Facilitating the marketing of peppermint compost by determining product stability and nitrogen release characteristics
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Was the award helpful in proving your ideas or not?
The project successfully characterized the decomposition and N release characteristics of fresh and stored peppermint hay. This study is part of an ongoing effort by our research group to characterize the value of a variety of locally-available organic materials. This information will be used to update Extension publications for management of organic inputs in agriculture. Based on our research, we anticipate greater recognition of the value of peppermint hay as a resource and greater demand for the product. High quality mint mulch products should command a premium price in horticultural markets. We look forward to further development of high-value mulch products from mint hay.

Technical Summary.
Short-term decomposition and N release from peppermint hay (Figures 1 and 2). In 2005-06, we incubated mint samples collected from farms in the Willamette Valley in moist soil in the laboratory to determine decomposition rate and short-term release/immobilization of plant-available nitrate-N. Freshly distilled mint hay samples (collected in Aug/Sept 2005) had C:N ratios 20 to 30, and rapid decomposition (40% of organic matter lost as carbon dioxide) in first month after soil incorporation. As the fresh hay decomposed, soil microbes took up plant-available soil nitrate-N. Plant-available soil nitrate-N was immobilized for the first month after incorporation into soil at room temperature (72 ^{o}F). Peppermint hay piled and stored outdoors for a year (crop harvested in 2004, mint sampled from the on-farm pile in Aug 2005) behaved differently. The stored hay performed like a compost. The hay stored for 1-yr. had a C:N ratio of 10 to 15, a very low rate of decomposition in soil (<10%) in first month, and it released plant-available N to the soil. Approximately 5 to 10 % of the total N in the mint was released as plant-available nitrate-N during the first month after soil incorporation. Mint piled and stored outdoors for 4 to 8 weeks after harvest performed similarly to fresh mint (rapid decomposition and negative plant-available N release in first month after soil incorporation).

Long-term N release from peppermint hay (Figure 3). Peppermint hay application in May, 2003 to field plots increased plant-available nitrogen measured in soil in the second

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and third year after application. In the second and third year after application (2004 and 2005), the plant-available N provided by peppermint was equal to approximately 4 lb N per dry ton of hay per year (6 % of mint total N applied per year).

Application of project findings. This research demonstrated the value of peppermint hay as a soil amendment. Because fresh mint residues immobilize plant-available N for several months after incorporation into warm, moist soil, they are not likely to increase the risk of nitrate-N leaching when applied to fields after harvest in the late summer or fall. Freshly distilled mint supplied zero or negative plant-available N for the first two months after incorporation into warm, moist soil. Storage of mint outdoors in uncovered piles in the Willamette Valley produced a product similar to compost after one year, with minimal management. A one-time peppermint application to field plots in spring 2003 increased soil plant-available N supply for crops grown at the field site in 2004 and 2005. About 40 % of mint organic matter was lost rapidly during the first month in soil. Thereafter, mint decomposed very slowly in soil, releasing plant-available N for 3 years after application. During the three summers following a one-time mint application to a field plot, cumulative plant-available N released from mint was about 20 % of the total mint-N applied. These N release characteristics make mint an attractive option for long-term enhancement of soil organic matter for urban and agricultural soils. Peppermint hay is unique in being useful in the short-term (1-yr) as a mulch while contributing positively to long-term soil fertility. Mint mulch products should have an advantage over bark/wood mulches for perennial beds where the mulch from the previous season is incorporated into soil annually.

Additional funding or recognition?
We have not received additional funding for work specifically with mint, but we are confident that we will have opportunities in the future to use our improved knowledge of mint decomposition and N release characteristics to develop high-value organic products that include mint residues.

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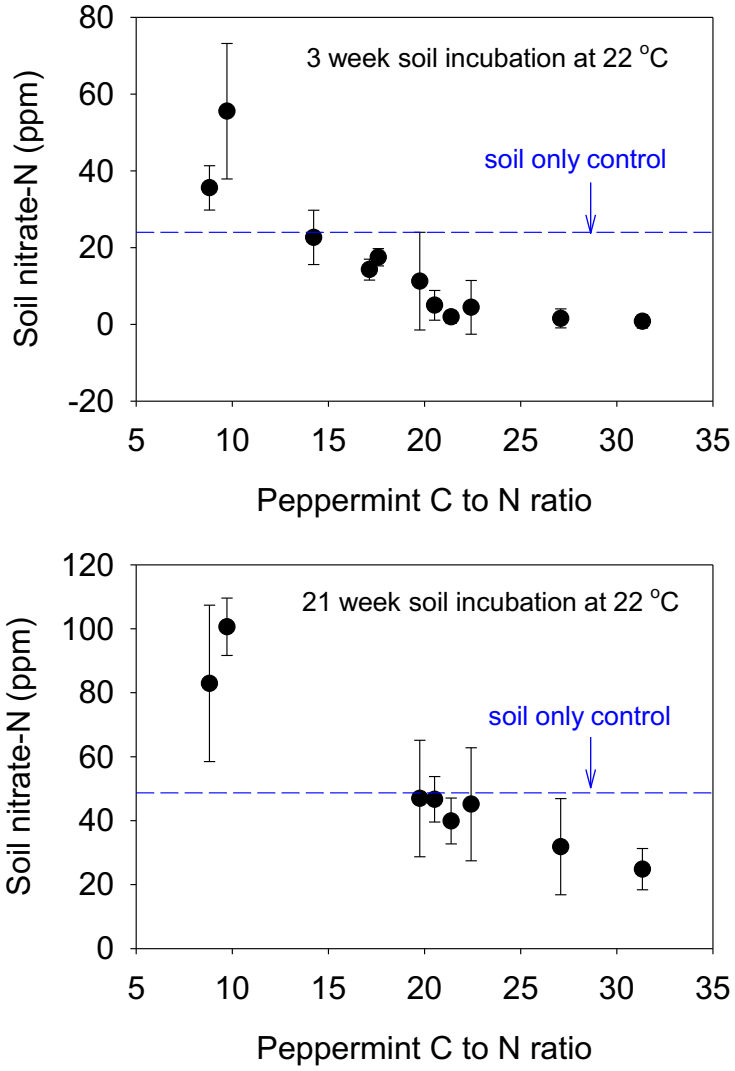

Figure 1. Nitrate-N concentrations in a moist Chehalis soil amended with peppermint hay residues from four Willamette Valley farms. Incubation at 22 °C (72 °F) conducted in the laboratory for 3 weeks (above) or 21 weeks (below). Peppermint residue C:N ratio was measured prior to start of soil incubation experiment. Dashed line represents the nitrate-N concentration in the Chehalis soil in the absence of peppermint (soil only control). Peppermint samples with C:N ratios < 15 came from mint that had been piled outdoors at two farms for approximately 1 to 2 years. Other peppermint samples with C:N > 15 were freshly distilled mint residues that were piled for 1 to 8 weeks following distillation. Error bars are standard deviation of the mean (n= 3).

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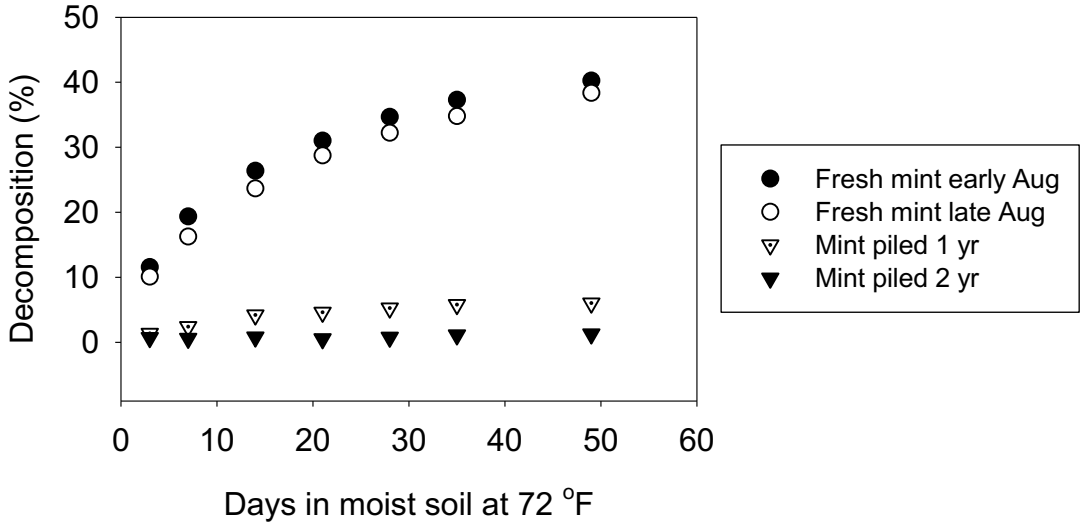

Figure 2. Cumulative decomposition (% of dry matter lost as carbon dioxide) of fresh peppermint samples collected within one week after distillation, and mint samples stored outdoors for approximately 1 or 2 years at four Willamette Valley farms. Peppermint residues were incorporated into a moist Chehalis soil and incubated in the laboratory at 72 °F.

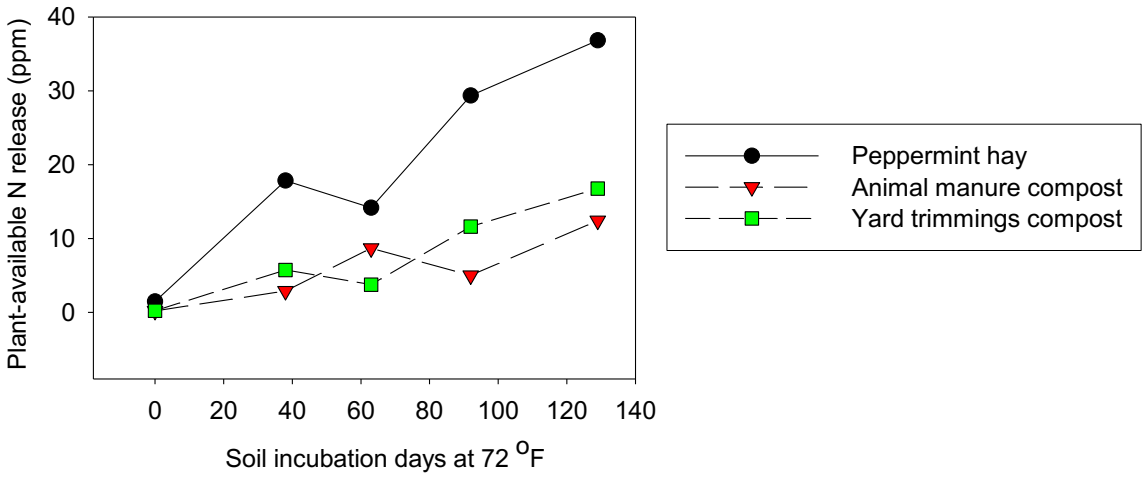

Figure 3. Plant-available N released from three soil amendments in 2005 in a moist Willamette silt loam soil incubated at 72 °F in the laboratory. Soil was collected from a field plot in April, 2005, approximately two years following a one-time application of 10 dry ton/acre of each amendment. Peppermint hay supplied approximately more plant-available N than competing products (manure compost or yard trimmings compost). Field location: North Willamette Expt. Station, Aurora.

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