Use of Shade Hoops for Summer Lettuce Production

By Adam Sauve

Demand for more locally grown vegetables is on the rise. According to the 2012 USDA Census of Agriculture, the number of farmers who sold directly to consumers increased 8% from 2007-2012, with metropolitan areas valuing the sale of locally grown food the most (Tropp, 2014). The rise in demand has researchers looking into ways of extending the growing season for vegetables. For example, high tunnels have been investigated as ways to start a growing season a little earlier or extend it later in the fall in climates where winter limits the growing seasons. In the production of lettuce, a cool-season crop, high tunnels have been used for early spring, late fall, and even winter production in temperate climates but, little is known about the use of shade during the summer months (Ilić et al., 2017, Zhao et al., 2009).

Figure 1 Lettuce bolting due to heat stress.

Lettuce (*Lactuca sativa),* is a cool-weather vegetable that prefers to grow at a temperature of 18.5° C (65.3° F). It can develop abnormal growth in high air and root

temperatures (Zhao et al., 2009). When temperatures begin to rise in late spring and summer months, the heat (30/16°C (86/60.8°F) day/night) can result in bolting (premature flowering of a plant to produce seed (Figure 1), tip burn, bitterness of the leaves and loose heads (Ilić et al., 2017). Plant breeders have developed varieties of lettuce that are better able to withstand the heat or resist premature bolting. In our experiments, we used a 50% shade netting to see if that would help produce good heads of two varieties of romaine, 'Sparx' and 'Salvius', and one variety of butterhead, 'Optima', lettuce that didn't bolt and were not bitter. Instructions for building the shade hoop structures that were used in our experiments are provided in the following pages. Although there are other ways and materials that could be used, the materials used in the construction of the hoops limited costs and are reusable.

A Simple Shade Hoop Construction

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These instructions are based are a step by step guide that will take you through the process of building affordable shade hoops that can be used year after year to shade lettuce or possibly other potential cool-weather vegetables (Figure 2). All the materials listed can be purchased at a local hardware store or online.

Figure 2. Lettuce growing under shade hoops (Sauve, 2018).

Tools Needed:

- *Permanent marker*
- *Tape measure*
- *Mason's line or some type of string*
- *Hammer*
- *Saw (used for cutting of PVC)*

Length	Hoops	Stakes	Zip ties	screws
10 feet	3	6	9	6
20 feet	5	10	15	10
30 feet	7	14	21	14
40 feet	9	18	27	18
50 feet	11	22	33	22

Materials List: *(Note, the amount of materials depends on length of desired structure, see table on previous page.)*

- *Shade netting (up to 300 foot rolls)*
- *¾”x 10’ PVC (hoop material)*
- *1 ½”x 10’ PVC (makes 10 stakes, see stake section)*
- *Twine or rope*
- *Zip ties*
- *1 ¼” exterior screw (comes in 1 and 5 pound boxes)*

Stakes: *(One, 1 1/2 Inch x 10 foot PVC pipe will make 10 stakes) Measure one foot increments on PVC tube and cut with saw*

- *Drill (one) 1/8” hole, one inch up from the bottom. This will be used to attach hoops to the stakes (Figure 3).*

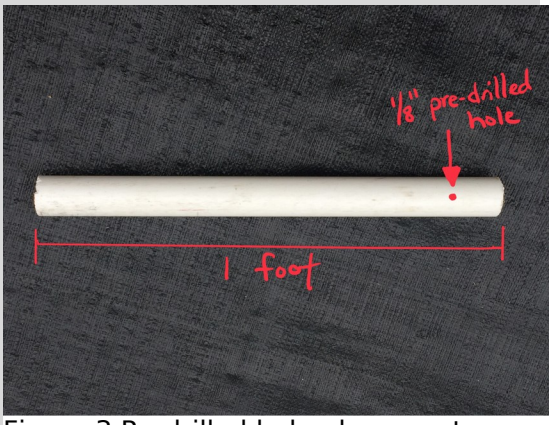


Figure 3 Predrilled hole placement (Sauve, 2018).

Marking out Perimeter: *A mason’s line will be used to establish a straight line as a layout for the sides of the hoops.*

- *To establish a side of the structure, run a string line 2.5 feet perpendicular from center, from the ends of your row (Figure 4).*
- *Space the 1½”x 1 foot PVC stakes you previously cut every 5 feet along the string line*

- *Using a hammer, drive the stakes into the ground leaving about 3” exposed above the surface of the soil (Figure 5).*

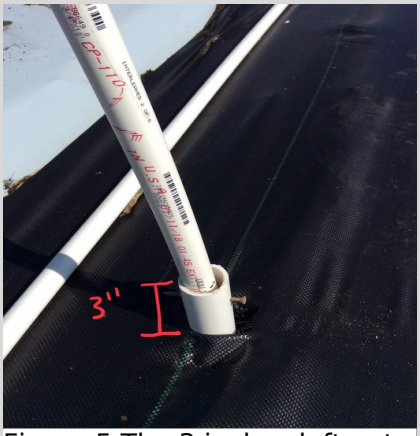
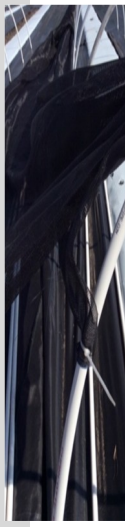


Figure 5 The 3 inches left out of ground for attachment of hoop to stake with screw (Sauve, 2018).

Figure 4 Side of structure marked (a) is the established string line between 2 stakes, 2.5 feet from the center of row (Sauve, 2018).

Hoop assembly: *The next few steps will guide you through the assembly of the structure.*

- *Measure 4” and 2 ½ feet up from the ends of the ¾” PVC and make a mark there. (Add picture of this detail).*
- *Place ¾” x 10 foot PVC pipe into the stakes along one side.*
- *Fasten the PVC pipe using the screws through the pre-drilled hole ensuring the 4” mark is at the top of the stake (Figure 3).*
- *Take the PVC pipe and bend it down and insert into the stakes on the other side, creating an arch, and attach with screws to the PVC stakes you previously hammered into the ground.*



Attachment of shade cloth: *In this experiment the shade netting came in 10 foot rolls that were then cut in half. Zip ties were used to attach the shade netting to the PVC. There are plastic fabric clips that are for sale that can be used.*

- *Rollout desired length of shade cloth along hoops and cut it using a knife or scissors.*
- *Attach shade netting to the PVC along the 2.5 foot marks previously made and attach with zip ties (Figure 4).*

Optional extra stability:

Although strong without anchors, twine can be tied to rebar stakes to add strength to the structure.

- *Anchor hoops at the ends of the rows to the ground with stakes and twine to add stability (Figure 5).*

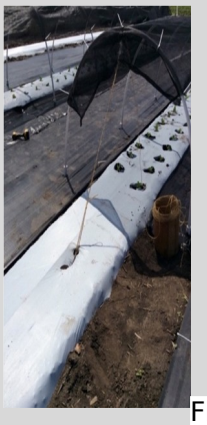


Figure 7 Rebar stakes at the ends of shade hoops (Sauve, 2018).

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