Association levels between *Pityophthorus pubescens* and *Fusarium circinatum* in pitch canker disease affected plantations in northern Spain

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With 2 figures and 1 table

**Abstract:** *Fusarium circinatum*, the causal agent of pitch canker disease (PCD), poses a threat to *Pinus radiata* plantations due to the presence of bleeding cankers on the trunk that can cause the tree to die. This pathogen has been reported to be phoretically associated with bark beetle species, specifically, with *Pityophthorus* species in California. *Pityophthorus pubescens* is a secondary pest, attacking weak trees or broken branches in healthy trees. The aim of this study was to know the association between *P. pubescens* and *F. circinatum* in PCD affected plantations in northern Spain. Specific aims were determined: i) to assess the phoretic association between *P. pubescens* and *F. circinatum*, ii) to study the presence of *F. circinatum* in *P. pubescens* infested twigs and iii) to evaluate whether PCD damages were enhanced in (E)-pityol baited *P. radiata* trees. Funnel traps baited with (E)-pityol were established and twigs from infested trees were sampled to collect insects and plant tissues in PCD affected plots, with the aim of testing the presence of *F. circinatum*. Moreover, an experiment was carried out in nature in which *P. radiata* trees were baited with (E)-pityol and PCD symptoms were evaluated 4 times during one year. A total of 263 specimens were collected from funnel traps between June and September 2010, 2011, 2012 and 2013. Moreover, 215 specimens were collected from 424 galleries within the twigs in 2012 and 2013. The pathogen appeared on 1.05% and 2% of the insects in the funnel traps during 2010 and 2012 respectively. Regarding the collected twigs, *F. circinatum* was found in 3 galleries, whilst results of the baiting experimentation showed symptoms in the crown were more influenced by (E)-pityol than those on the trunk. This work affirms a weak association between *P. pubescens* and *F. circinatum* in our study area.

**Keywords:** *Pinus radiata* – pitch canker disease – twig beetle – phoresy

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