

2012 Validation of Petroleum Hydrocarbon Stratified Remediation Subsoil Criteria

This study set out to validate the current AESRD subsoil guidelines by providing empirical evidence that regional deep rooted crops such as canola (*Brassica napus*) and alfalfa (*Medicago sativa*) are not affected by critical PHC concentrations in subsoil under drought conditions when plants are forced to extract moisture from depths below 1.5 m. There were no significant differences in aboveground biomass for canola grown in fine textured subsoil contaminated with F2 and F3 hydrocarbons at levels near Alberta Tier 1 guideline concentrations. There was an effect of F2 and F3 hydrocarbons on canola yield in the second simulated growing season for the coarse textured soil, however by the 3rd and 4th simulated growing season, the yields between treatments were no longer significantly different for either soil texture type and the only overall treatment effect for above ground biomass was observed for canola grown in the coarse textured soil contaminated with F3 hydrocarbon. There were no belowground biomass treatment effects for canola grown in coarse textured subsoil contaminated with F2 and F3 hydrocarbons at levels

near Alberta Tier 1 guideline concentrations, however, significant differences ($p < 0.05$) were found belowground canola biomass in fine textured soil contaminated with F3 hydrocarbon.

The influences of F2 and F3 hydrocarbons on alfalfa biomass were not significant. The effect of F3 PHC on alfalfa aboveground biomass was observed in the first simulated growing season in the fine textured soil. There was no yield loss due to contaminated subsoil in the six subsequent harvests. Root biomass was reduced as a result of F3 PHC contaminated subsoil in the fine textured soils, in the lower section only. There was no significant reduction in the coarse root biomass in the lower sections as well as fine and coarse roots in the upper and mid sections for F2 and F3 treatments.

Based on the results of this study, there was no irreparable yield loss due to subsoil contaminated with F2 and F3 hydrocarbons at levels near Alberta Tier 1 guideline concentrations. Some yield losses were observed in the first and second simulated growing season for alfalfa and canola, respectively. However, the plants recovered in the subsequent simulated growing seasons.

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