

Goldenberry High-Tunnel Trials at Wye Research and Education Center

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Objectives

Goldenberries or ground cherries are fruiting plants in the tomato family (genus *Physalis*). The fruit are orange berries enveloped in an easily removable husk (Figure 1). There is a large potential market in local grocery stores and farm markets. Popularity has been increasing over the past couple years. These trials were developed to investigate the practicality of high tunnel production of two *Physalis* species (*P. peruviana* and *P. pruinosa*) to expand growing season and increase sales windows for premium prices. In 2016 and 2017, fruit yield and harvesting time was measured and pests and diseases were tracked, to determine management tactics and potential profitability.

Varieties

In 2017, three varieties were trialed at WyeREC. 'Goldenberry' (*P. pruinosa*) is a prostrate spreading plant. When ripe, the fruit fall from the plant, so a catchment collection system is desirable. The low, spreading form makes building a catchment system a challenge yet some pruning and training is useful to make these plants more upright. The fruit have an intricate sweet flavor of pineapple and melons. The market value of goldenberries in stores and farm markets is up to \$4.00 for 3 to 4 ounces (about 20 "Goldenberry" fruit).

'Gigante' and 'Columbia' (*P. peruviana*) are very large upright plants with a vigorous growth habit. The fruit of 'Gigante' and "Columbia" are approximately 50% larger than 'Goldenberry'. Fruit must be pulled off of the bush and is more difficult to harvest than 'Goldenberry'. It has a bright lemony-sweet flavor. Expected pricing in markets are the same as 'Goldenberry'



Figure 1. 'Goldenberry' (left) and 'Gigante' (right) are two potentially valuable crops. Shown with a quarter for size comparison.

Methods

There are no peer-review published nutrient recommendations for goldenberries, however recommendations by Montes Hernández and Aguirre Rivera (1994) for a similar plant, the tomatillo, suggests a range of 107 to 214 lb N/acre. This should be performed in 3 or 4 split applications between planting in April and middle of August for high tunnel production.

High tunnels were prepared in April 2016 by amending soil with Smartleaf® compost at 4 lb (wet) per square ft, in row (7.9cuft/100 sqft). Three rows (80 sqft per row) were prepared. The compost was 0.5% nitrogen (N) and 0.04% phosphorus (P). A total of 1.6 lb of N and 0.1 lb P (organic, not all available) was applied per row. December 2016 soil tests showed adequate nutrients with an expected nitrogen release (ENR) of 150 lb. No further additions of compost were applied for 2017.

Seed for fruit were purchased from an online vender. Seeds were germinated in early February and grown in plug trays until they were 5 to 8 inches high. A soils test in September showed adequate nutrients except potassium. Plants were planted in late March, and assigned positions by variety in each row. A starter 20-20-20 fertilizer was applied as a soil drench.

Summer fertilizer additions included two 70% potassium nitrate and 30% urea in split applications totaling 34 lb N/acre each.

2017 Results

‘Goldenberry’ fruit were harvested seven times between June 24th and August 15th. Approximately 43 lb were collected from 15 plants. This averages about 46 oz per plant over the season. Potential profit per plant is over \$61 for this part of the season (46 oz x \$1.33 per oz). Figure 2 shows harvest date and average yield in ounces per plant. ‘Gigante’ and ‘Columbia’ fruit were harvested three times; July 13 and 20 and August 15th. A total of 8.5 lb were harvested, averaging only 6 oz per plant. Fruit were more difficult to harvest than ‘Goldenberry’. ‘Gigante’ and ‘Columbia’ and needed to be pulled with force from the plant. Also, the ripe fruit were lower on the plant, making harvest more difficult.

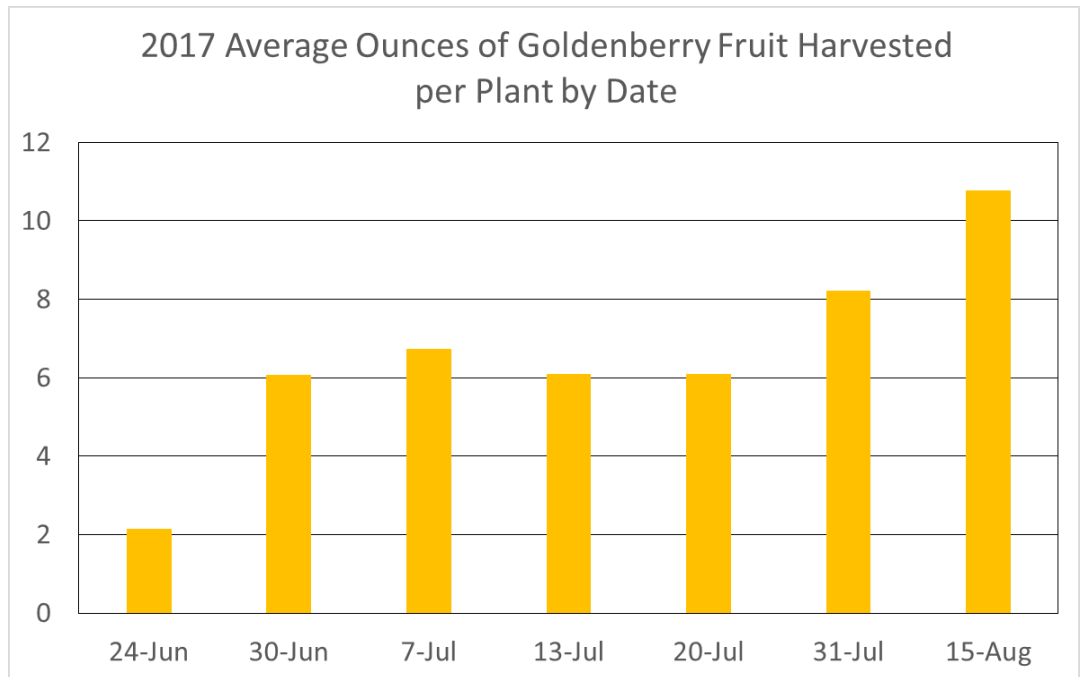


Figure 2. Average yield in ounces of ‘Goldenberry’ per plant by harvest

2017 Pests and Diseases

Aphids appeared on seedlings soon after planting. Within three weeks after planting, plants were predated upon by three-lined lema beetle (*Lema trilineata*) (Figure 3), especially ‘Gigante’ and ‘Columbia’. This was also a major pest throughout the summer in 2016. An experimental beetle Bt product was trialed, but had no effect on lema beetles.

Additionally for the same varieties, hornworm became a major problem by mid-July 2017. It was also a major pest throughout the summer and fall of 2016 (Figure 4). Another unknown lepidopteran species was found to be very problematic on ‘Gigante’ and ‘Columbia’. During early fruit development, some husks were found to have holes and fruit eaten inside by an unidentified moth (Figure 5). This was a common occurrence in 2016 and



Figure 3. Three-lined Lema beetle. A major problem on ‘Gigante’ and ‘Goldenberry’.

2017. 'Goldenberry' was unaffected. See pesticide application table below.

By August 2017, half the 'Goldenberry' plants became infected with Pythium and Fusarium root rot and the study ended for all varieties.



Figure 4. Tomato hornworm on 'Gigante' was a significant pest after September in 2016.



Figure 5. An unknown moth species caused this damage.

2017 Spray Schedule

Date	Pesticide	Target
4/27	Safer Soap	Aphids
4/28	Sevin	Lema Beetle
5/15	Safer Soap	Aphids
5/30	Safer Soap	Aphids
6/6	Entrust SC	Horn Worms/Lepidopterans
6/20	BtG	Lema Beetle
7/11	Entrust SC	Horn Worms

2017 Trial Conclusions

There are management issues including a number of pest species, especially with 'Gigante' and 'Columbia'. The lema beetle are a management problem throughout the season. While easily controlled with carbaryl (Sevin) during early plant establishment, another approach is needed during flowering to protect pollinators. Spinosad products (like Entrust EC), labeled for ground cherries, are effective for caterpillars and lema Beetle but must be applied in the evening when pollinators are inactive. Use of Bt or spinosad products was not effective for the husk boring lepidopteran. After establishment and during flowering, 'Goldenberry' was resistant to lema beetle due to the plant's fast growth rate. Due to pest management issues, harvest requirements and low production volume, 'Gigante' and 'Columbia' varieties are not recommended.

The trials ended August 2017 due to plant dieback from Fusarium and Pythium. 'Goldenberry' has great promise as market value is high and public interest is increasing. Trials for 2018 will include nitrogen fertility studies.

References

Montes Hernández, S. and J.R. Aguirre Rivera. 1994. Neglected Crops: 1492 from a Different Perspective. J.E. Hernando Bermejo and J. León (eds.). Plant Production and Protection Series No. 26. FAO, Rome, Italy. p. 117-122.

Acknowledgements

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