Dothistroma needle blight (DNB), caused by *Dothistroma septosporum* and *Dothistroma pini*, is a highly damaging disease of pine. DNB was originally considered a problem on exotic *Pinus radiata* plantations in the Southern Hemisphere and on both exotic and native pines in parts of North America in the 1960s. Since the mid-1990s, however, DNB has increased in importance in various parts of the world, including Europe. On susceptible species, DNB causes premature needle drop, a loss of yield and, in some circumstances, mortality. In some areas, DNB is controlled by the application of copper-based fungicides and silvicultural techniques, such as thinning and pruning. In New Zealand, there has also been a long history of selection of more resistant *P. radiata* for use in breeding programmes. A richer understanding of the resistance mechanisms involved in the *Dothistroma–Pinus* interaction will play a critical role in helping the development of sustainable integrated DNB management strategies. This review therefore summarizes current knowledge of defence mechanisms involved in the defence of Pinaceae against needle and shoot pathogens and identifies research gaps. Collaborative research efforts from countries directly or indirectly affected by DNB are rapidly generating new knowledge to address these gaps.