A Year of Ups and Downs at UMES Fruit Orchard

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History of Apple Production on the Eastern Shore

• USDA census of agriculture in 1925 showed
• 6.0 million pounds (m lb) of apple production in the Tri-County area
• Worcester (4.3 m lb)
• Wicomico (0.9 m lb)
• Somerset (0.7 m lb)

Currently no commercial apple production in these counties
History of Apple Production in Maryland

• USDA census of agriculture in 1925 showed

*1924: 83.2 million pounds (m lb)
*2015: 38.4 million pounds (m lb)

% Decline = 53.8

https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=MARYLAND
History of Peach (*Prunus persica* L.) Production on the Eastern Shore

- USDA census of agriculture in 1925 showed
- **6.4 million pounds** (m lb) of peach production in the Tri-County area
  - Worcester (2.9 m lb)
  - Wicomico (2.3 m lb)
  - Somerset (1.2 m lb)

Currently no commercial peach production in these counties
History of Peach Production in Maryland

• USDA census of agriculture in 1925 showed

*1924: 28.3 million pounds (m lb)

*2015: 4.5 million pounds (m lb)

% Decline = 84.0

https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=MARYLAND
History of Strawberry (Fragaria ×ananassae) Production in the Tri-County Area


News: Eastern Shore Strawberry Crop Outlook Is Good

Shipment of railroad car as follows

- Fruitland (100)
- Marion Station (200)
- Pittsville (160)
- Salisbury (160)
- Princess Anne (100)
Somerset County: ‘Strawberry Festival Without Strawberries’

UMES Professor Dr. Naveen Kumar will demonstrate the strawberry cultivation history of Somerset County, demonstration of potted strawberry plants, and conduct a survey from visitors about the rejuvenation of strawberry industry in Somerset County.

Date: May 13, 2017 and May 20, 2017.
Location: Downtown Marion

‘Fruitland without Fruits’
Horticulture Teaching at UMES

- Introduction to Horticulture: Hort-203
- Horticultural Crop Production: Hort-423

Teaching was restricted to class room only. No hand-on training.

[Link: http://iibs-current.blogspot.com/2015/10/importance-of-games-and-sports-for-our.html]
Rejuvenation of Fruit Industry is Important

- Increase farm income
- Promote crop diversification
- Prevent increase in carbon footprint
- Enrich the human nutrition
- Venue for agro-tourism
What We Did

Planting Date: 3/7/2017

Rootstocks: EMLA-111, EMLA-7, EMLA-106, G-11, Bud-9

Scions: 30

July: Yellow Transparent, Pristine

August-September: Initial™ (X6163), Fulford Gala, Summer Rambo

September: Crimson Gold, Day Break Fuji, Crimson Crips, Buckeye Gala, Royal Court

September-October: Crown Empire, Galarina

October: Hampshire, Hardy Cumberland, Melrose, Querina™ (Florina cv.), Nova Spy, Mutsu, Red Cameo, Smokehouse, Querina™ (X2775)

October-November: Enterprise, Red Yorking, Snapp Stayman

November: Aztec Fuji, Gold Rush, Pink Lady
What We Did

**Pollenizer:** Indian Summer (Early Season Bloom)
- Hyslop Carb Apple (Early-Mid Season Varieties)
- Chestnut (Early-Mid Season Varieties)
- Mt. Blanc™ (Mid-Late Season Varieties)

**Tree Geometry:**
- Row X Row = 20 Feet
- Tree X Tree = 10 Feet
- Tree Height = ≈ 15 Feet

**Scaffold Whorls:** ≈ 4-5

**Training:** Central Leader
What We Did

• Floor Management:

Tall Fescue: 200 lbs/acre

3 feet weed and grass free area around tree
After Planting: Drip Irrigation System

1 inch main line

Pressure Regulator: 8 psi

3/4 inch row line

0.5 gallon/hr
5 gallon/week

0.5 gallon/week
After Planting: Fertilizer Application

N: 0.02 pounds/year or 9 gram/tree for new trees (Calcium Ammonium Nitrate)

Broadcast 6 inch away from the main trunk

P and K in optimum amount
Diseases after Planting

- April-May, 2017  (Cedar Apple Rust)

Attacked on all scions
Slowed the growth of all scions
Crimson Gold/EMLA-7 was found to be the most susceptible
Galarina, Gold Rush, Royal Court, Querina TM on EMLA 111 overcome the adverse effects of rust. Showed improved growth

Diseases after Planting

June-Aug., 2017

(Japanese Beetle)

SEVIN XLR: Two Week Protection
Diseases after Planting

- Sep.-Oct., 2017 (Mealybug)

- Crimson Gold/EMLA-7
- Soap and Alcohol Spray
Bird Attack after Planting

(Crow Populations)

• July, 2017

Yellow Transparent/EMLA-7

One variety allowed to bear fruit for teaching purposes

http://rfalconcam.com/falconwatching/?p=6196
### Growth (vertical) Over a Period of 1 Year

<table>
<thead>
<tr>
<th>0-10 inches</th>
<th>11-20 inches</th>
<th>21-30 inches</th>
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<tbody>
<tr>
<td>Indian Summer</td>
<td>Crown Empire</td>
<td>Crimson Gold</td>
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<tr>
<td>Pink Lady</td>
<td>Hyslop</td>
<td>Hardy Cumberland</td>
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<tr>
<td>Hampshire</td>
<td>Day Break Fuji</td>
<td>Pristine</td>
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<tr>
<td>Chestnut</td>
<td>Yellow Transparent</td>
<td>Red Cameo</td>
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<tr>
<td>Initial (X6163)</td>
<td>Enterprise</td>
<td>Snapp Stayman</td>
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<tr>
<td>Querina Florina</td>
<td>Melrose</td>
<td>Galarina</td>
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<td>Nova Spy</td>
<td>Mutsu</td>
<td>Goldrush</td>
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<tr>
<td>Red Yorking</td>
<td>Smokehouse</td>
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<td>Aztec Fuji</td>
<td>Crimson Crisp</td>
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<td></td>
<td>Buckeye Gala</td>
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<tr>
<td></td>
<td>Royal Court</td>
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<td></td>
<td>Querina (X2775)</td>
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</tbody>
</table>
Interesting Observations

Yellow Transparent: Fruits in First Week of July (7 trees out of 10)  
: Fruits in First Week October (3 trees out of 10)

Freezing tolerance (EMLA-111) ?: November 3, 2017 (24-26°F)
: Querina Florina
: Crimson Crisp
: Galarina
: Querina (X2775)

Minor damage in these scions and heavy damage in all others
The study of the controlling of matter on an atomic and molecular scale. Generally nanotechnology deals with structures sized between 1 to 100 nanometer in at least one dimension, and involves developing or modifying materials or devices within that size.

A nanometer (nm) is one-billionth of a meter.
Introduction of Nanotechnology in Apple Cultivation

Nano-ZnO

Size distribution of nano-ZnO around 10 – 30 nm.

ZnO, Clay, and Sulfur are the integral part of earth crust and non toxic in nature

Nanoclay/Kaolin

Size distribution of nanoclay around 200 – 700 nm.

Nano-Sulfur

Size of nano-sulfur is 30 nm

Wingett et al. 2016
Effects of Nano-ZnO on Soybean Looper (Third Instar Larvae)

Five larvae were released in each petri dish (80% to 100% mortality within 5 to 24 hr.)
Effects of Nano-Sulfur on Soybean Looper (Third Instar Larvae)

Five larvae were released in each petri dish. (80% to 100% mortality within 5 to 24 hr.)

Shrinkage and Dryness

Soybean looper L3 + NS after 24 hr
Effects of **Nano-Clay** on Soybean Looper (Third Instar Larvae)

Five larvae were released in each petri dish.

Soybean looper L3 + NC after 24 hr

Shrinkage and Dryness

(80% to 100% mortality within 5 to 24 hr.)
Effects of nano-sulfur on **leaf intactness and blemishes** in field conditions using potted plants

Observation on Trifoliate leaves

Control

10 mM Nano-Sulfur
Effect of Nano-particles (Nano-ZnO) on Fusarium Head Blight

Decline in the area of fungal growth in NZO treated petri plates

Results awaited for NS study

Better mixing/suspension of NP in medium can give more better results.
Effect of Nano-ZnO (15-20 mM) on Feeding Behavior of Cucumber Beetle

- A: NZO 20 mM
- B: Preferential feeding on control leaves
- C: Control
- D: Control
- E: Control
- F: NZO 15-20 mM
Effect of Nano-ZnO (15-20 mM) on Feeding Behavior of Japanese Beetle

Control

Control + NZO

Control + NZO

NZO Alone

If no alternate option available beetle feeds on treated leaves

Preferential feeding on control leaves
We are expecting to develop an apple team comprises of extension personnel and growers during the three years of this project.

Four Events/Year

An apple team (November, 2017): 15 Members

Apple Gala (February 2018): Orchard planning and selection of varieties and rootstocks.

Apple March (May 2018): Role of pollenizer in fruit set.

Apple Festival (August 2018): Budget preparation and a trellis system to support dwarf type trees.
Pruning workshop at UMES
What is Next?

• I: Planting of 16 varieties of Pear (200 hundred trees)

• II: Planting of 11 Apple varieties on dwarf rootstocks (150 trees)

• III: Planting of Day Neutral Strawberries under low tunnels

• IV: Planting of Primocane Raspberries under high tunnels

• V: Nanotechnology trials
Thanks and Questions

Nap after hard work in field