

ABSTRACT OF THE THESIS

The Effect of Para-coumaric Acid and Coumarin
on Seed Germination, Seedling Growth, and Mineral
Nutrition of Several Old Field Herbaceous Species

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Ambrosia artemisiifolia (ragweed) and Setaria faberii (foxtail) have been noted as the dominant species in the first and second years following abandonment of agricultural fields on the New Jersey Piedmont. Aster pilosus (aster) and Solidago rugosa (goldenrod) become important by the third or fourth years and remain for several years until Andropogon scoparius (little bluestem) becomes the dominant herbaceous species. Allelopathic compounds in the surface litter or soil could regulate changes in the vegetative community by selectively influencing the establishment of herbaceous species at the seed germination or seedling growth stage. Para-coumaric acid and coumarin, two compounds commonly found in plant materials, were tested for their effects on the germination, seedling growth, and mineral nutrition of the species named above. The results of the germination experiments indicated that para-coumaric acid and coumarin could contribute to the disappearance of foxtail and increased importance of aster. The response of little bluestem seeds to para-coumaric acid corresponded to its increasing dominance in the field. Para-coumaric acid was

shown to have a selective effect on seedling growth that could result in the disappearance of ragweed and foxtail and subsequent establishment of aster, but the effects for coumarin on seedling growth revealed only a strong inhibitory effect for this compound on all species tested. The greatest effect noted for para-coumaric acid on mineral nutrition was an increase in calcium and a decrease in potassium concentrations in seedling roots. Coumarin was found to decrease shoot potassium and nitrogen levels with variable effects noted for other minerals. These results indicate a different mode of action for para-coumaric acid versus coumarin on mineral nutrition. The influence of para-coumaric acid and coumarin on seedling growth did not correspond to the results obtained in the mineral nutrition study, indicating that the effects of these compounds on mineral nutrition may be of secondary importance as a mechanism of action.