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Blackleg control in climate-adaptive Australian farming systems

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Australian canola producers are adopting a variety of management strategies to increase production and reduce risk under increasingly variable seasonal conditions. Management strategies include stubble retention and fallow weed control to preserve summer rainfall, earlier seeding to coincide with shifting rainfall patterns, earlier flowering to avoid temperature extremes and water limitations, as well as the utilisation of grain crops for forage during vegetative growth to mitigate risk. The impact of these changes on disease interactions in canola is unclear. We investigated the effect of three of these strategies (grazing crops, and altered sowing and flowering times) on blackleg (phoma), the most important disease of canola in Australia, to identify control measures that limit blackleg-related yield loss. Grazing vegetative canola crops occurs during autumn and winter, coinciding with the release of ascospores and moist conditions conducive for infection. Blackleg crown canker was greater in grazed compared to un-grazed crops, crops grazed at more advanced developmental stages beyond bud visible, and increased with heavier grazing intensity whereby plants were grazed closer to the ground. The increase in crown canker severity due to grazing was greater in crops infected with blackleg prior to grazing compared to an uninfected crop. Effective control measures included host resistance, protection from infection prior to grazing, and grazing at lower intensity during vegetative growth prior to stem elongation. Over the last decade, sowing times have moved earlier and consequently flowering has moved from spring into mid-late winter. Crown canker severity is reduced with earlier sowing due to avoidance of ascospore release and rapid growth. The severity of blackleg on flowers, pods, branches and upper stems (collectively termed blackleg upper canopy infection) increased with earlier flowering as crops have greater exposure to conditions conducive to ascospore release and infection. Crops flowering at the optimal time to maximise yield incurred grain yield losses of 0-30%. Control measures include host resistance, delayed flowering and fungicide application. In conclusion, farming system practices that improve productivity and profitability in the face of climate change have been identified for Australian canola growers. However, understanding interactions with disease is critical to fine-tune agronomic advice and ensure successful adoption.