Effects of Timing of Food Safe Sources of Organic Matter Amendments on Nutrient Cycling and Water Use

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PROJECT SUMMARY

Objectives:

- Execute 2nd year of organic matter amendment (OMA) source and timing trial
- Determine OMA mass loss and total soil organic carbon (TOC) and nitrogen (TN)
- Estimate N availability in the active rooting zone (0 – 20 in) between OMA treatments
- Compare nutrient availability in the top soil (0 – 4 in) and active rooting zone from OMA source and timing treatments
- Measure the effects of timing applications of composted manure on soil moisture and stem water potential (SWP)

Background and Discussion:

Organic matter amendments (OMA) offer an option to supplement or partially substitute synthetic fertilizers in crop production. We applied composted manure and green waste in either April or October to a young almond orchard. Multiple effects from OMA source and timing treatments were identified. Total organic carbon (TOC) and total nitrogen (TN) significantly increased in the soil (0 – 20 in) from green waste compost sources and October timing of application. There were significant differences in mass loss between composted manure and green waste compost with the greatest loss from October application.

There were also significant differences in net N mineralization and potential N leaching. These results suggest the N released from OMA is not being lost from the active rooting zone (0 – 20 in). Earlier application timing of OMA increased soil N retention. Inorganic N concentrations in the active rooting zone (0 – 20 in) were different between the timing treatments with greater nitrate concentrations in the April treatment, which was applied later in the production cycle.

The increase in soil organic matter from OMA also impacts soil water and tree water status. Soil moisture measured to 6 ft. in depth was greater in the composted manure treatment than in the control during 2016 growing season, with the greatest effect observed in October timing. Trees under either OMA treatment had higher SWP compared to the untreated control from April to July. This is further supported by the positive correlation between SWP and soil moisture in the October timing treatment of composted manure.

The increase in TOC and TN from OMA treatments shows decomposition of OMA results in the movement of organic C and N into the soil. Over time N from OMA is converted to inorganic N or retained in organic form. Net N released does not imply all N from OMA is plant available. However, we can infer this N is contributing to the TN pool.

There were no significant differences in N availability, nor in inorganic N or phosphate between OMA source treatments at both soil depths. However, there was significantly greater soil exchangeable K in the top soil of the green waste compost treatment compared to the control. This result suggests that greater K accumulation is occurring in the top soil and has yet to move into the active rooting zone.

Preliminary results indicate greater soil moisture retention under composted manure compared to the control. Trees showed less water stress for both April and October OMA timing treatments compared to the control. Greater soil moisture and tree water status in a high-water demand season of summer is potentially due to improved soil organic C.

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