

High Tunnel Bramble Production in 2007

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Introduction

High tunnels are polyethylene covered shelters being used in the vegetable industry to advance or extend the harvest season for many high value crops. Unlike traditional greenhouses, no supplemental heating is used in high tunnels. Brambles (raspberries and blackberries) are high value fruits that have good economic potential on small farms, but under Iowa growing conditions, they are not without risk. Traditionally, both crops are produced on biennial canes that grow vegetatively the first season (primocanes), and fruit in the second growing season (floricanes). Because the canes must over-winter, good annual production of floricane red raspberries has not been reliable, while the choice of adapted floricane blackberries is restricted to the less desirable thorny types and only in the warmest regions of Iowa. In both crops, there are now cultivars that grow vegetatively and fruit in the same growing season (primocane fruiting). Primocane red raspberries have been available for several years, but because they mature much later in the season than floricane cultivars, they have been difficult to market. Primocane blackberries were just released in 2006. This study was initiated to determine if a high tunnel could be used to improve over-wintering of floricane brambles, and if the harvest season of primocane brambles could be advanced far enough ahead that they could replace the floricane types. This report summarizes the results for the 2007 growing season.

Materials and Methods

In 2005, a 30 x 96 ft (2,880 ft²) high tunnel with a 3 ft rafter spacing and automated roll-up (venting) system was acquired and erected at the ISU Armstrong Research Farm with half the area (30 x 48 ft) designated for growing fruit and the other half vegetables. In 2006, 'Tulameen' (a non-hardy, high quality, floricane, red raspberry), 'Autumn Bliss' (a very early season primocane, red raspberry), 'Ouachita' (a non-hardy, thornless, floricane blackberry), and 'Prime Jan' (a newly developed, thorny, primocane blackberry) were planted in 10 ft plots spaced 6.5 ft apart in four rows running the length of the high tunnel. Each cultivar was replicated four times in a randomized complete block design. Because of differences in plant vigor and primocane origin, initial plant spacing was as follows:

Cultivar	Primocane Origin	Vigor	Spacing (ft)
Tulameen	rhizome	medium	2.5
Autumn Bliss	rhizome	medium	2.5
Ouachita	crown	very high	5.0
Prime Jan	rhizome	high	3.3

A companion planting consisting of the equivalent to one replication was established outside to compare harvest dates. A trellis was constructed to support the canes to a height of 6 ft, and water was supplied through trickle irrigation.

In 2006, the plants were allowed to establish. In the fall, the tunnel was kept open to allow the plants to go dormant. Once the leaves dropped, 'Tulameen' and 'Ouachita' plants were covered with straw for additional winter protection. During the winter, the tunnel was vented when in inside temperature rose above 60 °F and closed when outside temperatures were predicted to drop below 15°F. In the spring, the floricane cultivars were pruned to optimize cane density as follows: Tulameen, 3-5 canes per ft;

and ‘Ouachita’, 6-8 canes per crown. Because 2006 was the establishment year, few if any canes were removed. For the primocane cultivars (Autumn Bliss and Prime Jan) all canes were cut off at the ground. Beginning in March, the high tunnel was allowed to warm up to begin the growing season. The automated venting system was programmed to roll up the sides when the inside temperature rose above 85 °F, and closed again when it dropped. By mid-June brambles in the high tunnel had reached the top trellis wire, while outdoor canes had not reached the mid-level wire (Figure 3). ‘Prime Jan’ canes were approaching 8 ft, and were cut back to the top wire. As the berries matured, they were harvested two to three times per week, counted and weighed. In August high winds blew off the polyethylene cover on the tunnel.

Results and Discussion

The accumulated yield for the primocane cultivars (Autumn Bliss and Prime Jan) was over three times higher than on the floricanes cultivars (Tulameen and Ouachita) (Table 1). This difference between the primocane and floricanes types can be attributed to differences in the number of fruiting canes. Because the floricanes types have a two-year production cycle and 2006 was the establishment year, there were a limited number of floricanes per plot. As the floricanes types become better established, fruit yields should go up. On a per acre basis, the yields on ‘Autumn Bliss’ and ‘Prime Jan’ were phenomenal based on 6.5 ft row widths. However, for an enclosed production system, such as a high tunnel, production potential has to be considered on square footage basis which comes to about 0.5 lb per ft² for these cultivars.

Compared to the cultivars grown outdoors, the high tunnel advanced the harvest of Autumn Bliss, Ouachita and Prime Jan (Figure 1). The greatest advance in harvest occurred with Autumn Bliss which came into production five weeks ahead of outdoor plants and a week after Tulameen in the high tunnel. Also, Autumn Bliss plants produced a late crop on floricanes-

like laterals that developed near the base of the primocanes that had fruited earlier in the season. Heat, high winds and storms curtailed the production on the plants being grown outdoors. Tulameen canes did not survive the winter.

‘Prime Jan’ produced the largest berries followed by ‘Ouachita’, while ‘Tulameen’ and ‘Autumn Bliss’ were similar in size. (Table 1). The berry size of both ‘Tulameen’ and ‘Autumn Bliss’ raspberries declined during the harvest season, while the size of ‘Ouachita’ and ‘Prime Jan’ blackberries tended to fluctuate (Figure 2). In all cases, berries produced on the plants growing in the high tunnel were generally larger than those from plants being grown outdoors. They were also sounder fruit and exhibited much less disease symptoms than the ones grown outdoors.

When the polyethylene cover on the high tunnel was blown off in August, weekly production and berry size dropped, particularly on ‘Prime Jan’ (Figures 1 and 2). Gray mold (*botrytis* fruit rot), that was previously only evident on outdoor plants began to show up. It was 3 weeks before the cover was replaced. If this event had not occurred, primocane brambles would probably be more productive than reported, and maybe a longer harvest season.

If the entire high tunnel were devoted to the production of either ‘Autumn Bliss’ or ‘Prime Jan’ which produced about 0.5 lb per ft² would project to 1,440 lb per season. If the crop can be direct marketed in ½ pt containers (~ 0.4 lb) at \$3.50 the gross income would come to \$12,600 or \$4.375 per ft². At an approximate cost of \$2.60 ft² to purchase the high tunnel used in this study, growing primocane brambles in a high tunnel could be profitable.

Acknowledgments

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Table 1. Accumulated yield and average berry weight of ‘Tulameen’ and ‘Autumn Bliss’ raspberries, and ‘Ouachita’ and ‘Prime Jan’ blackberries grown in a high tunnel at the Armstrong Research Farm in 2007.

Cultivar	Accumulated Yield			Average berry wt. (g)	Number of berries per oz
	(lb/ ft)	lb/acre	(lb/ft ²)		
Raspberries:					
Tulameen	.83 b	5,562	.13	3.5 c	8.2
Autumn Bliss	3.24 a	21,712	.50	3.0 c	9.4
Blackberries:					
Ouachita	.90 b	6,031	.14	6.9 b	4.1
Prime Jan	3.26 a	21,847	.50	9.7 a	2.9

^z Mean separation by Tukey’s HSD ($P=0.05$).

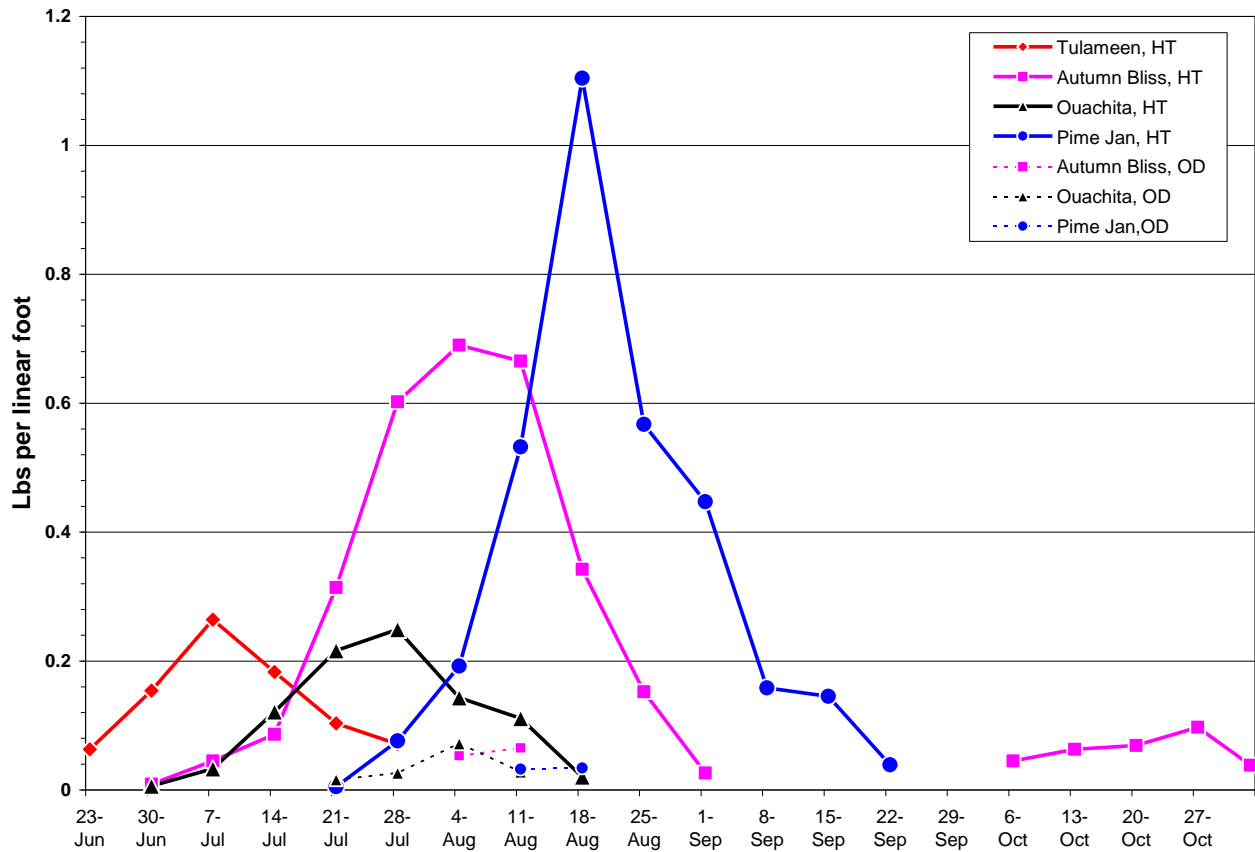


Figure 1. Weekly yield per linear foot of ‘Tulameen’ and ‘Autumn Bliss’ raspberries, and ‘Ouachita’ and ‘Prime Jan’ blackberries grown in a high tunnel (HT) and outdoors (OD) at the Armstrong Research Farm in 2007.

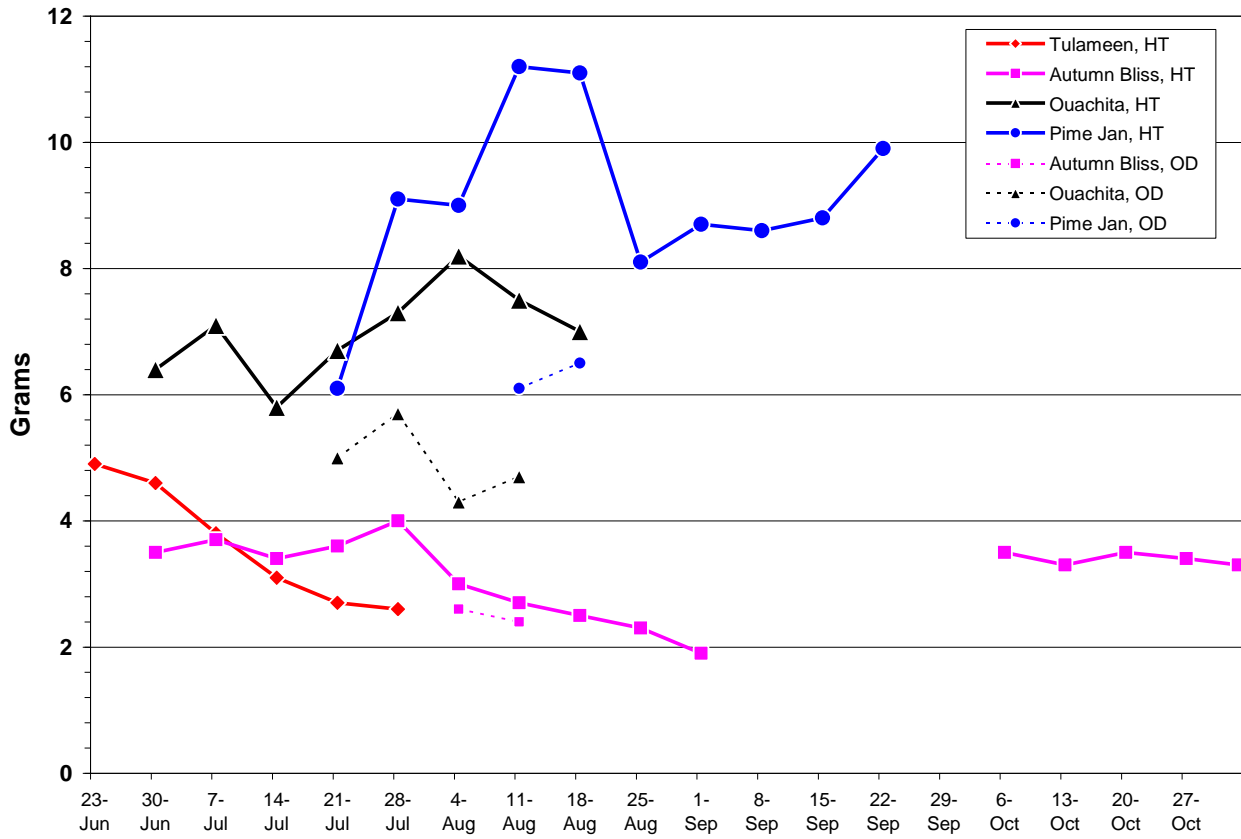


Figure 2. Weekly average berry weight of ‘Tulameen’ and ‘Autumn Bliss’ raspberries, and ‘Ouachita’ and ‘Prime Jan’ blackberries grown in a high tunnel (HT) and outdoors (OD) at the Armstrong Research Farm in 2007.



Figure 3. Brambles being grown in the high tunnel and outdoors in mid-June at the ISU Armstrong Research Farm.