**Annual Report to NARBA for 2017**

# Substrate Culture of Raspberries

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## INTRODUCTION

Production of fresh raspberries is challenging in the Midwest and Northeast United States due to a short, humid growing season, abundant disease and insect problems, and often cold winters. High tunnels can improve the profitability of raspberries by extending the growing season, increase yields, and improve fruit quality. However, a risk of tunnels is that soil can become infested with nematodes or fungal pathogens, requiring time to mitigate.

Growers in several regions grow raspberries in containers to avoid soil problems and for greater flexibility in harvest times. Container production is more expensive than in-ground culture, but high yields and quality may offset costs. Growers may also be able to gain more revenue by producing organic berries since organic raspberry prices in Midwest grocery stores on average are about 30% higher than conventional prices.

The purpose of this work is to develop an economically viable container production system for raspberries in colder regions. We are concentrating first on identifying suitable substrate and nutrient regimes for conventional and organic producers. Beginning in 2018, we will assess trellising and cane management for containerized raspberries.

## METHODS

This work started in 2017 in 200 x 26 foot high tunnels (Haygrove Tunnels Ltd.) at the Horticulture Teaching and Research Center (HTRC) in East Lansing, MI. Tunnels were covered with plastic from May to October. Plants are being grown in 3-gallon white plastic Gro-bags, and irrigated with one 0.5 gph emitter per pot. Organic and conventional studies were begun. In each study, plots consisted on 4 plants per plot, replicated three times with two cultivars (Polka, Kweli).

Media types. Two experiments were started in East Lansing to compare media types for conventional and organic potted raspberries. Four media types (below) were compared for the organic study. The fourth media was not included in the conventional study.

1. Coconut coir (Botanicoir Ltd., London) OMRI approved non-buffered
2. Bark:peat 70:30
3. Bark:peat:vermicomost 60:30:10
4. Leaf and food scrap compost

Pots were planted in April, 2017 and plants were fruited on primocanes in the fall. Canes were removed and weighed in November as a measure of vigor.

We designed a mixture of four organically approved products from Agri Energy Resources LLC (N-Force, K-Sulfate Sol, Drammatic O fish, Pillar 15) to provide a 4-1-4 (N-P-K) ratio organic fertigation regime, and used a soluble fertilizer (Peters 21-5-20) to provide a similar ratio to conventional plants.

Cane trellising and training studies start in 2018. Potted plants of several cultivars will be pruned to retain 2 floricanes. Canes will either be tied to a single stationalry wire above the row (standard system), or tied to one are of a V-trellis from Trellis Growing Systems. The trellis arm will be rotated to 60$^{o}$ beyond vertical early in the season until the fruiting laterals have developed, then swung to 60o to the opposite side for the remainder of the season. The goal is to position floricane fruit to the outside of the trellis. Once the floricanes are done fruiting and removed, the developing primocanes will be tied to each side of the trellis. Primocane and floricane fruit yields will be determined.

RESULTS

Data have not been statistically analyzed yet, but means are presented below. Overall fruit yields averaged about 1 lb per plant, which is similar to first year potted yields observed in other trials. Polka was more productive than Kweli because Kweli harvest began later and we concluded picking in the end of October. Kweli would have continued fruiting and producing more if we were equipped to close the ends of our tunnel to trap late season heat.

**Effect of media type on fruit yields and end of season cane weights of potted raspberries in an East Lansing, MI tunnel in 2017. Data are means of three replications.**

| Variety | Media type | Fruit yield (g/plant) | Cane weight (kg/plant) |
|---|---|---|---|
| | Organic | | |
| Kweli | Bark/Peat | 323 | 1.68 |
| Kweli | Bark/Peat/Vermicompost | 272 | 2.47 |
| Kweli | Coconut Coir | 254 | 1.81 |
| Kweli | Leaf/Food Scrap Compost | 527 | 1.83 |
| Polka | Bark/Peat | 532 | 1.23 |
| Polka | Bark/Peat/Vermicompost | 511 | 1.42 |
| Polka | Coconut Coir | 532 | 1.02 |
| Polka | Leaf/Food Scrap Compost | 535 | 1.14 |
| | Conventional | | |
| Kweli | Bark/Peat | 397 | 2.29 |
| Kweli | Bark/Peat/Vermicompost | 137 | 2.37 |
| Kweli | Coconut Coir | 118 | 2.45 |
| Polka | Bark/Peat | 488 | 1.58 |
| Polka | Bark/Peat/Vermicompost | 312 | 1.45 |
| Polka | Coconut Coir | 443 | 1.31 |

We also began collecting data to related plant canopy size and potential evapo-transpiration (based on temperature, wind, relative humidity) with water use (Table 2). The goal is to model water use and drainage percentage. Growers of potted plants often suggest that 30-50 % of applied water should drain from pots to ensure adequate leaching and prevent salt accumulation.

**Table 2. Irrigation water drainage from 'Kweli' raspberries potted in a bark/peat media on several dates in 2017. Drainage was collected over 24 hr periods that included six 15 minute irrigation cycles supplying a total of 6,000 ml water per plot.**

| Collection period | Canopy size ($inch^3$/2 plants | Drainage volume (ml/plot) | Plant water use (ml/plot) | Drainage % | Potential EPAN (inches)[z] |
|---|---|---|---|---|---|
| ORGANIC | | | | | |
| July 26-27 | 3681 | 1850 | 4150 | 31 | 0.138 |
| Aug 21-22 | 10695 | 1000 | 5000 | 17 | 0.131 |
| Aug 22-23 | 10695 | 1633 | 4367 | 27 | 0.107 |
| Sep 6-7 | 22459 | 2266 | 3733 | 38 | 0.087 |
| Sep 7-8 | 22459 | 2733 | 3267 | 45 | 0.062 |
| CONVENTIONAL | | | | | |
| July 26-27 | 3681 | 1817 | 4183 | 30 | 0.161 |
| Aug 21-22 | 23137 | 417 | 5583 | 7 | 0.131 |
| Aug 22-23 | 23137 | 833 | 5167 | 14 | 0.107 |
| Sep 6-7 | 33484 | 2083 | 3917 | 35 | 0.087 |
| Sep 7-8 | 33484 | 2833 | 3167 | 47 | 0.062 |

[z]EPAN is evapo-transpiration (inches/24 hr)calculated from a Michigan Automated Weather Network station on site.