Cucumber Beetle Experiment at Beech Grove Farm – 2008 Report

Standard Practice for Early Cucumbers

Floating Row Cover

Transplant Olympian cucumbers 12-15" apart on bare soil, May 7. Cover with Agribon 19. Remove floating row cover on June 15 to allow pollination.

Advantages

Low labor and inputs. Frost protection plus increased soil warming and air temperature. 100% cucumber beetle control during crop establishment; minimal bacterial wilt (2 plants).

Disadvantages

Cucumbers typically not as vigorous or productive as later plantings, presumably due to cold stress, and only a two week earlier harvest compared to cucumbers direct seeded under row cover a month later. Removing row cover for pollination usually coincides with first peak in cucumber beetle population resulting in a high percent of scarred fruit. (This year cucumber beetle pressure was lower and later than normal.)

New Practice for Early Cucumbers

Anti-Insect Screen on Caterpillar Tunnel

Working off the examples in the new "High Tunnels" manual*, we built a 102' caterpillar tunnel using materials we already had on hand, such as 5/8" rebar and 20' schedule 40 1" PVC pipe. We set 30" pieces of rebar 6' apart and 18" deep (12" of rebar sticking out of the ground) in two rows 10 ½' apart.

We slid the PVC plastic pipe over the rebar posts forming flexible hoops. For ridge purlin we used clothesline looped around the top of each hoop and tied to 36" rebar posts set approx. 8' past each end of the tunnel. (Attaching a separate rope from the top of each end hoop to the rebar anchor helped to stabilize the hoops in heavy winds.)

We placed the Enviromesh anti-insect screen over the hoops, securing it to the soil with plastic row cover pegs. Then we pulled the 6-mil greenhouse plastic over the insect screen and hoops. The poly cover is held in place with clothesline thrown over the tunnel and tied to 36" rebar stakes set halfway between each hoop. The ropes create the segmented "caterpillar" look and allow for side ventilation by propping up the plastic with boards or forked branches. The poly cover is bunched at the ends of the tunnel and tied to the ridge purlin anchor. We drove all of the 3' rebar stakes deeply into the ground on an angle (away from the tunnel) to securely anchor the lightweight, flexible structure. An unexpected benefit of the insect barrier is this mesh-like material seemed to make the whole tunnel more stable. As a result, we have not had to lower the vented sides in high winds as recommended in the manual.

We planted the outside beds of the 10 ½' wide caterpillar to three rows of early lettuce (4/23-5/2). Lettuce sales (approx. $1200) equaled the total estimated cost of the caterpillar materials (rebar, poly, clothesline, anti-insect barrier) at 2008 prices. On May 8 we transplanted Olympian cucumbers 12" apart on bare soil in the middle bed.

A quad of bees was installed on June 19.

Photo Credit: Rudy Perrault – photos taken July 13, 2008

* The Sustainable Agriculture Research & Education (SARE) sponsored High Tunnels manual and accompanying DVD, by Ted Blomgren & Tracy Frish, can be ordered from the University of Vermont Center for Sustainable Agriculture, 63 Carrigan Drive, Burlington VT 05405. 802-656-5459. The manual is also available online at www.uvm.edu/sustainableagriculture

Advantages

Caterpillar construction is low cost and low labor. Compared to floating row cover, the caterpillar increased air and soil temperature before and after pollination resulting in significantly earlier and larger harvest. The insect mesh is the key to providing side ventilation without bumblebees escaping or cucumber beetles invading.

Disadvantages

The caterpillar requires more labor and materials for construction and management than floating row cover. Headroom is somewhat limited (6 ½' peak), access is awkward under the sides, and soil preparation is not possible with field equipment. Although cucumber beetle damage to leaves and fruit was minimal, a fair number of these determined insects managed to get in the tunnel, by the third week of July, possibly under the sides where the anti-insect screen was not secured tightly to the ground and definitely at the ends of the caterpillar where the mesh did not reach the soil (due to miscalculation when ordering the material). Regardless, the earlier, higher quality harvest of cucumbers added diversity and income to our stand at the Williamsport Outdoor Growers Market. We intend to use the caterpillar tunnel for cucumbers again in 2009.

Yields

Standard Practice

Harvest from 72' of cucumbers, July 8 – August 2: 463 marketable fruit and 97 culls (21%).

New Practice

Harvest from 102' of cucumbers, June 30 to August 4: 1246 marketable fruit and 166 culls (13%). We consistently harvested 40 or more cucumbers per day beginning July 3.

2009 Mid-Harvest Report

We repeated the experiment in 2009, reducing the length of the caterpillar tunnel to match the size of the anti-insect barrier. We also added a third treatment to see if we could realize the advantages of the caterpillar for cucumber beetle exclusion and earlier harvest using one of our existing portable hoophouses. We simply lathed the anti-insect barrier to the inside of the doorframes at both ends of the 12 x 48' portahoopy. A zipper sown into the mesh by Keystone Tarps provides access for harvesting.

Advantages

A comparatively small amount of the expensive Enviromens is required to keep cucumber beetles, as well as rabbits and birds, out of the portahoopy. Since the poly cover is lathed to the still beams, the cucumber beetles cannot enter the structure at ground level. Access is easier than the caterpillar, at least initially, as the anti-insect barrier does not need to be attached to the door frames until soil preparation, planting and most of the early lettuce harvest has been completed. The portable hoophouse provides a lot more headroom than the caterpillar even though both are built with 20' PVC bows. The 12' width of the portahoopy also allows for three 3' wide beds, increasing early lettuce production by one third (two extra rows on either side of the cucumbers) plus the opportunity to replant the outside edge of the lettuce beds to a heat loving summer crop, like basil.

Disadvantages

The customized zipper door (including hemming the edges of the Enviromesh) cost $413.40. We were not entirely successful at creating a tight seal between the mesh and the inside of the irregular doorframes. (The framing of the portahoopy end walls was not designed with this in mind.) A few beetles had already managed to get into the structure by the second week of June. The construction of the portable hoophouses requires more materials and labor, and moving them is more involved and time consuming than the caterpillar. Because the portahoopies rely on end-to-end rather than side ventilation, their length must be limited to prevent overheating. By contrast, the caterpillars can be made as long as the available poly cover, up to 300'.

Management and Observations

On May 13, we transplanted 46 Olympian cucumber plants 12" appear in a single row at all three sites. We removed the floating row cover from the field planting and installed the bumblebee quads in the caterpillar and portahoopy on June 16. Cucumbers were slower to come into production than in 2008, presumably due to the consistently cooler weather. As of July 12, we had only harvested 117 marketable fruit from the cucumbers in the caterpillar, 121 from the portable hooophouse and 7 from the field. Cucumber beetles arrived earlier in 2009 and beetle pressure has been much more intense than in 2008. All of the culls from the field planting have been a result of beetle scarring while the culls from the screened structures have been due misshapen fruit.

In 2008, bumblebee activity seemed very low in the caterpillar. We only saw 1-2 bees flying at any one time. Adding tomatoes, in 2009 to the caterpillar, and basil, intentionally allowed to flower, to the portahoopy, noticeably increased the number of bees we observed flying around and actively pollinating. So far the increased bumblebee activity has not translated into higher cucumber yield or quality.

Yields

Field cucumbers, 7/9-7/20: 154 marketable fruit and 17 culls.
Caterpillar tunnel, 6/30-7/20: 337 marketable fruit and 27 culls.
Portable hoophouse, 6/30-7/20: 298 marketable fruit and 13 culls.