

## Disease Development Cycle of Canada Thistle Rust

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### Abstract

The obligate rust fungus, *Puccinia punctiformis* (F. Strauss) Rohl., is perhaps the first plant pathogen proposed as a biological control agent for Canada thistle, *Cirsium arvense* (L.) Scop., or any other weed. However the disease cycle of the rust has not been completely understood and this has prevented the rust from being successfully used as a biological control agent. The primary misunderstanding has been over the natural infection court, which has been postulated to be shoot buds on underground roots, an oddity among rust fungi. Rather, our research indicates a different scenario. In the spring, systemically diseased shoots arise from shoots on roots infected with the fungus. The first signs of the fungus on these shoots are orange haploid pycnia (spermagonia) that cross fertilize to form haploid dikaryotic aeciospores. These spores infect leaves of nearby plants and give rise to uredinia that produce haploid dikaryotic urediniospores that, in turn, infect other leaves. In the late summer the uredinia transform into telia which undergo nuclear fusion (karyogamy). Through mitotic division the telia give rise to two-celled diploid teliospores. In the late summer and fall, the plants that emerged in the spring senesce and diseased leaves bearing telia dehisce and deposit teliospores onto newly emerging rosettes. Under conditions of adequate dew, that are common in the fall, the teliospores undergo meiosis and germinate into haploid basidiospores that infect the rosettes. The fungus then develops hyphae that grow into the roots of the rosettes where it survives the winter. Systemically diseased shoots emerge from this rootstock the following spring. Repeated inoculations of rosettes with teliospores in the fall is a practical means of producing systemically diseased plants the following spring, initiating a disease epidemic, and possibly affecting successful biological control.