The Interaction of ground cover management system and nutritional source on growth and development of an organic apple orchard in the south.

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An organic orchard was established in 2006 to evaluate the interaction of ground cover management and nutrient source effects on orchard development and tree performance. Trees of 'Enterprise' on M.26 rootstock were planted at approximately 600 trees per acre and trained to a modified vertical axis system with a 2-wire trellis support. The orchard has been managed following NOP standards. Upon planting trees received one of four ground cover vegetation management treatments: Wood chip mulch (WC), green compost mulch (GC) from municipal sources, shredded white paper mulch (SP), or left essentially untreated with a mow-and-blow (MB) where the under-tree vegetation was managed by periodic mowing and the mowing debris from the row middles blown under the trees to act as a mulch. Over-laid across the ground cover vegetation management treatments were three nutrient source treatments being an untreated control (NF) where the ground cover management mulch would provide all nutrition, or annually applied composted poultry litter (PL) or a certified commercial organic nutrient source with a poultry litter basis (CF). Changes in soil nutrient levels, soil biology, tree nutrient levels, tree growth and development and the early cropping, and arthropod diversity and pest damage during the orchard establishment phase were measured. Typically, an orchard takes five to seven years to mature into a bearing condition and those years are considered the establishment or developmental years. Previous work has indicated that the establishment and developmental period and rate of growth will be determinants on ultimate orchard productivity. This reports on that developmental period. Soils sampled annually at the 0-10 and 10-30 cm depths in the spring before and after treatment applications. Initially, microbial biomass and enzyme activities appeared to benefit from the MB in the surface 10 cm, while dissolved soil-extractable and soil-solution N pools frequently were greatest under GC at depths to 30 cm. Nutrient applications (PL and CF) did result in increased dissolved organic N pools in the 0-10cm depth. Soil respiration, an indication of total biological activity in the soil, was highest in June with WC and GC and lowest with MB, but there were no differences due to nutrient source. Seasonal under-tree competitive vegetation density was lowest with the SP vegetation management but not affected by nutrition. After five years growth, trees with WC and GC had larger trunk cross-sectional area, an indication of overall vegetative cumulative growth, than trees with SP or MB vegetation management, but there were no differences due to nutritional treatments. Although not significantly different in tree height, by year five, trees with WC and GC had achieved the target height of 10 ft while SP and MB had not. All nutrient source treatments resulted in trees of similar height, although trees NF trees were the tallest compared to those with additional nutrition supplied. Yields in the study were limited by weather conditions the past two seasons and did not achieve production targets. However, trees with WC had the greatest cumulative cropping followed by GC, both of which were twice as great as SP and 33-55% greater than MB. Although not significantly different, NF resulted in 10% less cropping than trees with supplemental nutrition.