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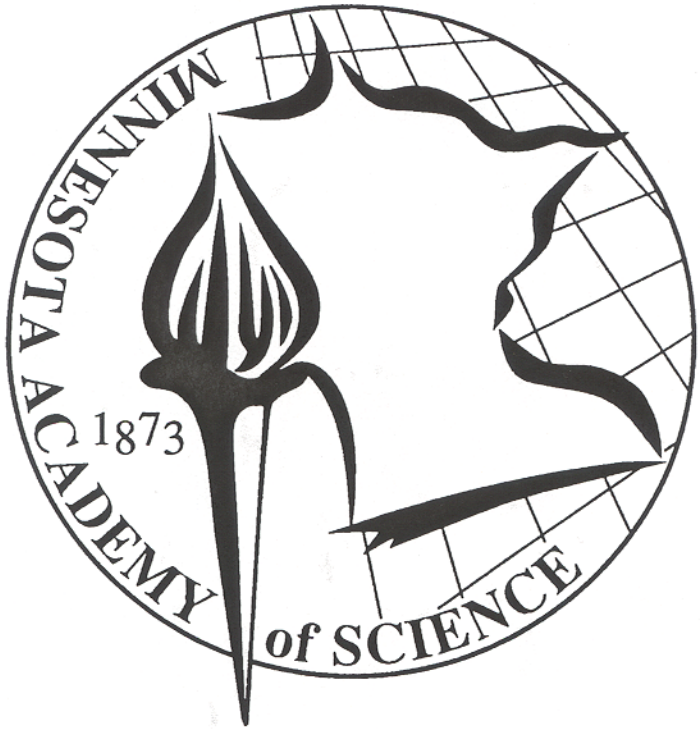

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DECOMPOSITION AND COMPOSITION ANALYSIS OF SIBLING *BT* CORN AND NON *BT* CORN

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Literature suggested that *Bt* corn has higher lignin concentration compared to its sibling non-*Bt* corn. It was hypothesized that an increase in lignin concentration would result in a decrease in rate Bt corn decomposed compared to its non-*Bt* sibling. Reduced decomposition may result in increased residue, which could reduce erosion. However, persistence of *Bt* corn in the soil may also mean an increase in residence time of toxin, increasing potential hazard to non-target organisms and increasing selection potential for toxin-resistant target insects. This study determined the biochemical composition (soluble sugars, starch, hemicellulose, cellulose, lignin, total C and total N) and the rate of decomposition of stover from *Bt* and non-*Bt* corn on stover (2 mm). The ground stover was incubated in a Barnes soil at 25°C and 60% WFPS. Gas chromatograph was used to measure the total respired CO_2 of amended soil periodically over 120 d. A two-component exponential decay model was used to describe the decomposition of the corn residue. The more quickly decomposing material are referred to at the active fraction and the slower component as the passive fraction. The half-life of the active component was 10.6 days for *Bt* corn and 11.4 for the non-*Bt* sibling. The passive component had a half-life of 1066 for Bt corn and 1366 for the non-Bt corn. Suggesting that the Bt corn may decay slightly faster than the non-Bt corn. In the field corn stover will also be subjected to predation by macro and meso-fauna, which could alter rate of decomposition.

DECOMPOSING PLANTS—DOES COMPOSITION AND PLANT PART AFFECT DECOMPOSITION RATE?

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Understanding decomposition of plant residue is vital to understanding C and N cycling, both in terms of plant nutrient needs and global change. Roots typically constitute less than half the total plant biomass but literature suggests they contribute 1.4 to 1.8 times as much C to the soil as above ground plant biomass. This study addresses the related issues of plant composition, residue decomposition, and C and N cycling. The first objective was to compare the biochemical composition of roots, both among species and with leaves and stems. The second objective was to evaluate the decomposition rates of roots, leaves and stems among species and relate those rates to biochemical composition and to C and N mineralization rates. Plant materials from C3 and C4 species were collected at physiological maturity. Structural and nonstructural components from roots, stems and leaves were measured. Decomposition of plant material in soil was monitored as evolved CO_2 at 25°C and 60% water-filled pore space. Chemical composition and decomposition varied among species and plant organs.

CORN STOVER AS A BIOFUEL

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Corn stover is one of several feedstocks being considered as a biofuel. Although corn stalks currently are not harvested routinely, the huge amount of biomass produced annually makes corn a potential commercial biofuel. Removal of crop residue from the field needs to balance against preventing soil erosion, maintaining soil organic matter levels, and preserving or enhancing productivity. After corn stover is fermented to produce ethanol, the remaining residue is about 70% lignin. Lignin decomposes slowly, which can help stabilize soil structure. One use of fermentation by-product would be as a soil amendment, thereby minimizing some of the negative impacts of stover removal on soil structure. Laboratory studies show that by-product of stover fermentation increased microbial biomass and soluble C by 20% compared to soil with out amendment. In the severely eroded soil, humic acid concentration (r^2=0.84, $p<0.0001$) and aggregate stability (r^2= 0.35, $p< 0.001$) increased linearly with increased fermentation by-product concentration. Thus, laboratory results suggest that this fermentation by-product has potential as a soil amendment. Returning by-product to the field may slow the loss of soil organic matter caused by removing corn stover. Careful management of stover removal (avoiding eroded or erosion prone areas) and selective placement of the by-product could contribute to a sustainable use of corn stover for ethanol production.

ANNUAL MEDICS (*MEDICAGO* SPP.) CAN HELP DEVELOP SUSTAINABLE AGRICULTURE IN THE UPPER MIDWEST.

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Recent interest in sustainable cropping systems has renewed interest in legumes as forage, cover, N-fixing, weed smothering, living mulch crops, and to reduce soil erosion. Annual medics, *Medicago* spp. closely related to perennial alfalfa, grow rapidly, produce large amounts of biomass with many pods, supply nitrogen through nitrogen fixing bacteria, are adapted to a wide range of soil types, and have hard seeds that remain viable in the soil. Medics do have