Impact of Compost Materials on Microbial Community Function for the Management of Plant Pathogens and Weed Seeds

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Abstract:
The physical (heat) and biological (decomposition) effects of compost on weed seeds and plant pathogens offer farmers the opportunity to manage pests proactively using locally sourced materials and without pesticides. However the strength of these effects is influenced by characteristics of the organic material available within the compost pile. The form and complexity of carbohydrates often determines the availability of nitrogen outside of the readily available animal forms of nitrogen (i.e., manure). Studies have shown that the source of carbon in compost can directly impact the extent of future colonization by antagonists of plant pathogens. Specifically, a known antagonist of Rhizoctonia: Trichoderma spp., will vary in both population size and suppressive effect as a result of the availability of lignocellulosic material in compost. As a possible antagonist for Alternaria (early blight pathogen), Trichoderma is of interest for compost management in Vermont. Using spectrophotometry, we quantify concentrations of functional extracellular enzymes in compost. These enzymes are appropriate indicators of the extent to which various forms of organic material are being utilized, and suggest the presence of various families of decomposers. Comparing the concentrations within a pile through time and among piles of different recipes, (distinguished by their carbon sources: hay, hardwood, softwood) we observe how the activity of microbial communities changes in response to changes in available resources. Using these results, we identify points in the composting process when weed seeds and pathogens are most vulnerable, and beneficial organisms are most likely to colonize. Additionally, we offer suggestions for compost management that will optimize weed seed fatality and disease suppression.