

## BIOAG FINAL REPORT

### TITLE:

Developing Improved Management Practices to Overcome Soil Health Issues in Red Raspberries

### PRINCIPAL INVESTIGATOR(S) AND COOPERATOR(S):

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### KEY WORDS:

Red raspberry, soil health, soil borne disease, alleyway management, irrigation practices

### ABSTRACT

In the Northwest, red raspberry producers have noticed a gradual decline in raspberry productivity and planting longevity from a historical length of 10-15 years to a current industry standard of 5-7 years resulting in significant increases in production costs. This planning grant brought together researchers from three states (WA, OR, CA) and British Columbia that work in small fruit production (red raspberries focus) from a diverse set of disciplines (pest, nutrient and cultural management and breeding) to identify casual agents of decline and to identify integrated cultural practices for red raspberry producers to mitigate decline impacts. Participants were surveyed prior to the meeting and asked to contribute previous and on-going research abstracts. A day-long meeting was held to discuss research priorities and to develop specific activities for targeted funding sources.

### PROJECT DESCRIPTION

Red raspberry growers have noticed a decrease in the life (halved in most cases) of productive plantings; costing significant amounts in income losses and replant costs. One suspected reason is the decline in soil health, a loss of soil organic matter and beneficial soil biological activity, and subsequent increase in soil-borne diseases such as root rot (*Phytophthora rubi*) and nematodes (*Pratylenchus penetrans*). A reliance on fumigation and post plant soil-applied pesticides has been used to overcome these issues, but the efficacy of these products is short-lived and changes in label use patterns has compromised their historical widespread use. While development of resistant varieties to these pests is the long-term goal, producers need effective tools until resistant varieties are identified.

Previous research projects that have focused on soil health declines in red raspberry has largely looked at specific components of the production system. The focus of this planning grant was to bring together researchers from diverse disciplines, to discuss gaps in knowledge, share previous research, and discuss future directions for research. Prior to the day-long meeting, researchers and industry personnel were surveyed and asked to contribute previous and on-going research abstracts to a knowledge database.

At the meeting, 18 participants built upon their previous knowledge and developed a direction for future research in raspberry decline issues. Participants broke into three groups (Cultural, Pest, Breeding) based on researcher discipline or producer interest and identified knowledge gaps and needs for future research. Participants determined that future research needs to work in three directions: 1.) Identify renovation practices that reduce soil pathogen pressure (PRE-PLANT); 2.) Identify cultural management practices that can reduce risk associated with soil health declines (POST-PLANT); and 3.) Develop key genetic resources that can mitigate soil-borne disease pressure (RESISTANCE). PRE-PLANT priorities include: reducing inoculum pressure during renovation, assess survival of soil-borne pathogens during renovation, quantify dominant soil-borne pathogen populations, and characterize the genetic

diversity of these pathogens. POST-PLANT priorities include: amendment and allayment management options and benefits, temporal distribution of soil-borne pathogen, and irrigation practices that can mitigate pathogen density. RESISTANCE priorities include: identify traits associated with resistance and identify cultivars with morphological traits associated with resistance. Teams were formed along specific issues based on expertise and interest.

#### OUTPUTS

- Work Completed:
  1. At the 2012 Washington Small Fruit Conference a clicker survey of red raspberry producers was performed to quantify the impact (economic, environmental, and social) that soil health declines has on the red raspberry industry. Fourteen participants finished the survey that was compromised of 30 questions.
  2. A day-long symposium was held in Mt. Vernon, WA. Contributors included raspberry producers, researchers, and Extension professionals from Oregon, California, Washington, and British Columbia, Canada. There was a total of 18 participants with an additional 6 contributing research abstracts prior to the meeting.
  3. A Zotero database was created that currently houses all relevant research and outreach materials associated with soil health declines in red raspberry and other relevant production systems. Participants at the in-person meeting were trained on using and contributing to the database.
  4. Four grant applications have been submitted to state and national funding sources.
  
- Publications, Handouts, Other Text & Web Products:
  1. A web knowledge-base library was developed using Zotero. Zotero is a free downloadable program that allows users to store and organize information in an online “library”. Through invitation to the Zotero “Raspberry group”, members are able to add information to a common informational library. Information submitted by the Raspberry group may be cross referenced, searched, and stored in the cloud for future use. In addition to peer-reviewed literature stored in the Raspberry group library, PowerPoint presentations, newsletter articles, and other sources of information related to raspberry production declines were added. Using Zotero, members are able to make current research topics more accessible.
  
- Outreach & Education Activities: None planned

#### IMPACTS

- Short-Term:
  1. An integrated team has been assembled to work on the identified issues.
  2. Feedback from red raspberry producers was compiled on the economic impact of soil health declines.
- Intermediate-Term:
  1. Through the collaborative efforts of the assembled team of researchers we expect that will identify a number of management tools that producers can utilize in the next 2-3 years.
- Long-Term:
  1. Our long-term impact will results in lengthened planting longevity of red raspberries in the Pacific Northwest by developing integrated management tools. We expect

that in 5-10 years plantings will return to their previous commercial standard of 15-20 years.

ADDITIONAL FUNDING APPLIED FOR / SECURED

To date, the final detailed approaches were submitted to the WSDA Specialty Crop Block Grant Program, USDA-NIFA PMAP Program, and the Western Region - Regional Integrated Pest Management Program.

GRADUATE STUDENTS FUNDED

NONE.

RECOMMENDATIONS FOR FUTURE RESEARCH

During our survey of red raspberry producers at the WA Small Fruit Conference participants prioritized that fertility and pest (pathogen) management were their highest research concerns. Priorities for future research that were identified by researchers include: fertility management, irrigation delivery improvement, integration of improved alleyway management tactics (i.e. cover cropping, organic amendments), development of improved renovation tactics, and development of resistant red raspberry varieties.