FACT SHEET

Western Sustainable Agricultural Research and Education (WSARE) GRANT FW09-008

THE USE OF TWO MESILLA VALLEY, NM AGRICULTURAL BY-PRODUCTS TO CREATE A NEEDED ORGANIC MATERIAL SOIL AMENDMENT

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SUMMARY:

To correct very low soil organic material (SOM) in my desert farm in Chaparral, NM, I composted pecan shells and dairy manure obtained from the nearby Mesilla Valley. After 9 months of composting I applied the compost to pistachio trees. Nine months later I compared soil analyses of four groups of trees: untreated, shells only, manure only and composted. After 11 months I compared leaf nutrition and tree/leaf changes in the four groups. Beneficial effects were seen in the compost group including increased SOM, CEC and reduced soil pH. In the shell group increased soil iron and manganese were observed, perhaps because of binding by shell lignins and polyphenols. Nitrogen (N) immobilization appeared to occur, however, in the shell and compost groups at 9 months, perhaps because of the slowly decomposing pecan shells carbon release. Leaf analysis at 11 months showed a clear-cut progression of leaf N% with the compost group having the highest N% and the untreated group the lowest. This study demonstrated modest results, but suggests that pecan shell composting with dairy manure may provide a viable method of increasing SOM content in desert farms.

OBJECTIVES:

1. *Improve very low SOM in my desert farm.*
2. *Become proficient in large-scale agricultural composting*
3. *Systematically find an effective and efficient carbon source in the Mesilla Valley for composting.*
4. *Measure the effects of pecan shell:manure composting in the soil, leaves and tree growth in my pistachio orchard.*
5. *Modify compost composition for future studies.*

METHOD:

Pecan shells were mixed with dairy manure to create and approx. C:N content of 40:1 using v:v 1:9. After nine months (to permit mineralization,) the compost was applied along with three control groups: untreated, shells alone, and manure alone. Each group studied consisted of nonbearing pistachio trees. Nine months later soil was sampled. Eleven months after application leaf samples were taken and the tree growth and leaves were compared.

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RESULTS:

<u>Soil analyses at 9 months revealed:</u>

1. Increased SOM%: 1.45% in manure and compost, compared to 1.00% in untreated and shell
2. Associated with the increased SOM%, the soil CEC also increased: 22.0 in compost, 22.6 in manure compared to 20.6 in untreated
3. Reduced: soil pH: 8.15 in manure, 8.20 in compost compared to 8.4 in untreated and shells
4. Soil sodium: 29% lower in the compost compared to the manure
5. Increased iron and manganese in both shells alone and in compost: both highest in the shell compared to other groups
6. Reduced soil nitrates in shells (3.45 compared to untreated 7.30 ppm) and in compost (34.7 ppm compared to manure alone 48.9 ppm)

<u>Leaf analyses at 11 months revealed:</u>

1. Increased N%: compost 2.60% compared to untreated 2.42% or manure alone 2.49%

<u>Tree growth observation revealed:</u>

1. No enhanced growth associated with increased leaf N%
2. No impaired growth associated with presumed N immobilization
3. No juglone growth inhibition in shells or composts groups

DISCUSSION:

While pecan shells are a readily available Mesilla Valley carbon source by-product for composting with dairy manure, the shells' slow decomposition may lead to prolonged N immobilization. Even after 9 months of compost maturation and another 9 months until soil analyses, apparent N immobilization occurred. On the other hand, the slow shell decomposition also provided a long lasting organic soil amendment with prolonged increased SOM%, CEC and decreased pH of reduced soil sodium compared to manure alone.

Despite presumed N immobilization, leaf analyses at 11 months appeared to show a clear-cut enhanced leaf N % in the composted group. Neither enhanced tree growth (in the compost group) nor reduced growth (in group associated with presumed N immobilization) occurred. No juglone inhibition was noted as a result of using pecan shells as a soil amendment.

Interestingly, use of pecan shells may have disproportionately bound iron and manganese, supporting previous studies suggesting that shell and bark lignins and polyphenols bind heavy metals and have usefulness in decontaminating waters polluted with heavy metals.