Crop Response to Excessive Root Zone Contamination with Petroleum Hydrocarbons Under simulated Drought

Bonnie Drozdowski
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In the past, the effects of petroleum hydrocarbons (PHC) on crops were quantified at shallow soil depths, where the root concentration is maximal. These relatively abundant data have been used to justify PHC guidelines for the “surface soil” (to 1.5 m depth). For the underlying “subsoil”, the Alberta Environment (AENV) has arbitrarily set critical PHC concentration assuming that the surface soil criteria can be exceeded in subsoil by a factor of two or more due to the lack of eco-contact at depth. However, some of the regional crops such as canola and alfalfa develop root systems beyond the 1.5 m depth. Under the droughty conditions, much of root water uptake by deep-rooted crops occurs at depth.

A project previously completed by the Alberta Research Council was focused on verifying current PHC guidelines for subsoil. The results did not indicate

an effect on crop performance even though root systems did demonstrate avoidance behavior and or diminished growth into PHC contaminated subsoil. The trial did not include contamination in the surface soil thus leaving some room for speculation on what the result would be if both the surface soil and subsoil were contaminated. In addition, the earlier trials did not answer the industry's concerns over the possibility of current PHC guidelines being too conservative.

The objective of the proposed study is to determine experimentally the lowest PHC concentrations, which affect crop performance for both surface soil and subsoil.

The study can possibly prompt a revision of current Tier 1 regulation for critical PHC concentrations for eco-contact in agricultural areas. The results will demonstrate to the government and public how far the existing PHC guidelines actually are from impacting the crops significantly under the extreme climatic conditions. Also, depending on the study outcome, the stratified remediation guidelines, which are currently only applicable to an area of 75 sq. meters around the well centre, can be expanded to the area of entire lease.

The study will substantiate further the government Tier 1 guidelines for PHC in soils for eco-contact in agricultural areas and strengthen the stratified remediation concept that is used in current

guidelines.