

Transitioning to Organic Production Using a Strawberry, Muskmelon, and Cover Crop Rotation

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The transition from conventional to organic farming is an important period for fruit and vegetable growers. Often, weed, disease and insect pressures and soil fertility problems reduce the yield of marketable crops, yet growers need to generate income. Despite the ecological benefits and high prices received for organically produced crops, there may be financial risk during the transition to organic production period. Strawberries and muskmelons are high value crops, and as part of a rotation may offer a higher return per acre than other crops. A day-neutral strawberry/muskmelon/cover crop rotation was investigated in the four-year transition to organic certification status in Iowa. Growing high-value horticultural crops in the transition years requires meeting pest control and fertilization needs using approved organic practices. We tested the success of composted hoop-house hog manure and corn gluten meal as organic fertilizer sources for these crops. Several biological control agents were investigated for pest management: *Bacillus subtilis* (Serenade) was applied for control of fungal foliar diseases (anthracnose, Alternaria leaf spot, and gummy stem blight), *Trichoderma harzianum* (T22, PlantShield) was applied for control of anthracnose fruit rot; and *Beauveria bassiana* (Mycotrol) was applied to control tarnished plant bug (*Lygus lineolaris*).

The experiments were conducted at the Iowa State University Horticulture Station, Ames, Iowa. The experimental design was a split-split plot with the presence/absence of composted hoop-house hog manure as the main plot, the presence/absence of corn gluten meal (CGM) as the sub-plot, and the application of biological insect and fungus controls as the sub-sub plot in four replications. The plots were established in 2001 with day-neutral 'Tristar' strawberry (*Fragaria ×ananassa*), in 2002 with 'Athena' muskmelon (*Cucumis melo*), in 2003 with a cover crop of oats (*Avena sativa*) and ladino clover (*Trifolium repens*), and in 2004 with day-neutral 'Tristar' strawberry. Trickle irrigation was used to ensure horticultural crops received one inch of water per week.

Fertility treatments were applied to the plots before planting in the spring of each of the four years. Composted hog manure from an organic hoop house production system was applied by hand to obtain an equivalency of 30 lb N/A for day-neutral strawberry, 60 lb N/A for muskmelon and 55 lb N/A for cover crop plots. Similarly, organic CGM (Bioscape Inc., Pealuma, CA) was hand applied to obtain the equivalency rates the same as the composted hoop house hog manure. Compost and CGM were incorporated with rakes and tillage immediately after application. In fall of each year, soil samples were collected from each sub-sub plot. Three samples per planting row were taken with 1.5 in.- tipped soil probes at a 6 in. depth. These samples were bulked for a total of four samples per sub plot. Soil quality measurements included % moisture, inorganic nitrogen (NH₄ and NO₃), cations (K, Ca, Mg) electrical conductivity (EC), bulk density, pH and % N and C.

Analyses showed that % soil moisture was highest in fall 2001 from plots receiving CGN + compost, but this trend did not continue in 2002, when it was similar to corn gluten meal and the control treatments and in 2003 when there were no differences among treatments. The level of cation nutrients differed among years. In fall, 2001, potassium was highest in soil samples from plots receiving CGM or compost. In 2002 and 2003, there were no differences among treatments in soil sample potassium levels. In the first years of transition, there was no apparent benefit of using corn gluten meal and compost. Analyses of soil samples are on going and will determine the overall effect of treatments after four years.

In the first year of transition, 2001, there were no differences among soil fertility or biocontrol treatments for total yield, number of strawberries or average berry weight. In 2001 there was little disease presence and insect pressure was quite low. In 2002, there were no differences among soil fertility treatments for yield parameters. Plants in plots receiving the biocontrol treatments had more melons and a higher yield than the control, but the yield and quality of that year's melon crop was well below the conventional average, most likely due to cucumber beetle pressure. In 2004, day-neutral strawberry plots receiving corn gluten meal had more berries. There was little disease or insect pressure in the 'Tristar' planting in 2004.

In a related, but separate experiment, three day-neutral cultivars utilizing four rates of corn gluten meal as a nitrogen source were investigated at the Iowa State University Horticulture Station during the 2002-2004 growing seasons. The plots were maintained as annual plantings and the experimental design was a randomized complete block design with four replications. Cultivars included Tristar, Tribute and Seascape. Granulated corn gluten meal (CGM) was applied to the soil at four rates: 0, 50, 100, or 200 g/m². White on black polyethylene mulch and trickle irrigation were used as production practices.

In 2002 and 2003, the rate of CGM had no effect on total yield or berry number. In 2003 plants receiving 200 g/m² had higher average berry weights. In 2004, plants receiving 200 g/m² had higher berry numbers and average berry weight, resulting in a larger yield. Strawberry cultivar performance varied by year, in 2002, the highest yielding cultivar was Tristar due to a higher berry number, but in 2004, the highest yielding cultivar was Tribute that had a higher berry number. 'Seascape' had the largest berries.

Publications Resulting From This Work

- Nonnecke, G., M. Gleason and C. Cambardella. 2002. Transitioning to organic production in Iowa with a strawberry/muskmelon rotation. Annual Fruit/Vegetable Progress Rept. 2001. Iowa State Univ. Extension FG 601:44-46.
- Nonnecke, G., N. Christians and L. Radics. 2004. Influence of corn gluten meal rate on day-neutral strawberry cultivars. Annual Fruit/Vegetable Progress Rept. 2003. Iowa State Univ. Extension FG 601:66-67.
- Nonnecke, G., N. Christians and L. Radics. 2005. Corn gluten meal rate and day-neutral strawberry cultivar affect yield, berry number and berry weight. Annual Fruit/Vegetable Progress Rept. 2004. Iowa State Univ. Extension FG 601:46-47.