THE UNIVERSITY OF BRITISH COLUMBIA

Influence of Tile Drainage and Amendment Application Timing in Poorly Drained Soils of Delta, British Columbia

Summary results from Too Much Water or Too Little?

Project context: Organic vegetable farmers in areas of the Lower Fraser Valley (LFV) confront many challenges when it comes to water management and maintaining soil health and crop production despite potential for changes in precipitation, due to climate change. On-farm operations including installation of tile drainage and alternative amendment application timing may be useful to mediate some of the issues associated with these changes. Tile drainage may help to moderate soil moisture and increase shoulder-season workability. Applying amendments in the fall, rather than in the spring, may be helpful in reducing the number of farm spring operations, when soil workability may be limited.

Although these management practices have potential benefits, they also may have drawbacks. Installation of tile drainage may lead to a depletion of soil organic matter (SOM) as soil is lost to tile drains. Fall amendment application may lead to a loss of nitrogen (N) from fields, potentially leading to depleted spring soil N. Thus, integration of water and amendment management is key to finding management plans which preserve both the ability of the farmer to work the field and the ability of the field to produce crop biomass.

Project overview: The objective of this study is to investigate the interactions between amendment application timing and tile drainage spacing to provide growers with potential beneficial management practices to aid in climate change adaptation. To investigate this interaction and gain insight into beneficial management practices for farms across this area, plots were established in the fall of 2019 in Delta, British Columbia (BC).

Methods: The field of interest was planted with field peas during the 2019 growing season and silage corn during the 2020 growing season. A cover crop mixture (tillage radish, sunflower, and vetch) was also planted during the over-winter period.

A 2-factor randomized complete block design (n=3) was established to compare two levels of tile drainage spacing and three levels of amendment application. Tile drainage treatments included a 15- and 30-ft tile spacing, and amendment application treatments included a fall compost application (municipal compost), a spring compost application (chicken manure compost), and control (no compost application). Fall compost application occurred on October 1st, 2019 and spring compost application occurred on April 27, 2020, by manure spreader according to the rates defined in Table 1. The area of each treatment plot is 100m2. Soil sampling was completed on April 7th and April 13th, 2020 and cores were measured for volumetric water content (VWC) and electrical conductivity (EC). A subsample area defined by a 3m2 quadrant within the center of each plot was determined for crop biomass sampling. Biomass sampling was completed just prior to harvesting of silage corn, in October of 2020.

Table 1. Compost amendment and plant-available nitrogen (N) application rates for fall 2019 and spring 2020 in kg or Mg compost per hectare and kg plant-available N per hectare.

Season / Year	Compost Moisture Content	Compost Applied (dry weight Mg/ha)	Plant Available N Applied (kg/ha)	Total N Applied (kg/ha)
Fall 2019	0.41	15.49	61	281
Spring 2020	0.51	10.37	106	270

Both silage corn stalk and ear biomass fresh weight significantly differed between 15- and 30-ft tile drainage spacing. However, no significant differences were observed between amendment treatments, at either level of drainage. Volumetric water content (VWC) and electrical conductivity (EC), on the initial spring sampling date (April 7th, 2020) were significantly different between 15- and 30-ft tile drainage spacing, but not between amendment treatments (Fig. 1A, C). One week later, VWC and EC were both seemingly unaffected by tile drainage spacing or amendment application (Fig. 1B, D).

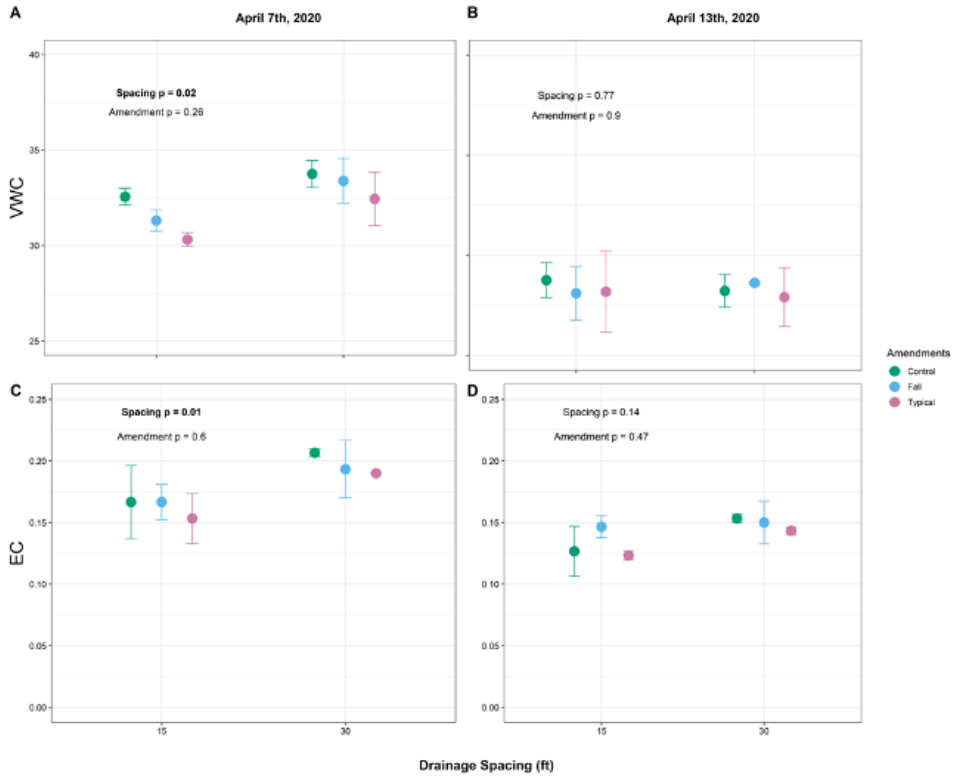

Figure 1. Average volumetric water content (VWC) for each tile drainage spacing treatment on April 7th, 2020 (A) and April 13th, 2020 (F) and average soil electrical conductivity (EC) on April 7th, 2020 (C) and April 13th, 2020 (D). Colored points represent three amendment application treatments (green-control, blue-fall compost application, and pink-typical (spring) compost application. Significant differences ($p > 0.05$) indicated in bold for tile drainage spacing. No significant differences between amendment treatments, at either level of tile drainage spacing. Error bars show ± standard error (SE) of the mean.

For detailed results visit https://sal-lab.landfood.ubc.ca/

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