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## ***Spongospora* infection of potato roots: cultivar differences and effects on plant productivity**

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Powdery scab has for a long time been considered as a “cosmetic disease”, reducing the quality of potato tubers. We have investigated the root infection stage of the *Spongospora subterranea* life cycle in glasshouse and field trials. This followed field trial results indicating that pre-planting soil application of pesticides (which reduced powdery scab on harvested tubers) also increased tuber yields through increased tuber size. In glasshouse experiments, in which a potato cultivar highly susceptible to tuber powdery scab was grown in sand/nutrient solution, measured water use by plants over a 6-week period after inoculation with *S. subterranea* sporosori, and the nutrient content of shoots. Water use by inoculated plants was reduced by 140% compared with uninoculated plants, and this was accompanied by a 27% reduction in shoot dry weight and a 6% reduction in root dry weight. Inoculated plants had increased (Na, +64%; Mg, +11%; N, +4%) and decreased (K, -11%; S, -11%; P, -15%; Mn, -25%; Zn, -48%, Cu, -59%) nutrient contents. These results indicate that inoculation by *S. subterranea* adversely affected root function, probably by disrupting root membrane selectivity. A field trial, examining the effects of inoculation at seed tuber planting on subsequent tuber production, measured a 26% reduction in number of tubers and a 22% reduction in weight per tuber from inoculated plants, resulting in an overall reduction of 42% in weight of tubers per plant. A further glasshouse experiment measured effects of *S. subterranea* inoculation on eight potato cultivars ranging in known susceptibility to tuber infection from very susceptible to very resistant. Inoculation reduced water use in all of the cultivars, and the numbers of root galls varied independently of relative susceptibility to tuber infection.

These results indicated that host susceptibility to the root infection stages of the pathogen (development of zoosporangia in root epidermis cells and of root galls) may be under different genetic control from susceptibility to tuber infection. Our research provides strong evidence that *S. subterranea* has the potential to severely harm host growth and productivity. Furthermore, the results strongly suggest that the reaction of cultivars and breeding lines to root infection (as well as tuber powdery scab) should be considered in evaluations of their relative susceptibility to the pathogen.