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Reconsideration of disease cycle of Rapeseed stem rot caused by Sclerotinia sclerotiorum and management with biological agents

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Sclerotinia sclerotiorum attacks and kills rapeseed (Brasscia napus) during ripening. It causes huge losses every year in China, by 8.4 billion RMB (about 1.25 billion US$) evaluated by experts. The stem rot was believed to be initiated by ascospore-infection of petals during blossom stage, and followed by contact infection of leaves and stems. At the late stage of infection, S. sclerotiorum produces sclerotia as dormant structure to overseason in soil. Recent years, we frequently found that rapeseed seedlings were killed by S. sclerotiorum in winter at Provinces Sichuan, Hubei, Hunan and Jiangxi. Sclerotia in the field were found to germinate myceliogenically to produce hypha to infect leaves close to the ground, and then the pathogen reached the stem through the rotted leaves, the rotted leaves also could contact leaves of other plants. S. sclerotiorum also killed weeds and used them as bridges to reach rapeseed seedlings. Importantly, sclerotia formed on dead seedlings also could germinate carpogenically at rapeseed blossom stage. Thus, we conclude that winter infection contributes considerably for stem rot. Currently, farmers are encouraged to use non-tillage or shallow tillage model with high density planting, and rapeseed straw is also required to remain in the field, this cultivating model may lead to accumulation of more and more sclerotia in soil and enhance the severity of stem rot. To cope with these novel characteristics of disease cycle and cultivation model, we used Coniothyrium minitans, a sclerotial parasite to treat soil and used a mycovirus-infected hypovirulent strain DT-8 to coat rapeseed seeds before sowing. C. minitans could rot sclerotia in soil, while strain DT-8 could grow endophytically in rapeseed and enhance plant resistance and release mycovirus in the population of S. sclerotiorum. Both treatment could control stem rot and promote the seed yield efficiently.