

CONTROLLING WEEDS BETWEEN RAISED BEDS WITH PLASTIC MULCH

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Producing fruiting vegetables (tomatoes, peppers, eggplant) and melons with plasticulture for fresh market has become the standard practice in Delaware and other regions of the mid-Atlantic States. Based on the 2009 USDA Ag Statistics, there are over 16,000 A of fresh market tomatoes, peppers, and eggplant in the region, and an additional 9,000 A of melons. Plasticulture provides many benefits to the grower, including moisture conservation, cleaner produce, better diseases resistance, and better weed control in the crop row. Weed control between the rows of plasticulture vegetables and melon crops can be challenging due to the limitation of some “tools”. For instance, the plastic does not allow for close cultivation, forming the beds prevents using cover crop and mulches for weed control, and wide rows limit the benefit of crop canopy for shading out late emerging weeds. As a result most growers have relied on chemical weed control. Herbicide options are limited for effective full-season weed control, furthermore incorporating additional herbicide mode of action would be very beneficial.

Curbit, Sandea, Dual Magnum, Command, Devrinol, metribuzin, Prowl are labeled for providing residual control between the rows of plastic in melons and/or fruiting vegetables. But many of these products are limited in the spectrum of weeds that they will control. Also, many will limit which vegetables can be planted in the field the following year. These products are typically applied in combination with paraquat, using hooded (shielded) applicators. Two new herbicides may have potential for weed control in row middles, Chateau and Sharpen. Both are PPO-inhibiting herbicides (Group 14) which are not typically used in vegetables and can bring a different mode of action for resistance management. Both can be used at rates significantly higher than typically used in field crops, which will improve their performance and longevity in the soil. However, there are no crop rotational restrictions after six months if the soil is tilled prior to planting the rotational crop. Valent, the manufacturer of Chateau, has granted special local needs labeling (24c SLN) for use in fruiting vegetables and melons to some states. Recent field studies examined Chateau for potential for labeling in PA and provide additional information on its benefits. Sharpen, is not labeled for the proposed uses, but it is being evaluated to determine its appropriateness in this region.

Objectives of the studies:

1. Evaluate effectiveness of various herbicides for weed control in row middles for plasticulture
2. Evaluate potential herbicides for use in plasticulture
3. Evaluate crop safety of various crops for herbicides that could be registered in PA

Field Study Methods and Materials:

Two trials were conducted, the first focused on weed control, and the second examined crop safety. The first study was conducted with watermelon and muskmelon and examined Chateau at 3 and 4 oz/A, and Sharpen at 3 and 5 oz/A. Chateau/Valor is used in soybeans at 2 oz/A and Sharpen is used at 1 to 2 oz/A in corn and soybeans. In addition, a standard treatment of Strategy (Curbit plus Command) plus Sandea was evaluated. This study was done both in DE and PA.

The second study examined crop safety. Plots consisted of multiple crop species that were evaluated for response to Chateau or Sharpen. Tomatoes, peppers, eggplant, and watermelons were planted in each plot. Chateau at 4 oz/A and Sharpen at 5 oz/A was applied prior to transplanting or 10 days after transplanting to examine crop safety. This study was only conducted in DE.

All applications were made with a hooded (shielded) sprayer to prevent/minimize herbicide contact with crop foliage.

Field studies were conducted from 2011 to 2013 at two locations, Georgetown, Delaware (DE) with Dr. Mark VanGessel and Rock Springs, Pennsylvania (PA) to examine various potential herbicide programs for row-middle weed control and crop injury in watermelon (var. '7187HQ' and 'Top Gun') and muskmelon (var. 'Aphrodite' and 'Athena') in black plastic. PRE and POST-directed programs were evaluated. Herbicides included: Strategy (2 pt/A); Curbit (24 fl oz); Sandea (0.67 oz); Chateau (3 and 4 oz); Sharpen (3 and 5 fl oz); Reflex (1.5 pt); Sinbar (4 oz); Dual Magnum (1.3 pt); and Gramoxone (3 pt). Visual weed control evaluations were taken periodically throughout the growing period. Crop yield data and phytotoxicity ratings were also collected. Small-plot studies were arranged in a randomized complete block design with three replications. The purpose of conducting research at multiple locations is to evaluate these herbicide programs under different growing and climatic conditions, including different soil types and broader range of weed species.

Results:

Potential herbicide programs study (PA and DE): Chateau and Sharpen have potential to be labeled for weed control in row-middles. These herbicides in combination with Curbit were compared to a PRE standard of Strategy plus Curbit plus Sandea and a POST program of the same mixture plus Gramoxone. In PA, late season ratings revealed that the PRE Strategy tank mixture program provided 88 to 96% control of common purslane, common lambsquarters, redroot pigweed, and hairy galinsoga, while the POST Strategy mixture with Gramoxone provided 97-98% control of the weeds. Both rates of Chateau and Sharpen provided 94-99% and 77-89% control, respectively, of the same species. Across all the treatments, ladythumb control ranged from 78-86% control. None of the treatments resulted in significant crop injury or yield decreases. In DE, none of the treatments resulted in stunting significantly different than the untreated check for both watermelon and muskmelon. Due to flooding in mid-season the plots were not taken to yield. Late season ratings for common lambsquarters control was excellent (>97%) and morningglory control was >79% for all treatments except Strategy plus Curbit plus Sandea. Fall panicum control was similar for all treatments (averaging 82%), except Sharpen which provided <40% control.

Crop injury study in DE: When melon vines were 18-21 inches long herbicide treatments were applied with a hooded sprayer. Residual herbicides (Reflex, Chateau, Dual, Sandea in all three years; and Sinbar and Sharpen in 2011 and 2012) were applied in combination with Gramoxone and a surfactant. In 2011, results were quite variable and no significant differences in treatment were detected. However, watermelon stunting at 8 DAT was 18 and 21 for Chateau and

Sharpen, respectively. Although no yield differences were detected, plots treated with Chateau and Dual yield at least 15% less than the untreated check. For muskmelon at 8 DAT, Sharpen, Chateau, and Dual all caused 40, 32, and 20% stunting, respectively. Yield was not significantly different, but Chateau, Dual, Sharpen, and Sinbar all resulted in >15% reduction in yield. In 2012, no treatment was rated significantly different than the untreated check for either watermelon or muskmelon. In 2013 in watermelon, only Reflex had an injury rating (14%) significantly different than the untreated check. No difference in yield was detected. For muskmelon, all treatments resulted in $\geq 10\%$ stunting at 9 DAT and Reflex, Chateau and Dual treatments were still rated $\geq 10\%$ stunting 24 DAT. Despite no significant differences for yield, Chateau, Dual and Sharpen treatments resulted in >25% reduction in harvested yield. In this trial, Chateau has the potential to cause stunting to both crops if the spray drift is allowed to injure young plants. Furthermore, muskmelon appears to be more sensitive to Sharpen, Chateau, and Dual than watermelon.