Oregon Wine Advisory Board
Research Progress Report

1997 - 1998

Identification of biological control agents against powdery mildew (*Uncinula necator* Burr.) of Grape (*Vitis vinifera* L.)

Walter Mahaffee
Horticulture Crops Research Laboratory

OBJECTIVES OF PROPOSED RESEARCH

1. Develop a cost-effective system for identifying potential biological control agents of powdery mildew on grape that are efficacious in the Pacific Northwest.

2. Begin a primary screening program to develop biological control agents specifically adapted to the Pacific Northwest.

The long-term goal of the work is to develop an integrated biological control system for managing foliar and fruit pests of grape that eliminates or greatly reduces the reliance on chemical pesticides.

OBJECTIVE ONE

Work Completed:

The cultivars Cabernet Sauvignon, Chardonnay, Pinot Noir, and White Riesling were examined in the development of each of the below assay systems. For the majority of these systems, Pinot Noir was chosen because of its susceptibility (in the green house) to powdery mildew. Cabernet Sauvignon was used in systems requiring surface disinfestation of leaf tissue, since it was the least susceptible to tissue damage.

Detached leaf assay
Two detached leaf systems were developed. Leaves from greenhouse grown vines were surface disinfested and placed on water agar and maintained in an incubator. Powdery mildew infected tissue remained viable for greater than two months and allowed for cleistothecia formation. Thus, this system would be useful for testing biological control agents for inhibition of cleistothecia formation.

A second detached leaf disk assay was developed, using non-disinfested leaves. Leaves were detached and placed in aquapicks. Powdery mildew infected leaves could be maintained in greenhouse and field environments for greater than 14 days.

Leaf discs assay
Two detached leaf disk systems were developed. In the first system, leaves were surface disinfested then leaf disks of 10 mm diameter were removed from the leaves, placed on water agar, and maintained in a growth chamber. Powder mildew infected disks could be maintained for greater than 21 days.

Greenwood assay
Grapevines of each cultivar were started from hardwood cuttings, potted, and maintained under greenhouse conditions. Nodal cuttings from vines were rooted and kept under greenhouse conditions until 5th true leaf is fully expanded. Powdery mildew infected material can be maintained for greater than four months. The generation of rooted cuttings is laborious, which would limit its utility as a primary screening assay. However, it would be very useful as a secondary assay to confirm biological activity of agents identified in the primary screen.

Nodal propagation in tissue culture
None of the published growing media for tissue culture of grape nodal cuttings or any of the numerous modifications we attempted resulted in a sufficient plant growth rate for this system to be effective as a primary screen. However, the system did prove to be useful in keeping sterile powdery mildew isolates and would be useful in future investigations on the nechanisms by which biological control agents affect powdery mildew. It was possible to maintain)owdery mildew infected tissue for greater than one month. System was not pursued further.

Callus culture
Proved to be too laborious and was not pursued further.

Current Experiments

The consistency of disease incidence and biological control activity of AQ 10 in each system is currently being investigated and by mid March should be completed. Once this series of experiments is completed, a single assay system will be chosen and the primary screening program will begin (see Objective 2).

OBJECTIVE TWO

Work Completed

We have already collected more than 130 bacterial, fungal and yeast isolates from grape plants with a reduced incidence of powdery mildew. In addition we have developed a collection of over 35 individual isolates of powdery mildew, several of which are suspected of being resistant to several pesticides.

Experiments still to be completed
The screening procedure optimized and selected from the above systems will be used to identify potential biological control organisms from a collection of microbial isolates from grape tissues. In addition, we are also modifying this system to assay powdery mildew isolates for resistance of chemical pesticides

Based on the results so far for objective 1, it is expected that approximately 100-200 microbial isolates will be screened for biological activity by June.

Significant Findings
The establishment of potentially effective assay systems that do not rely on disinfested tissue is significant, since any biological control agent will have to compete in the field with the indigenous microflora. The modified leaf disk and detached leaf assays provide such systems. In these systems, plant material is easy to obtain and maintain, labor costs, and assay time are greatly reduced compared to the greenwood assay. Thus by using these systems, it will be possible to screen potential biological control agents for both activity against powdery mildew and ability to compete with the indigenous

microflora. This will reduce the number of false positive (strains that show control activity but cannot survive on leaf surfaces) and reduce the amount of time and money wasted developing strains that cannot survive on leaf surfaces.