Pollination, the Grand Interaction Among Flowers, Bees, Growers and Beekeepers

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Squash Production Requires Pollination
Fruit and Vegetable Production Requires Pollination

Why Do We Need Bees?
Annual Pollinated Crop Value

- United States – $14.6 Billion
- Tennessee - $300+ Million
Tennessee Apiculture Programs

Estimated Economic Impact After Surveys: Reducing Losses to One-Half of Average Loss.
Saving 10,000 Colonies Valued at $1,720,000.
If Flowers Are Restaurants to Bees, Then What Are Bees To Flowers?

• Hungry?
• Thirsty?
• Robots?
• Sexual Facilitators?
• Fooled?
• Pollinators, of Course!
• Partners +
Comparing Flowers to Restaurants

- Both Offer Food “Rewards”.
  - Bees Need Nectar as Carbohydrate and Pollen as Protein.
  - People Need Carbohydrates and Proteins.

- Both Advertise to Attract Visitors.
  - Flowers are “Signs” to Bees.
  - Restaurants Use Signs to Attract People.
Yum! I found the Goodies!

Nectar!
What is the “Purpose” of Flowers?

- Advertisement to Attract Pollinators.
  - VISUAL
    - Color – Visible to Bees – Blue, White, Yellow
    - Bees “See” UV but not “Red”.
  - Nectar Guides of Contrasting Color.
  - TEXTURE – Affects reflection of light
  - FORM + DEPTH + SHAPE
Henbit –

Note red pollen on bees head

Note – Purple "nectar guides"
Evening primrose (Oenothera biennis): To the human eye the flower looks solid yellow but insects can aim for the bullseye in the centre.
Hooters

Shrimp Clams Wings

Lunch Special
Ham & Cheese Fries $5.49
Wing Special 3-6

2001 Calendars R Here
Magnolia Flower

1. Stigmas Receptive First
   Female First = Protogynous

2. Anthers Open Later
   Male Stage
Carpenter Bee Perforates Corolla

Honey Bee “Thieves Nectar”
I am glad Tennessee skunks are not this large!
Honey Bees, Pollination and Dogwoods? – You’ve Got To “Bee Kidding”

John A. Skinner
J. Patrick Parkman
Michael D. Studer and
Mark “Dogwood” Windham
Dogwood Breeding Project

“Fooling the Bees”
Dogwoods Are A Major Nursery Crop
Native Dogwoods Provide Food For Wildlife
<table>
<thead>
<tr>
<th>Dogwood Anthracnose</th>
<th>Powdery Mildew</th>
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</thead>
<tbody>
<tr>
<td><em>Discula destructiva</em></td>
<td><em>Microsphaera corni</em></td>
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<tr>
<td>Lesions on leaves</td>
<td>White Lesions on leaf surface.</td>
</tr>
<tr>
<td>Twigs, bark.</td>
<td></td>
</tr>
<tr>
<td>Aided by cool wet</td>
<td>Distorted foliage.</td>
</tr>
<tr>
<td>weather</td>
<td>Aided by warm dry weather followed by cool nights.</td>
</tr>
</tbody>
</table>
Cornus florida cultivars

- Appalachian Spring
  - White Bracts
  - Resistant to Anthracnose
  - Susceptible to Powdery Mildew

- Cherokee Brave
  - Pink Bracts
  - Resistant to Powdery Mildew
Overall Goal

To produce a white dogwood that is resistant to anthracnose and powdery mildew.
Dogwood Pollination

- Dogwoods Probably Native Bee Pollinated?
- Dogwoods Not Attractive to Honey Bees?
  - Very Low Nectar Production
  - More Attractive Nectar Plants Nearby?
  - Pollen Only?
- Pollination Studies Incomplete
Cultivars in Cages With a Nucleus Colony of Honey Bees
Trick or Treat The Bees?

- Create a False Nectary of Sugar Syrup
  - Gives Forager Food
  - Reward Reinforces Behavior
- Place at Base of Bracts – Careful Now!
- Add QMP – Queen Mandibular Pheromone
  - Adds Scent Cue
  - Cue Reinforces Behavior
- Low and “Beehold” – It Works!
The End