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Evaluation of Rowcover Treatments for Warm Season Crops

Although the benefits of using rowcovers to protect warm season crops like peppers and melons are well established, the best type of rowcover to use is still a valid question. Perforated clear polyethylene covers result in the greatest enhancement of air temperatures in the vicinity of the crop. Although this may be beneficial when conditions are cool, temperatures under clear poly covers may become excessive on warm sunny days. Porous rowcover materials such as Reemay allow for more air movement resulting in more moderate conditions inside the tunnels. Recently the concept of zip tunnels has been introduced in an effort to combine the best of both types of rowcovering. Zip tunnels are constructed of clear non-perforated polyethylene to produce maximum warming, but the tops of the tunnels are always open ... allowing some ventilation. A drawstring system allows the size of this opening to be varied, depending on prevailing conditions and the needs of the crop.

This trial evaluated the performance of two cultivars of bell pepper (King Arthur and Double Up) grown using clear poly, Reemay or zip tunnel systems and two cultivars of cantaloupe, (Earligold and Gold Express) grown using clear poly or zip tunnels. Transplants of each cultivar were planted out in late May. Wavelength selective soil mulch was used along with drip irrigation. Sections of each row were covered with tunnels constructed by draping perforated clear polyethylene or Reemay rowcover over metal hoops. The zip tunnels are supported beside and above the plants using plastic stakes stapled onto the tunnel material. The Reemay and clear poly tunnels were left in place until early July, by which time temperatures were more consistently favorable to growth of the test crops. The zip tunnels were left in place for another 2 weeks in melon crop and were never removed in the peppers. This decision was based on the premise that overheating would not be a problem as the zip tunnels as supposed to provide superior ventilation. Pepper fruit were harvested once they reached 50% red, with a final harvest just prior to the first killing frost in late September. The melons were harvested at full slip stage, with a final harvest just prior to frost.

Results

Zip tunnel performance - The zip tunnels were initially set to have minimum ventilation, as the days after the crop was transplanted were consistently windy. Although the test site was fairly sheltered, the zip tunnels blew apart on several occasions and had to be re-installed. The plastic stakes used to support the sides of the tunnel were not sufficiently strong to prevent the zip tunnels from being blown virtually flat by high winds. The standard tunnels withstood these wind events with minimal damage. The drawstring system designed to allow the tunnels to be opened or closed did not work well. This prevented us from testing the efficacy/practicality of opening or closing the tunnels in response to prevailing conditions.

Aside from the damaging winds encountered at transplanting, growing conditions were excellent in 2003. An unusually severe infestation of aphids occurred early in the season while the pepper plants were still under the row covers. This delayed timely detection of the problem and also made treatment difficult. However good control of the problem was eventually obtained by applying a systemic insecticide through the drip system. Temperatures inside the zip tunnel closely matched those in the clear poly tunnel.
Peppers - King Arthur was far earlier than Double Up. The first fruit ripened to mature red about 5 days earlier in the Reemay treatments than in the other treatments. The enhanced earliness in the Reemay treatments was even more clearly illustrated by the fact that over 25% of the fruit in that treatment turned red prior to frost, as compared to only 7-12% in the other treatments. Total yields of marketable fruit (mature green + red) were similar in all three treatments, but the value of the crop in the Reemay treatments would have substantially greater as red fruit command a substantial price premium. Although the warmer conditions characteristic of the clear polyethylene rowcovers and zip tunnels appeared to enhance early growth of the pepper transplants, it also appear to retard fruit set. The pollen of peppers is damaged at temperatures exceeding 25C - while temperatures under clear polyethylene tunnels can exceed 40C even on relatively cool days. The more porous woven Reemay covers appear to produce more stable and moderate growing conditions - eventually leading to higher yields.

Melons - crop growth was quite poor in the trial irrespective of the covering treatment. The plants were slow to start fruiting and the fruit were small and slow to mature. Rodent and disease damage to the fruit were severe. Although total yields under the two types of crop cover were similar, the poly covers allowed twice as many of the fruit to reach maturity prior to frost than in the zip tunnels. As the two types of cover produced similar temperatures, this yield difference must be related to some other variable. It is possible that leaving the zip tunnels in place for an additional two weeks interfered with bee activity, thereby delaying fruit set.

Conclusion

Although the zip tunnels theoretically represent the best of both the clear and woven rowcover systems, we found them to be costly and difficult to manage, with no appreciable advantages over the standard types of rowcover system.