

PNVA RESEARCH PRE-PROPOSAL

Title: Grafting Vegetables for Verticillium and Fusarium Wilt Resistance

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Institution: Washington State University

Identification of the Problem: Eggplant, watermelon and tomato are significantly impacted by Verticillium and Fusarium wilt; growers experience up to 25% crop loss in most years and 100% loss in some years. As listed by the Compendium of Washington Agriculture^[1], there were 100 acres of eggplant (2007), 300 acres of tomato (2006) and 597 acres of watermelon (2007) in Washington. The value of eggplant production in Washington in 2007 was \$500,000, and tomato production reached a value of \$ 1.0 to \$1.2 million in 2006. Verticillium and Fusarium wilt are issues throughout Washington, likely due to potato-based rotation systems, and fumigation does not provide adequate control. Grafting with resistant rootstock is used throughout Asia, Europe and Canada for eggplant, watermelon and tomato and provides excellent disease control. This project will evaluate vegetable rootstocks and grafting techniques for Verticillium and Fusarium wilt control of eggplant, watermelon and tomato under Washington field conditions.

Generalized Research Protocol:

This study will test grafting as a technique to control Verticillium and Fusarium wilt in eggplant, watermelon, and tomato at WSU Mount Vernon NWREC and in cooperating Washington grower's fields with high Verticillium and Fusarium wilt pressure. At WSU Mount Vernon NWREC, plants may be inoculated to ensure Verticillium and Fusarium wilt. We will identify resistant rootstocks and determine cost and availability in Washington. Rootstocks and vegetable crops will be seeded in the greenhouse at WSU Mount Vernon NWREC to determine seeding dates for each for optimum size and time of growth for each grafting technique. We will test grafting techniques (e.g. tube, apical/cleft, tongue, slant-cut/splice, hole insertion, and side) for each crop and rootstock, and measure rate of success for each. In addition, this study will identify simple, inexpensive greenhouse technologies that would be appropriate for small-scale growers who may be interested in creating their own grafted vegetables.

The most promising rootstocks and grafting techniques will be selected for each crop and transplants will be grafted for a field study. Three separate on-farm field studies will be conducted, one each for eggplant, watermelon and tomato. For all studies, the design will be a randomized complete block with four replications. Treatments in each study include grafted vegetables with selected rootstocks, self-grafted, and non-grafted. Crops will be grafted in April/May and transplanted to the field in early June.

At WSU Mount Vernon NWREC, plant health will be rated weekly, and plant height (eggplant, tomato) and vine number and length (watermelon) will be measured every two weeks. Eggplant and tomato yield (fruit number and weight) will be measured weekly, and

^[1] Compendium of Washington Agriculture <http://www.snakeriver.org/wscpr/WSCPRBook.cfm>

watermelon yield will be measured in mid and late August. On-farm sites will be located in western Washington (1 site) and eastern Washington (2 sites). At all on-farm sites, plant health, size and yield will be measured in late June, mid-July and early August. At all sites, whole plants will be harvested and whole-plant fresh weight will be measured in late August or before disease affected plants collapse completely. Plants will be assayed for Verticillium and Fusarium wilt in the laboratory.

This study is designed as a Master of Science student project to be conducted from Jan 2010 through May 2012. This proposal is for Year 1 funding (2010). A literature search will be initiated in January. Vegetable grafting will start February 2010 to establish timing of rootstock and scion seeding for each grafting technique, and grafting for the field experiment will occur in April/May and transplanted to the field in early June. Plant health will be rated and plant growth will be measured weekly throughout the summer. Yield and plant fresh weight will be measured in late August, and laboratory Verticillium and Fusarium bioassays will be conducted September through November. First year data will be analyzed and a preliminary report prepared in December. The field study will be repeated in 2011, with Year 2 measurements conducted as described for Year 1. Growers may be solicited for continuing funding for Year 2 (2011).

Anticipated Results:

Expected outcomes from this project include: 1.) An effective disease control method for Verticillium and Fusarium wilt that can be utilized by conventional and organic growers; 2.) An expansion of crop options in the area due to effective disease control; and 3.) The opportunity for new agricultural industries to develop – the production of grafted transplants and rootstocks.

General Budget (including matching funds and sources):

	PNVA ¹	NARF ²	WSCP	In-Kind	Total
Time-slip wages	\$ 4,000	\$ 4,000	\$ 5,801		\$13,801
Goods & Services	\$ 500	\$ 500	\$ 4,278		\$ 5,278
Travel	\$ 780		\$ 3,080		\$ 3,860 3860.00
Employee Benefits	\$ 720	\$ 720	\$ 883		\$ 2,323
Other ³				\$ 6,000	\$ 6,000
Total Request	\$6,000	\$5,220	\$14,042	\$ 6,000	\$30,482 31,262.00

¹ Eggplant, watermelon and tomato growers are contributing to PNVA for this research project; the balance of funds is being requested from PNVA.

² Northwest Agricultural Research Foundation (NARF) is funded through grower self-assessment.

³ Other includes on-farm field space, field plot establishment and maintenance, and value of lost crop @ \$2,000 per site X 3 sites.

Plans for Future Funding:

This study is designed as a 2-year MS student project. The student has been recruited and will start course work Spring Semester 2010 at WSU. The Department of Horticulture and Landscape Architecture has committed half the student funding for 2 years. The remaining half plus operating costs must be raised from grants. We will resubmit this project for funding in 2011 to all sources listed above and will solicit growers to contribute the full amount to PNVA.