

## Soil temperature as affected by tile drainage in heavy clay soils of Manitoba

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### Introduction

Drainage either natural or artificial raises soil temperature, thereby warms up and dries the soil quickly. A common axiom among drainage practitioners is that tile drainage increases spring soil temperatures in cold and humid climates. This hypothesis regarding influence of tile drainage on soil temperature is not well documented from heavy clay soils of Manitoba.

### Methods

- The experimental treatments were comprised of non-tiled and tiled plots. Tiled plots had three subsurface drainage spacings: 15-, 30- and 45-feet.
- Each treatment had three replicated plots.
- Soil temperature measurements were done daily during May 17- June 17.
- On tiled plots, soil temperature was measured exactly on the tiles.
- Temperature measurements were done at 1- & 6-inch soil depths during morning & afternoon hours.
- ANOVA was used to test the significance of the soil temperature differences at each measurement depth, among the drainage and non-tiled plots.

### Results

- Drainage plots were relatively warmer than non-tiled plots but this trend was not consistent during the course of the study (Fig 1).
- When the weekly soil temperature data were analysed, there were no differences among drainage treatments and non-tiled plots (data not shown) except during the week of June 13-17, when 30 and 45 feet drainage plots had warmer soils (at 6-inch depth in the afternoon; Fig 2) than non-tiled plots.

- A difference of almost 2°C were recorded between tiled and non-tiled plots at certain dates when measured at 1-inch soil depth. These differences in soil temperature were quite less (about 0.8°C) at soil depth of 6-inch (Fig 1).

### Discussion

Soil temperature strongly influences biological processes, such as seed germination, seedling emergence and growth, root development, and microbial activity in the soil.

Tile drainage is considered an important agriculture practice to remove excess water or soil moisture from saturated agricultural fields. Tile drainage has been reported to raise soil temperature in clay soils of Minnesota (Jin *et al* 2008) and the current study was planned to test this hypothesis in heavy clay soils of Manitoba. This study was done on PESAI site in Arborg MB where soil has clay content of 70-80%.

Although drainage plots were warmer than non-tiled plots in this study but significant differences in soil temperature were recorded only in the last week of study (June 13-17). During the period of study, PESAI site received 187% of the normal rainfall. This exceptionally high rainfall might have some role in lack of temperature differences among drainage treatments and non-tiled control plots. PESAI is planning to extend this study throughout the crop season to examine soil temperature variations on the tiles.

### References

Jin, C. X., Sands, G. R., Kandel, H. J., Wiersma, J. H., & Hansen, B. J. (2008). Influence of subsurface drainage on soil temperature in a cold climate. *Journal of Irrigation and Drainage Engineering*, 134(1), 83-88.

**Drainage plots were relatively warmer than non-tiled plots but this trend was not consistent. Further studies are needed to investigate the influence of tile drainage on soil temperature in heavy clays.**

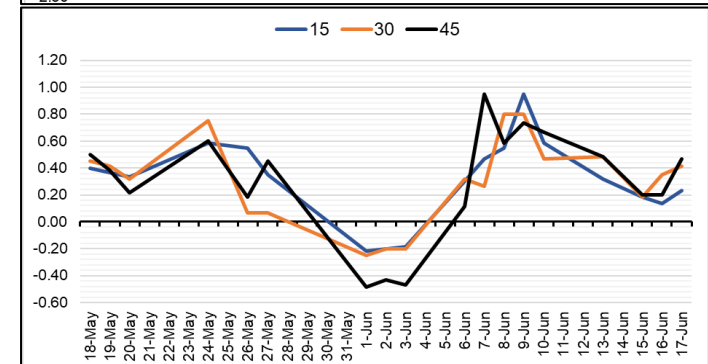
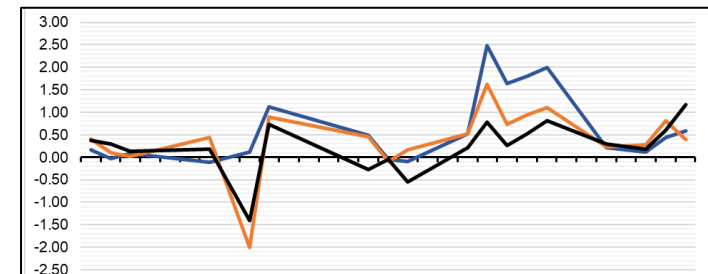
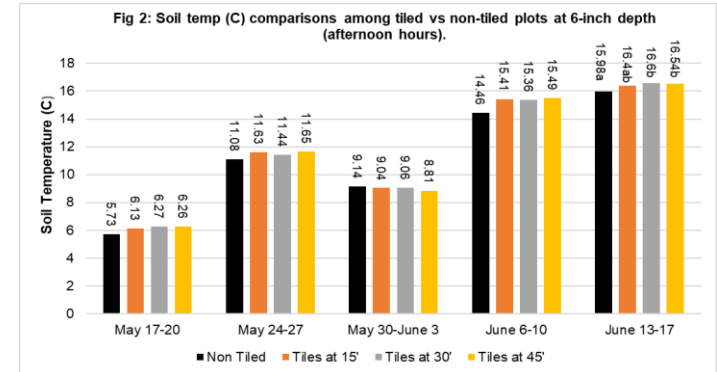


Fig 1. Soil temp (C) differences among drainage (15', 30' & 45' wide tiles) and non-tiled plots at 1 inch (above) & 6 inch (below) soil depths.