ROOT DECLINE ASSOCIATED WITH SUBSOILING IN THREE LOBLOLLY PINE SEED ORCHARDS

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Abstract.--Root systems of 20, 20 and 30 loblolly pines at the Chesapeake Corp., Virginia Division of Forestry (VDF) and Union Camp Corp. seed orchards, respectively, were excavated and analyzed for the impact of subsoiling on healthy and declining trees. The incidence and severity of annosum root rot were also investigated. Colonization of subsoiled root tips by soil-borne microorganisms was recognized by a resin soaked band more than approximately 6mm wide, failure of wound callus formation, and the absence of adventitious root proliferation from tissue proximal to the wound surface. Trees with obvious graft incompatibility, basal fusiform rust cankers or mechanical damage to the bole were excluded. At the Union Camp orchard, both the healthy/subsoiled and declining/subsoiled trees had similar percent numbers of subsoiled primary roots, 76 and 79, respectively. However, the declining/subsoiled trees exhibited much greater primary root resin soaking by length (18%) than healthy/subsoiled trees (8%). At the VDF orchard, declining/subsoiled trees had more subsoiled primary roots (13%) than healthy/subsoiled trees (6%). Primary root resin soaked length was also greater among the declining/subsoiled trees (94%) than healthy/subsoiled trees (82%). At the Chesapeake orchard, declining/subsoiled trees had more subsoiled primary roots (33%) than the healthy/subsoiled trees (18%). However, declining/subsoiled trees exhibited much greater primary root resin soaking (41%) than the healthy/subsoiled trees (0%). Soil texture analysis from the upper 15cm of the A horizon revealed a similarly low percent clay content , 3-7%, for the three orchards. However, the average clay content at a depth of 45cm for the Chesapeake orchard (14%) was much greater than for the Union Camp (8%) and VDF (6%) orchards. The reduced amount of root resin soaking among declining/subsoiled trees at the Chesapeake orchard may be related to this heavier soil texture affording a wetter and thus more favorable edaphic environment for the healing of subsoiler wounds. An experiment will be conducted at the Union Camp orchard this summer to investigate the effects of various available soil moisture levels on root wound healing. Although resin soaking was exhibited in approximately 75% of all subsoiled primary roots, attempts to isolate Heterobasidion annosum were negative. Originally implemented for increased superior seed production, subsoiling may increase root dysfunction and stimulate seed tree decline, especially on droughty sites.

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