Influence of stem canker (*Rhizoctonia solani* Kühn) on tuber yield, tuber size, reducing sugars and crisp colour in cv. Record

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**Summary**

In eight experiments in 4 years, inoculating seed tubers with *R. solani* caused stem canker and in seven experiments decreased the total yield and the yield of tubers 40 – 70 mm. Yields of larger tubers were usually increased. In most experiments inoculating increased the reducing sugar content of the tubers and darkened the colour of crisps, but did not consistently affect the amounts of sucrose. Treating soil with aldicarb or oxamyl before planting also slightly increased the total reducing sugars.

**Introduction**

Infection of potato shoots by *Rhizoctonia solani* Kühn soon after planting causes lesions that girdle and prune off shoot tips. Secondary shoots form as branches from below the lesions, and these develop as aerial shoots (Hide et al., 1985a). Later, stolons are attacked and developing tubers are severed. Further tubers are produced on stolon branches and, although in healthy crops most tubers are initiated during 4 weeks in June and July, observations in infected crops indicated that some were initiated in August and September (Hide et al., 1985b). Therefore both phases of stem canker disease can delay tuber initiation and bulking, and also alter tuber numbers and tuber size distributions (Hide et al., 1989).

In eight field experiments in 4 years, stem canker was induced by inoculating seed tubers at planting with cultures of *R. solani* to investigate its effect on the the quality of tubers for crisping. In three experiments, plots were sited on fields infested with the nematode *Globodera rostochiensis* (Woll.). Samples of tubers were analysed for sugar content on several dates during storage and sub-samples were processed and the colour of the crisps assessed.

**Materials and methods**

All seed tubers of cv. Record were SE grade and spaced 23 cm apart within rows. Inoculum of *R. solani* was produced by growing cultures on horticultural vermiculite
moistened with 2% malt extract in autoclavable plastic bags at 15 °C. After 6 weeks the cultures were mixed to break large sclerotial masses and 5 ml was sprinkled over each seed tuber before covering with soil.

Experiments were sited at five sites (Farms A – E) in North Nottinghamshire where rows were 91 cm wide, and at Rothamsted, Hertfordshire and Woburn Experimental Farm, Bedfordshire, using 76 cm rows. One seed stock was selected each year and samples of tubers were planted on the different farms. No fungicide was applied to the seed tubers in any year because less than 6% of the tubers were affected with black scurf and then only with trace amounts (<0.5% surface affected). All plots were treated with herbicide before emergence, with fungicide to protect against late blight and with haulm desiccant according to local practice. Irrigation was applied at Farms A – E.

Tubers were usually harvested by machine and in most experiments they were size graded and weighed and stored at 8.5 °C. On several dates during storage tuber samples (40 – 70 mm) from each treatment were taken to determine fructose, glucose and sucrose contents as % fresh weight by the Boehringer Enzymatic Procedure using a Technicon Autoanalyser. Sub-samples of tubers were processed and the colour of crisps assessed with reference to the IBVL standard colour chart (dark, 1; light, 9). The variability of crisp colour in the sample was also assessed visually (uniform, 1; very variable, 4).

1987. Two rows were planted each with 50 seed tubers on 28 April at Rothamsted and inoculum applied to one row. Tubers were harvested by hand on 24 September and sugar content determined on one sample of tubers on four dates during storage from January to August.

1988. Seed tubers were planted on 3 May at Rothamsted in two adjacent unreplicated plots of 0.015 ha. Inoculum was applied to the seed in one plot and tubers were harvested on 19 October. The total produce from each plot was divided into four equal samples and stored at 4.0, 6.5, 8.5, or 10.0 °C. Tubers were analysed for sugars on three dates during December - April 1989.

Experiments at Farms A and B comprised 4-row plots of 0.036 ha randomised in five blocks; seed tubers were planted on 11 and 24 April respectively and either inoculated with R. solani or not inoculated. The field at Farm B was infested with G. rostochiensis (55 eggs/g soil) and additional randomised plots within each block were treated with aldicarb (Temik at 3.5 kg/ha) and planted with seed tubers that were not inoculated. Tubers were harvested on 5 October (Farm A) and 12 September (Farm B) and during storage samples from each plot were analysed on six dates from December to June 1989.

1989. The experiment at Woburn was on a field infested with G. rostochiensis (43 eggs/g soil). Plots of 0.0024 ha were either treated with oxamyl (Vydate) at 5.5 kg/ha on 3 May or not treated, and seed tubers were not inoculated or inoculated with R. solani during planting on the following day. The experiment comprised four blocks of four randomised plots. Tubers were harvested on 12 October and samples from each