. *Corticium rolfsii*: Background information and suggested management practices. MAF Quality Management information sheets. MAF Lynfield Plant Protection Centre, Auckland. 5 p.
- Dingley, J.M., 1969. Records of Plant Diseases in New Zealand. *N.Z. Department of Scientific and Industrial Research, Bulletin* 192. 298 pp.
- Pennycook, S.R., 1989. Plant Diseases in New Zealand. Volume 2. Plant Diseases Division, DSIR, Auckland. 502 pp.
- Punja, Z.K., 1986. Progression of root rot on processing carrots due to *Sclerotium rolfsii* and the relationship of disease incidence to inoculum density. *Can. J. Plant Path.* 8: 297-304.
- Punja, Z.K., Carter, J.D., Campbell, G.M., and Rossell, E.L., 1986. The effects of calcium and nitrogen fertilizers, fungicides, and tillage practices on incidence of *Sclerotium rolfsii* in processing carrots. *Plant Disease* 70: 819-824.
- Snowdon, A.L., 1991. A colour atlas of post-harvest diseases and disorders of fruit and vegetables. Volume 2: Vegetables. Wolfe Scientific Ltd, London. 416 pp.