



Peony, Shade, & Irrigation

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Project

Water is a limited resource in the drought prone US West. Although peonies use relatively less water than most cut flower crops once they are established, they still require consistent watering to produce new eyes and good bloom size.

Our project tested the use of shade cloth as a way of reducing the amount of water needed on established plants as well as to establish newer plants (planted fall 2021) while still producing comparable blooms to control groups being watered around one–two inches of water per week.

The use of shade cloth has been studied for reducing water requirements on vegetables and has been found to **reduce the need by about 50%.**

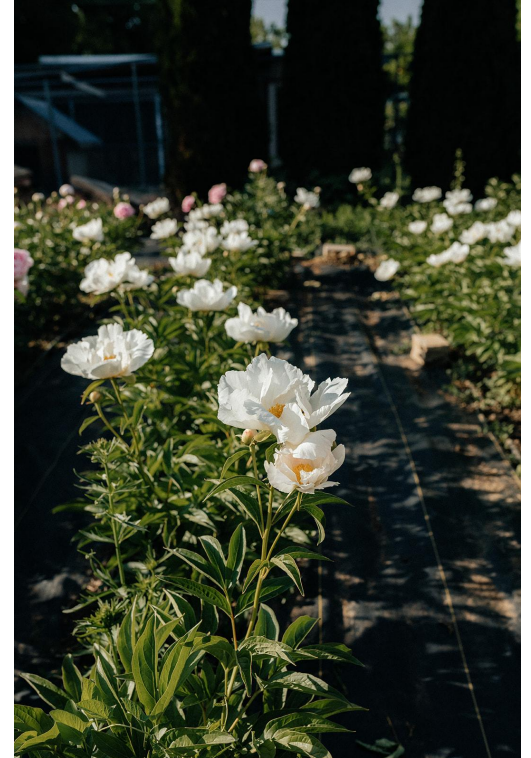


In a fruit and vegetable study done in 2017 they found that "shading increases relative humidity under the structure and decreases wind. An increase in relative humidity decreases evaporation which causes soil and plants to retain more moisture under shade. There are decreased water requirements for crops grown under shade. (1)" A soybean study also found that "the shade cloth wind screen decreased water stress and water use. (2)"

1. Maughan, Tiffany; Drost, Dan; Black, Brent; and Day, Sam, "Using Shade for Fruit and Vegetable Production" (2017).
2. Allen, L.H. Jr., "shade-cloth microclimate of soybeans" (1975).

Objectives

1. Reduce the amount of water given to peony crops by half with the use of 50% shade cloth.
2. Record data and soil moisture and compare bloom production and size to the control group
3. Educate other growers on how to implement project
4. Farm tour to educate the public on the impact of water conservation with the use of shade cloth.



Reducing water without reducing yield

- Shade cloth **will not** change the air temperature.
- Shade cloth **will** reduce the radiation load on our crops and soils.
 - Lower surface temperature of the plant and soil
 - Lower temperature = lower water loss (less evaporation from the soil and less transpiration from plants, sort of like sweating less).
- Shade cloth **can** protect from wind, which has a drying effect.
- USU tested 30% shade (70% light transmission). 50% shade limited = testing, and not at all in Utah.



Shade Cloth

Types of Shade Cloth: Woven and Knit

Woven is more rigid and is installed on top of t-posts with zip ties. Quicker and cheaper but has less coverage

Knit is more flexible and installed with hoops and clips. It offers better coverage and wind protection but costs more and takes more time

*we used 50% shade cloth for our project



Project Details



We wanted to study peonies so that other farmers could benefit on having more research on a high cost perennial flower. Using shade cloth can help farmers establish crop with less water and heat stress.

We felt that peony plants would be healthier because they will be subjected to less heat and drought stress through the use of shade.

Healthy plants that are not stressed may also produce more eyes and more blooms per plant, which would increase profitability of the plants.

Shade cloth may also help secure the high investment cost of peonies in times of drought when water may not be available. This will be especially helpful to new growers who are just planting peonies that are not yet established and less drought resistant.

Project details: Cultivars

Cultivars	Description	Timing	Notes
'Coral Charm'	Pink	Early	No fragrance
'Charlie's White'	White double	Early/Mid	Light fragrance
'Duchess'	White	Mid	Fragrant, partial shade
'Sarah Bernhardt'	Pink double	Late	Fragrant



Soil Moisture Meters



We encountered significant, unanticipated **challenges with soil moisture sensors.**

Product availability and lack of package bundling and information on components resulted in delays in getting the meteors .

Our sensor required another component (a gateway) that was not advertised.

It took a significant amount of time, even though there was extensive communication with the company throughout the process.

This experience illustrates the newness of soil moisture technology for the public and the challenges to implement it for farmers.

The app is user friendly and you can get the data off the website.

Sensors must be calibrated to your soil type for correct data



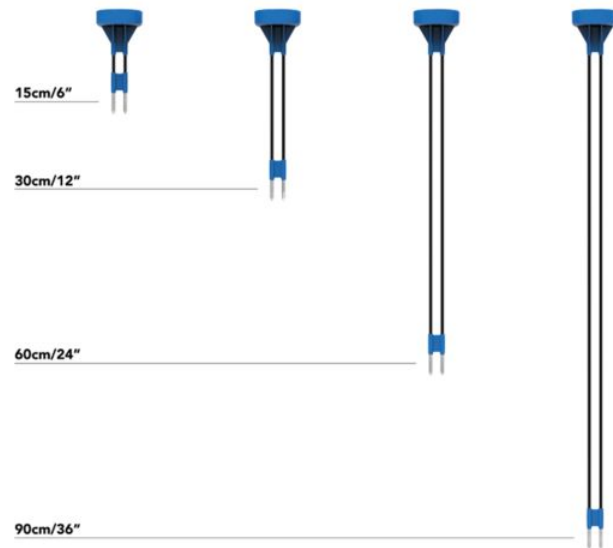
Project details: Shade & irrigation

Irrigation: 3 hrs @2x per week with 50% shade cloth and 4x per week in 0% shade.

Soil moisture: \$\$\$\$ and newly available = can be difficult to choose, order, and deploy. We anticipate options will improve.

- Sensoterra was reliable after establishment and accurate in tests with USU's research-grade moisture sensors.
- This is not an endorsement!

Available in the following lengths



Extension
UtahStateUniversity.



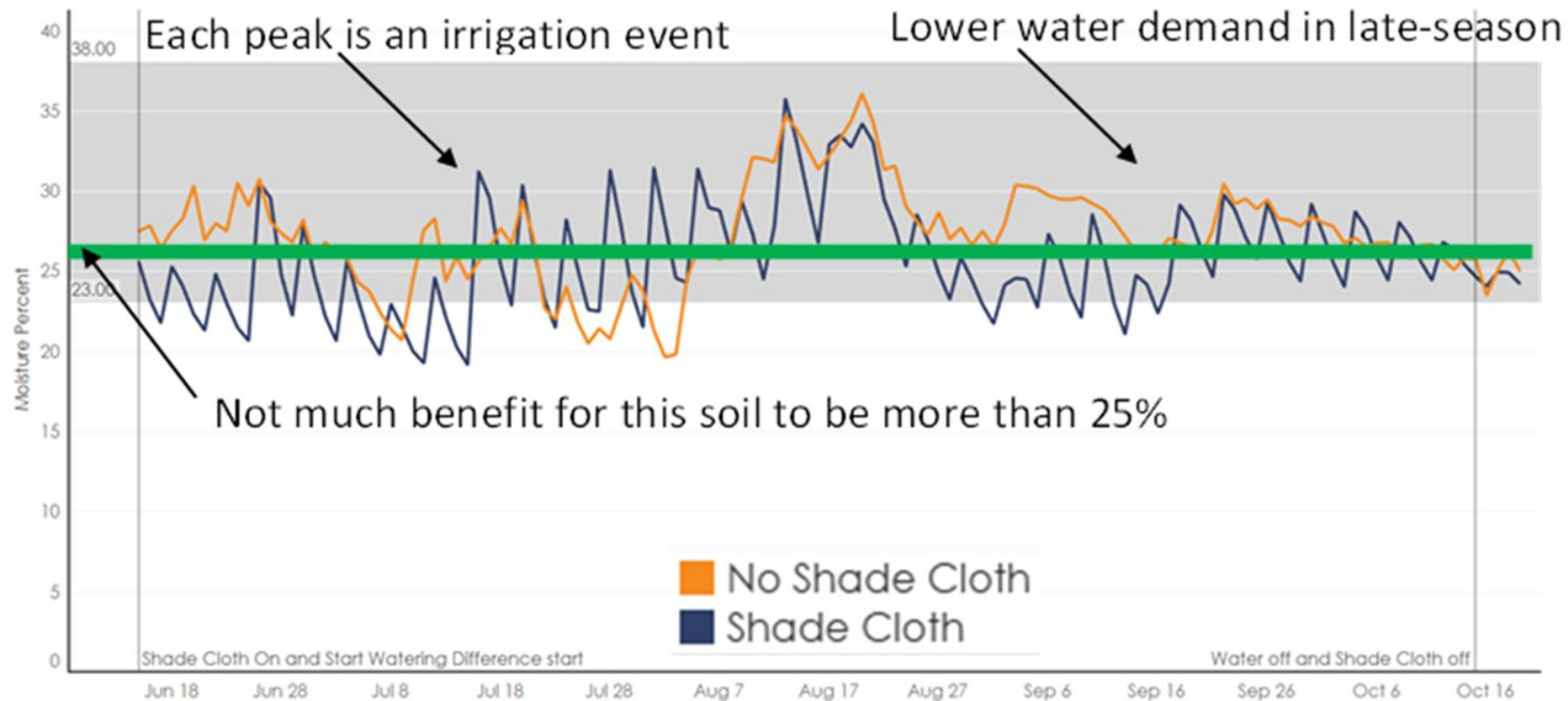
Results: The soil

- Soil **w/o shade** (orange) had 2x more water than soil **w/shade** (blue).
 - Soils in full sun had more moisture, but not in a way plants could use/benefit.
- Irrigation lasted 3 hrs per event, with 2 lines of drip per bed at a 0.33 gph flow rate.
 - We can reduce the water use further, possibly to 2 hrs, especially after bloom.
 - Challenge is irrigation zones – hard to reduce one area. What advice can we provide to new farms setting up?



Results: The soil (hourly moisture)

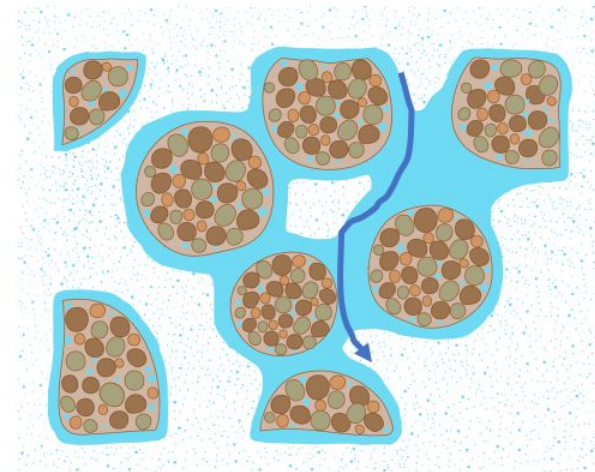
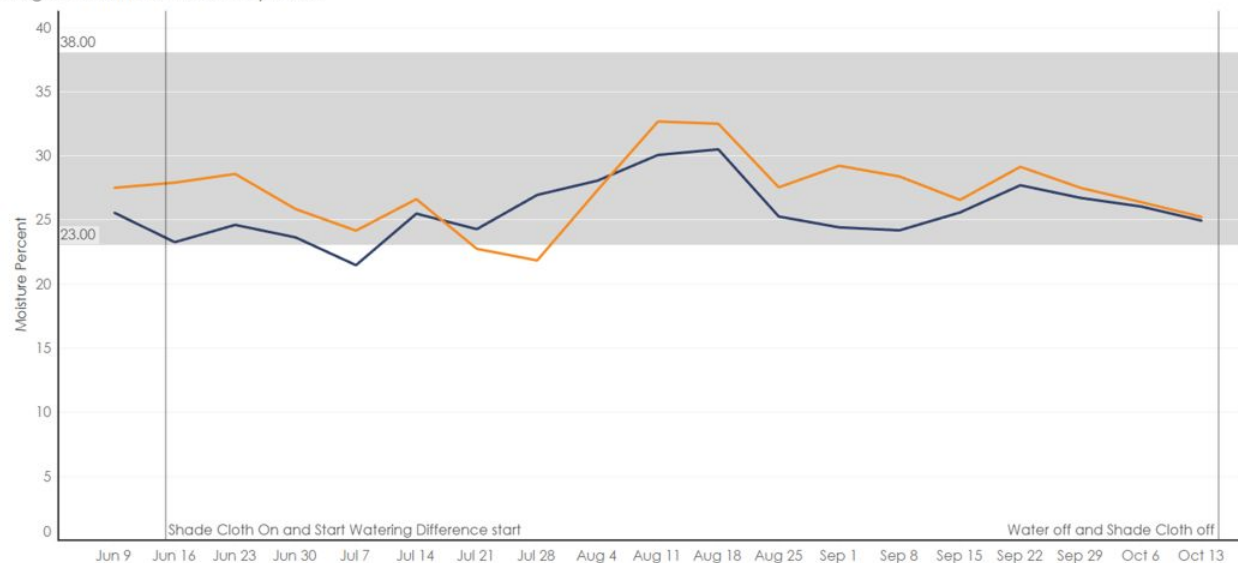
Soil Moisture Percent by Day



Results: The soil (daily moisture)



Avg. Soil Moisture Percent by Week



Microfarm irrigation calculator (*in prep*)

Drip Irrigation Calculator (fill in yellow boxes)

1) Fill in the yellow box with your bed size in feet (ft). The total area will calculate for you in the dark gray box.

Width ft
Length ft
Total area sq ft

2) Fill in the yellow boxes with your drip tape specifications and the duration of your irrigation events (in minutes).

Number of irrigation lines per bed
Emitter spacing inches
Flow rate gpm/100 ft
Recommended pressure max psi
Actual pressure/reducer rating psi
Event duration minutes
No. of events per week

IRRIGATION APPLICATION RESULTS

in gallons and inches applied by your system based on the inputs:

Gallons
Gallons applied per minute per bed:
Gallons applied per irrigation event:
Gallons applied per week:
Inches
Inches applied per minute per bed:
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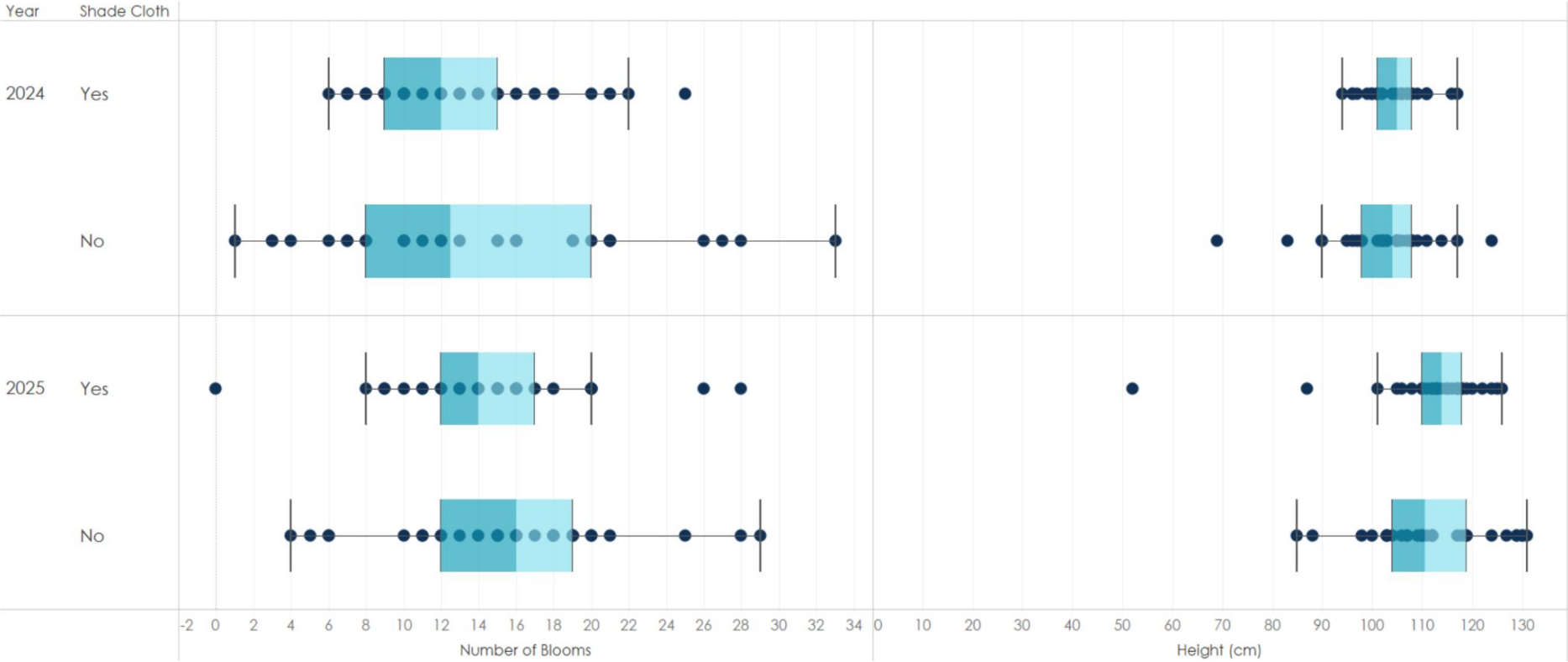
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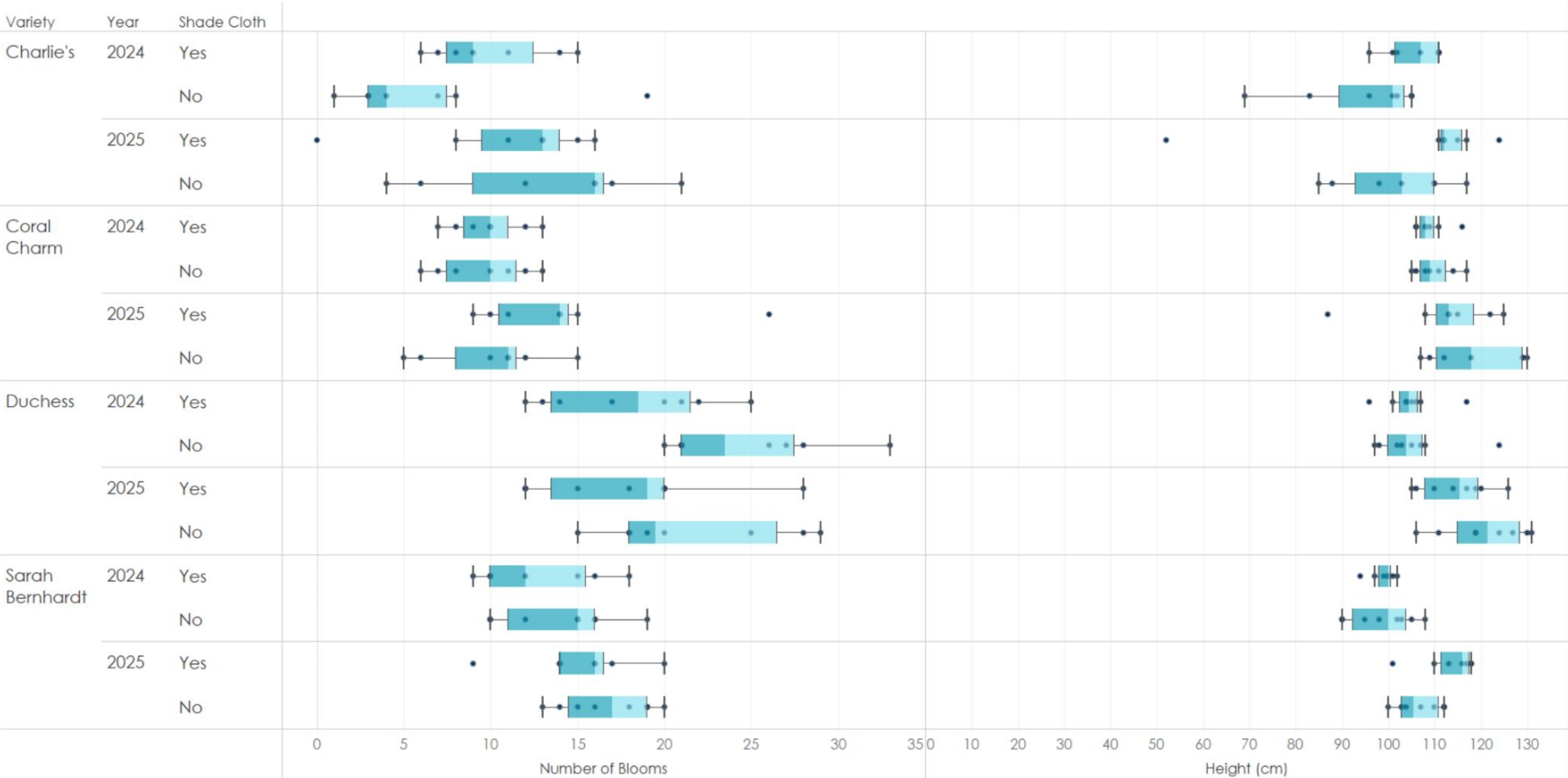
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Inches applied per week:



Bloom Count and Plant Height (2024-2025)



Bloom Count and Plant Height by variety (2024-2025)



Observations

Soil under the shade cloth felt and looked more moist than soil in the field.

Die-back timing in the fall for the peony plants didn't seem to differ between the shaded plants and the plants in the field.

Both shade and non-shade cloth crops remained healthy throughout the growing season, with the exception of a few Sarah Bernhardt peonies under the shade cloth section had powdery mildew at the end of the growing season.

Because the shade cloth was added after blooms they didn't experience stretching for the sun as they would if planted under a tree or had shade cloth the entire year.

We chose to add shade cloth after blooming for ease of harvesting and because the heat and higher water usage doesn't happen until they are done blooming.

Summary



- Shaded plants were given half the amount of water as those in full sun
 - Soil moisture **was never** in a water-stress range
 - **No change** in plant productivity (growth or yield)
 - Could **further reduce** irrigation – keep above 10% moisture and below 25% for most Utah loams.
- Cultivar differences – holy production, Duchess!
- Ways to save water
 - Increase organic matter
 - Use shade
 - Use mulch
 - Zone crops by water demand
- USFC Field Day Aug 5: Irrigation calculator
- Consider WSARE grants



Thank you for listening



Please fill out our eval:



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