



Mulching practices to improve plant growth, water savings, and soil organic matter content during establishment of highbush blueberry

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Background: Since 2011, greater than 80% of the new blueberry acreage in Oregon has been established using weed mat—a porous, black polyethylene ground cover placed in the blueberry row—rather than the traditional Douglas fir sawdust mulch. Positive findings from our 9-year study in organic blueberry, in which the use of black-colored weed mat resulted in about the same yield and fruit quality as sawdust mulch, influenced this trend, because the weed mat was much more economical for weed control. Our research also revealed that weed mat, as an alternative to conventional sawdust mulch, increased irrigation requirements by as much as 50% (Strik et al., 2017a). This is primarily due to increased soil temperature and reduced soil organic matter content compared to sawdust mulch, which is a disadvantage in blueberry production systems. We also observed in an un-replicated trial that blueberries grew particularly well when the plants were mulched with a combination of sawdust mulch covered with weed mat (Strik et al., 2017b). We suspect that adding sawdust under the weed mat helps to mitigate fluctuations in soil temperature, but of course, it also requires additional materials and labor costs.

Little information is available on the impact of the color of weed mat on canopy microclimate. We had originally planned on testing white weed mat, which does not increase soil temperature as much as black, but had issues in past trials with excessive weed growth underneath the white weed mat due to increased light infiltration. Green weed mat color has not yet been tested for effects on growth, yield, and fruit quality in blueberry, but has been shown to maintain lower soil temperatures than black, while preventing most weed growth underneath (Machado and Bryla, unpublished). For this reason, we decided to use green weed mat for this trial.

Study establishment: This study was established in October 2016 at the NWREC with five treatments: Douglas fir sawdust mulch (3" deep layer on the surface of the raised bed in-the-row, replenished over the study as needed); black weed mat placed on the soil surface in the row; green weed mat placed on the soil surface in the row; and both weed mat treatments placed over a sawdust mulch layer of approximately 2 inches in depth.

Results to date: Plants were pruned in winter 2017-18 for a small first crop in 2018, leaving 30-40 buds per plant, and pruning weight was measured. After pruning, one plant per plot was

removed by hand in order to measure root volume and biomass as well as above ground biomass. Nutrient samples were sent from each plant part (roots, crown, whips, “old” wood, and “new” wood). We noticed a visual difference in the presence of vole tracks and holes as we were removing plants from different mulch treatments and created a rating system for vole damage severity.



Root growth and whole plant nutrient content

- Plants grown with black weed mat (no sawdust underneath) had the smallest root systems as well as the lowest pruning weight while black + sawdust had the largest root systems and pruning weight.
- Sawdust, with or without weed mat on top, was a deterrent to voles.
- Mulch treatments resulted in differences in nutrient content in the plant crowns. Other plant parts did not show significant differences.

- When content of all plant parts was combined, there were differences in many nutrients largely due to plant dry weight differences
- No significant impacts of mulch type on above ground:below ground ratios of dry weight and nutrient content
- Total change and allocation of nutrients from the time of planting will be calculated after the 2018-19 dormant season plant digging is completed.

Yield and fruit quality

- Yield per plant, berry weight, Brix, and the percentage of total fruit harvested during the first two harvests was impacted by mulch treatment while firmness, berry diameter, and % harvested on the third harvest were not impacted
- Yield per plant was highest in black + sawdust compared to black alone. Sawdust and the green mulch treatments were similar to one another.
- Sawdust mulch resulted in the highest berry weights (2.5g/berry compared to 2.3 for black), and percentage of fruit harvested on the first pick.

Canopy size and leaf nutrients

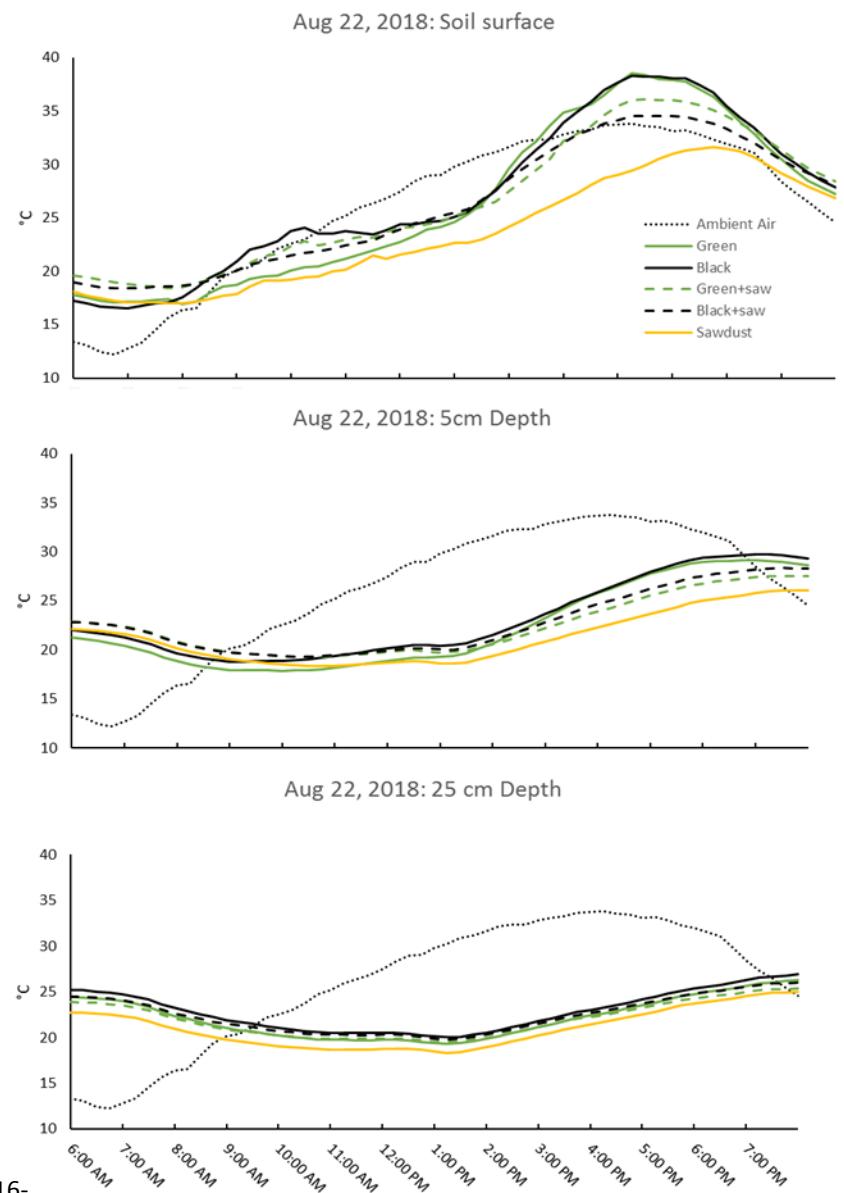
- Leaves from each plot were sampled for nutrient concentration on July 25, 2018.
- Black + sawdust, which had the highest yield and plant size, had lower leaf N than the other mulch treatments, as well as lower leaf S and Cu but the highest leaf B.
- No significant differences in plant height, but canopy widths were larger in sawdust and black + sawdust than



other treatments, with overall canopy volume being highest in black + sawdust compared to black. Other treatments were intermediate.

Soil temperature

- Sawdust generally had the lowest temperatures and least fluctuation throughout the day, while black and green weed mats without sawdust had the highest afternoon soil temperatures and greater variability throughout the day.
- Sawdust underneath weed mat had an insulating effect, though at 25 cm depth soil temperatures were more similar among treatments.
- On cooler days the treatment differences were reduced compared to the hottest days when differences were most pronounced.



Mulch treatments in winter after planting (2016-17). Treatments are quite different visually

