Production Systems Plants Theme Advisory Group

Non-edible Horticultural Research

Al Sullivan, Plant Agriculture
Species Priorities/Sub-priorities

- Genetic technologies / plant breeding – ornamentals, rubber, hazelnut
  - new cultivars/ mutants
- Production Efficiency – greenhouse, turf
  - lower inputs, efficient systems
- Environmental Ecosystems Impact- ornamentals
  - effective use of water and nutrients, enhance natural pollinators
- Product Diversification – rubber, ornamentals, hazelnuts
  - new crops, new products
- Plant Protection- greenhouse ornamentals
  - IPM systems
- Product Quality Improvement- rubber
  - higher yield of latex
Capacity

- **FACULTY**
  - Dale, Lyons, Moussa, Scott-Dupree, Sullivan, Van Acker, Wolyn
- **Summers -Research Scientist**
- **GRADUATE STUDENTS**
  - 6 – MSc, 1 – PhD

- **COLLABORATIONS**
  - OMAFRA Specialists
  - ON Turfgrass Research Foundation
  - Numerous Golf Courses
  - VRIC/ Flowers Canada/ Landscape Ontario
  - Universities – Ohio State, Michigan, Rutgers, Memorial
  - Tire and rubber companies
Case Study 1

• Russian Dandelion as a Source of Natural Rubber
  • David Wolyn, Jim Todd, Rene Van Acker
Natural Rubber - Rubber Tree

- Native: Amazon basin
- Latex → rubber
- Better than synthetic
  - Petroleum-based
- Canada: too cold to grow

Globally = $32 Billion
North America = $6 Billion
Natural Rubber Prices

Demand from emerging Asian economies + production constraints.
Demand Predicted to Exceed Supply

**Millions Metric Tonnes**

- **Demand**
- **Supply**

- **2011**
- **2015**
- **2020**
Russian Dandelion

World War II Experiment Adapted to S. Canada
Russian vs. Lawn Dandelion

Russian Dandelion

Lawn Dandelion
Breeding Research - U of G

- OBJECTIVES
- Rubber yield
  - % rubber (>10%)
  - Root weight
- Unbranched roots
- Rapid, uniform germination
- No 1st-yr flowering
Agronomic Research

- Spacing
- Soils
- Fertility
- Weed control
- Pest control
- Irrigation
- Etc.

Jim Todd – OMAFRA, Rene Van Acker – U of G
North America Economic Potential - Dandelion

Demand in NA:
- 2.7 billion lbs./yr ($6 B)

Next decade
- 8% of market
- 240,000 acres

Grow to 30%
Case Study 2

• **Native Ornamental Species for Greenhouse and Landscape**
  • **Al Sullivan and Praveen Saxena**

• **Issue**: Need for new cultivars with a competitive advantage

• **Objectives**
  • Develop new cultivars and germplasm using native species
  • Develop tissue culture protocols for mass propagation
  • Use *invitro* mutagenesis to produce unique variants
  • Adapted to low input environments
Breeding and Evaluation - Ornamentals

• Choice of species – adapted to low input environments

• Rigorous evaluation in field/greenhouse trials

• Crossing scheme and selection for:
  • flower size and colour
  • plant shape and height
  • duration of flowering
  • post-harvest longevity
  • survival
Field and Greenhouse Evaluation

- Three levels of watering
  - high – uniformly moist
  - low – slightly moist and stress
  - drought – repeated cycles of wilting

- Replicated trials in field
- or greenhouse

- Multiple genera - species
Ornamentals for BIOMASS?

- C4 metabolism (like corn)
- Perennial – low input
- Spreading growth habit – rhizomes
- Adapted to cool climates
Echinacea: Polyploids generated from chromosome doubling. A- tetraploid, B- octaploid, C-mixoploid
Level of antioxidants in 12 Echinacea plants subjected to oryzalin vs control (plant 1)
Implications/Benefits to Ontario

- New crops and revenue streams for Ontario growers - diversification
- New cultivars that can be grown and/or licensed to the world
- Cultivars with increased levels of medicinal compounds for more efficient production
- New cultivars for greenhouse and landscape trade that are adapted to low input environments
- High output in vitro plant propagation systems (disease and virus free)

- New Opportunities - GRIPP
The Gosling Research Institute for Plant Preservation (GRIPP)

Nurturing plants, people, and the planet

Programs

Research
Conservation
Education
Spiritual Botany
Service
Plant Industry

Medicinal plants

Elm
Chestnut
Oak
Hazelnut
Birch
Mulberry
Orchids

Medicinal plants
Issues and Challenges

• Succession plan for faculty

• Recognition for non-edible vs edible species

• Sustained funding from industry and health of the industry in the face of increasing imports
• Questions
Phenolic contents of 12 Echinacea plants subjected to oryzalin vs control (1)