Black Stem Rust / Barberry Program Update

APHIS-PPQ
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Historical Objectives: Eradication Program
• Role in maintaining the durability of resistance in small grain crops (wheat, barley, oats, rye) after series of epidemics
• Reducing the chances of new rust races developing on alternate host barberry
• 1917: Barberry Eradication Program initiated, >600 million (98%) plants eradicated
• 1919: Federal Quarantine established. 17 States are listed as “Protected States”
• 1981: USDA eradication program officially ends

Routine Activities: – Regulation 7CFR 301.38
• Rust resistant varieties approved for propagation and commercialization
• Screening for rust resistance at USDA-ARS, Cereal Disease Laboratory (CDL), St. Paul, MN (~1 year time line)
• Statistics: ~300 varieties/species tested - ~25 popular varieties in the market.
• Inspections of nurseries in the protected states under Compliance Agreements
• Program managed through “Cooperative Arrangement” SPHDs/SPROs/State Agricultural Dept.

Screening of Barberry cultivars in the Greenhouse at USDA-ARS, Cereal Disease Laboratory, St. Paul, MN (David Long, Yue Jin) - APHIS-PPQ Funding ($45,000)

• Out of 35-40 varieties in the market majority are B. thunbergii species or their hybrids
• Plants are locally bred, shipped interstate, new varieties imported, exported to Canada ($7)
• Current morphological identification of 40+ varieties not practical
• CFIA, Canada introduced molecular (AFLP) typing as “quality control” in 2008
• One instance of rejection of shipment from MI to Canada based on molecular typing

BSR program highlights (2010 – 2012)
• Through the Direct Final Rule process PPQ added 21 new varieties of rust resistant Berberis and 2 varieties of rust resistant Mahonia to the regulated list. 3 more will be added to the list in 2012.
• Working with the Field Operations folks on resolving issue on “Annual Report” requirements. PPQ is flexible on the nature of the report. States should work with the SPHDs.
• Recent USDA-ARS research (Yue Jin et al, 2011) has indicated that B. koreana and their hybrids with B. thunbergii (Bailsel and Tara) are susceptible to stripe rust (P. striiformis f. sp. tritici). PPQ does not regulate stripe rust.
• Issue of rust symptoms on B. koreana hybrids shipped to Canada resolved with CFIA – thanks to prompt action of USDA-ARS (Yue Jin, Les Szabo).
• Request to Industry stakeholders to fund USDA-ARS for resistant testing of barberry would assist in the sustainability of this important program.
BSR Program Highlights

- Farm Bill funding 10201 for BSR proposals:
  - Michigan Department of Agriculture for surveying barberry varieties in nursery trade
  - GIS – Archiving historical data for survey on re-emergence of barberry
- Renewed interest in the BSR program and its role in potential threat from strain Ug99 – PPQ participation in USDA-ARS Recovery Plan
- Successful in leveraging resources and supporting collaborations

Current Program Status: Barberry / Ornamentals – Mark Brand, University of Connecticut (Funding: NIFA, University Grants, USDA-FAS)

- Research on ecology and invasiveness of barberry using molecular tools
- Hybridization in nature between ornamentals and common barberry
- Mislabling of ornamental varieties surveyed
- Well characterized barberry germplasm collection at Storrs

University of Connecticut, Storrs – Mark Brand

- Molecular techniques (AFLP) can determine “trueness” and avoid duplication of names
  - “Quality Control” expertise at Univ. of Conn. will reduce trade issues
  - MSU, Mt. Univ. of Conn. Farm Bill project All 151 plants in nursery trade tested, were true to type.
  - Clonal variation noticed in 14 samples, mainly in “Crimson Pygmy”
  - Eliminate hybrids of common barberry (B. vulgaris) from trade?
  - Univ. of Conn. Breeding for “triploid” low fruiting capacity varieties - avoid dispersal

Barberry Program: Washington State

- WA Program initiated in 1944 due to severe rust epidemics in 1941-43 and ended in 1978
- Only 21 Eastern Washington Counties are protected
- Re-emergence of common barberry in a small number of sites in both WA and ID
- Foster surveyed 100 properties and discovered re-emergence in 9 properties
- Murray and Chen detected barberry in 20 locations in Whitman, Stevens and Latah Counties

Pacific North West – Barberry Working Group

- Follow-up reports from stakeholders
- Encourage destruction of barberry when found
- Reporting suspected stem rust & barberry to @ http://PNWstemrust.wsu.edu
- Build an archive of PNW barberry eradication materials and data
- Resurvey select locations for barberry, monitor BSR development and race composition
United States Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine

How to Recognize Common Barberry

Archiving and Digitizing Barberry Eradication Records for re-emergence survey

Lisa Kennaway, CPHST and Tim Murray, WSU

Surveys in Wisconsin

Disease Management & Epidemiology: BSR

Adrian Barta

Todd Voss, Iowa Dept of Ag

BSR and Incursions of Ug99

Cooperative efforts: USDA

- USDA-ARS. Cereal Disease Laboratory, St. Paul
  - Research on early detection tools (L. Szabo)
  - Race typing of BSR pathogen (Yue Jin)
  - Breeding for resistance
- USDA-APHIS-PPQ / CPHST roles – facilitation, permitting, and training
- S. Isard, Penn State (USDA-NIFA, bio-security grant). Modeling current and future Ug99 movement into W. Hemisphere
  - Air-borne from East Africa – Not Significant
  - Human-mediated – Sig.
  - Air-borne (future) from S. America – Sig.
- Need for awareness to prevent accidental introduction (shoes, clothing, military vehicles, etc) – Fact Sheets

Flow chart for reporting Ug99 detections

Rust on barberry leaves

Rust spores

Shoes or clothing

R. Singh, CIMMYT

1944-1956
Recommendations for Improving BSR program Ad-Hoc Working Group, Riverdale, May 2009

Participants: USDA-ARS, CSREES, APHIS, ANLA, NPB, Universities - Penn State, Washington State University, SD State University, University of Connecticut.

Barberry:
- Improve “Scientific” or “Technical” aspects – Fingerprinting/Nursery Surveys
- Improve information flow to stakeholders (Nursery industry) and regulators
- Harmonize BSR activities with CFIA (Canada) – trade in barberry, Ug99 related information

Black Stem Rust (Ug99):
- Need to link with Wheat/Small grains industry on barberry eradication
- Be part of the Global Efforts on Ug99
- Leverage Resources with other federal agencies, Grain and nursery industry and improve coordination and communication.

Goal: Meet objectives of the NAPPO Executive Committee declaration (August 11th, 2008), USDA “Action Plan”, Plant Board Resolutions, BSR program needs.

THANK YOU

Seedless B. vulgaris species in Iran

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