

# Effect of Volumetric Water Content and Clover (*Trifolium incarnatum*) on the Survival of *Escherichia coli* O157:H7 in a Soil Matrix

The use of manures and animals waste is increasingly being used as a source of crop nutrient and soil organic material in the production of organic crops. These organic means of fertilization are, however, a source of potential pathogens such as *Escherichia coli* O157:H7 (*E. coli*) in the “farm-to-fork” food production system. The soil provides a matrix for the transfer of these pathogens from the waste to the plants. There is a need to understand the various environmental factors that influences the survival of *E. coli* in organic cropping systems; soil moisture is one such factor. Cover crops or green manures are typically used to maintain productive soil conditions in organic cropping systems. A 7-week greenhouse study was conducted to determine the survival of *E. coli* in highly controlled soil matrices subjected to two environmental stressors: soil volumetric water content (25 or 45 % VWC), and the growth of clover (planted or unplanted).

Molecular-based analyses revealed that *E. coli* survival was significantly lower in soils maintained at either near water-holding capacity (45 % VWC) or under clover growth (Figure 1). The significant reduction under clover growth was only observed when *E. coli* populations were determined relative to all bacteria (Figure 2), indicating the need to further study the competition between *E. coli* and the total bacterial community in organic soils. Given the significant effect of clover on *E. coli* survival under different moisture conditions in this study, there is potential involvement from antimicrobial activity of clover exudates. Future work should concentrate on their specific mechanisms of inhibition that may potentially lead to the development of crop rotations/production systems to improve pre-harvest food safety and security in ready-to-eat and organic production systems.

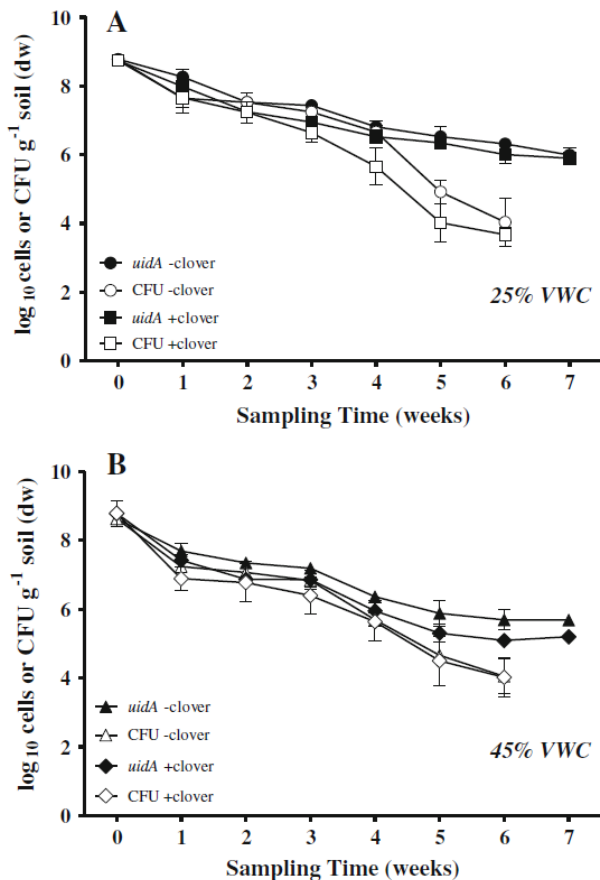


Figure 1. Comparison of log<sub>10</sub>-transformed *E. coli* concentrations as determined by qPCR amplification of *uidA* gene (closed symbols) and direct plate counts (open symbols) in soil matrices maintained at a 25 % VWC or b 45 % VWC.

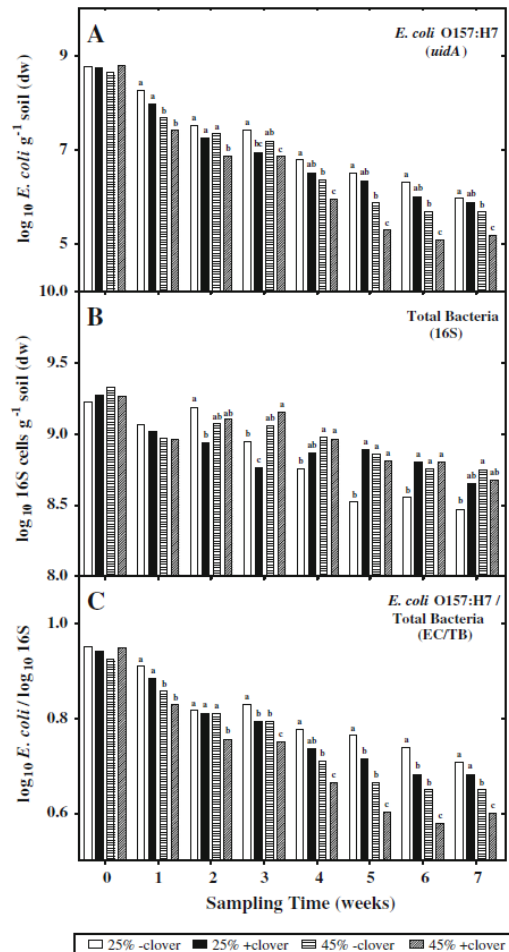


Figure 2. Effect of volumetric water content and clover growth on qPCR concentrations of (a) *E. coli* using the *uidA* gene, (b) total bacteria using the 16S rRNA gene, and (c) the relative change in the *E. coli* population to the total bacteria (EC/TB). Bars represent the mean value samples, and the letters above the bar indicate significantly difference based on least significant difference at a 0.05 probability level (LSD0.05).

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