

High Tunnel Bramble Production
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High tunnels, as shown by research conducted at Penn State with small fruit crops, have value for season extension, and for improvement in fruit quality due to protection of the berries from the elements. In Pennsylvania, early frost dates result in only a small portion of the potential crop of most primocane-bearing raspberry cultivars being harvested. In addition, low winter or fluctuating spring temperatures have, in the past in colder locations, resulted in no crop on thornless blackberries. This research was conducted to find out to what extent high tunnels would extend the length of season during which primocane-bearing raspberries could be harvested, and whether they could make thornless blackberry production possible in some areas where it currently is not feasible.

One 17'x36' tunnel of 'Heritage' and 'Autumn Britten' primocane-bearing raspberries, and 'Triple Crown' thornless blackberries was planted in 2000. In this tunnel, a spacing was used that was slightly reduced from what would be used in field plantings with 8' between rows and 18" between plants. Planting took place in mid-April, about 6 weeks before the last expected frost date for this area. Otherwise, establishment procedures were very similar to what would have been used in field production. The soil was tested and amended according to soil test recommendations before planting, and trickle irrigation was used. In 2001, a tunnel of 'Heritage', 'Josephine', and 'Deborah' primocane-bearing raspberries, and 'QDE-1' Wyeberries was established in a higher-density planting, with 4' between rows and 1' between plants. This planting was established with organic production in mind, as it became apparent from the previous year's planting that pesticide usage could be greatly decreased or entirely eliminated in high tunnel bramble production. Planting in this tunnel did not take place until mid-May, about 5 weeks later than in 2000.

Several interesting findings were apparent. 1) Production of raspberries and blackberries was much higher than would have been possible in field production. Marketable yields of nearly 1 lb per linear foot of row (or about 5000 lb/acre) were obtained with 'Autumn Britten' the same year plants were planted, which is similar to yields that had been obtained from a 3-year-old field planting at this same site. 'Heritage' yields were lower in the first year due to lateness of the crop, though a few additional measures taken to conserve heat through the first hard freeze could have increased yields considerably. 'Heritage' produced about 3/4 lb of marketable fruit per linear foot of row for a summer crop in its second year, and an additional 3 1/2 lb of marketable fruit per linear foot of row during the fall. This would translate to a yield of 23,000 lb of marketable fruit per acre, or 4 times that normally expected for this site in the field during 2001. Similar season-long yields were obtained in 2002, but most of the crop load was obtained from the summer crop rather than in the fall. Research is underway to better understand this balance and develop recommendations concerning cane management. 2) Plant growth was greatly increased, with many canes reaching 6 to 7 feet tall. Because much potential bearing length of the cane remained to produce a second crop after the fall harvest, summer cropping in addition to fall cropping was very feasible. All cultivars in both tunnels were cropped for both a summer crop and fall crop during 2002. 3) Not only was the season extended later into the fall, but because the plants broke dormancy earlier in the spring, harvest began about 3 to 4 weeks earlier than normal for the fall crop. Therefore, 'Heritage' did not finish out the entire fall season. For

that reason, 'Josephine', and 'Deborah', 2 cultivars that would be too late for field production were tried, though their yields were not as high as for 'Heritage' or 'Autumn Britten'. 4) Thornless blackberries also produced very high yields, at about 3.6 lb/linear foot of row, or over 19,000 lb per acre. 4) Quality of berries was very high, with percent marketable ranging from 82% to 98% depending on row spacing, cultivar, and time of year. 5) Early planting (at least 6 weeks prior to the time that planting would normally take place in the field) is needed in order to achieve good yields in the year of planting. 6) Organic or pesticide-free production is relatively easy to achieve. Pests that were encountered in the high tunnel were two-spotted spider mites, which were controlled by a release of predatory mites when populations were still low, and Japanese beetles on the summer crop. 7) Yields in the two tunnels were similar. When the closer (4') row spacing was used, yield per linear foot of row decreased by half compared to rows that were 8' apart, probably due to shading of neighboring rows by the plants. This resulted in nearly identical per area (or per tunnel) yields between the two tunnels.