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# Mistletoe infection in mixed and pure pine stands: a special case of associational resistance

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## Abstract

Increasing evidence is showing that tree diversity contributes to forest ecosystem functioning and the provision of ecosystem services. The fact that a given tree species suffers less damage when growing with heterospecific neighbors than amongst conspecific plants, i.e. associational resistance, seems a common pattern for herbivore insects and root pathogens. However, the effect of tree diversity on abundance of parasitic plants, such as mistletoes, has to our knowledge never been studied. And yet, mistletoes can affect tree growth, possibly leading to decline in conjunction with water stress. In this study, we tested the effect of tree diversity on the presence of European mistletoe (*Viscum album*) on Scots pine (*Pinus sylvestris*) and maritime pine (*Pinus pinaster*) in pure and mixed stands in northern Spain. Since only 1.2 % of maritime pines were infected by mistletoe, we considered it a non-host species. The infestation level of Scots pines was significantly higher in pure Scots pine plots (45.1%) than in mixed plots of Scots pines and maritime pines (25.4 %). Scots pine trees that were taller than the surrounding trees had a higher infestation probability. Since in mixed plots Scots pine trees were slightly lower than maritime pines, tree apparency whereby host trees were partially dominated by non-host trees may partly explain the observed associational resistance. However, plot type remained significant after the effect of tree height was accounted for, indicating that other factors additionally contribute to lower mistletoe infestation on Scots pine in mixed plots. This associational resistance may be related to the behavior of seed dispersing birds (e.g. Mistle thrush) that may prefer to land on taller trees or to spend more time in infested pure stands thereby provoking new infections. The association with maritime pine thus allows diminishing the negative effects of *V.album* on growth and survival of Scots pines.

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