Effect of Seedbed Packing on Canola Seedling Emergence

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Abstract

Many agricultural cultivation equipment produce a stratified seedbed, i.e., made up of layers of soil having different bulk densities, porosities and structure. For example, tillage accomplished using a chisel followed by a roller and a spike tooth harrow will leave the top soil layered. Type of culter, presswheel and orientation of culter and presswheel in a seed drill can affect stratification.

It has been reported that in stratified seedbeds moisture is better conserved while still permitting an appropriate soil structure with good seed-soil contact for the early stages of crop growth. It is believed that a layered seedbed reduces the evaporation rate from the top soil by disrupting the continuity of capillary tubes.

In this study we propose to investigate the effect of a layered seedbed on seed germination and seedling establishment of canola (Brassica campestris) under controlled conditions. Canola was selected because of its increasing importance in Saskatchewan and world agriculture. Additionally, canola has a poor germination success rate. Since the growing point of canola is above ground, its germination can be easily impeded by soil resistance. It is therefore planted at shallow depths (12-25 mm); however, its minute seed size makes it highly susceptible to temperature and moisture variations in the upper soil layer.

Treatments include five stratification levels and four soil moisture contents from **30%** to 90% of field capacity in a clay soil. Layer bulk densities are 0.95, 1.2 and 1.4 Mg/m^3 for loose, bottom and dense horizons, respectively. Ambient temperature is controlled at two discrete levels **(5" C, 15" C)** over each 24 hour period. Soil moisture content and temperature are monitored at four different depths. Tests are of ten days duration at the end of which percent seed germination and seedling emergence are determined.

One of the major challenges associated with this study is the measurement of soil moisture. Three types of sensors were compared: an aluminum fiber-glass sensor (Model MC-300, Soiltest Inc., Lake Bluff, IL), resistance based parallel steel probes and a small (9mm x 15mm x 17mm) plaster of Paris 'gypsum block' made by the authors. For the small scale experiment here the first two types of sensors proved unsatisfactory, largely because of particle contact and size considerations. The gypsum block showed a satisfactory response to soil moisture changes in the soil, even in the very loose layer, and because of its small size comes to equilibrium in a relatively short time. Preliminary experiments showed significantly different drying rates, germination rates and seedling emergence in different treatments.