MANAGING VERTICILLIUM WILT ON EGGPLANT THROUGH GRAFTING, AND GRAFT SURVIVAL IN HEALING CHAMBERS

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Eggplant (*Solanum melongena* L.) sustains significant losses due to Verticillium wilt (caused by *V. dahliae*) in Washington. Soil fumigation is often used for disease management, but is not always effective or sustainable. Grafting has been used world-wide to manage soilborne diseases in solanaceous crops, and was evaluated in this study for managing Verticillium wilt. Vigor, yield, and Verticillium wilt severity were evaluated for four treatments of 'Epic' eggplant: 1) Grafted on *S. aethiopicum*; 2) Grafted on 'Beaufort'; 3) Self-grafted; and, 4) Non-grafted. The experimental design was a randomized complete block replicated five times at two field locations where Verticillium wilt has been serious. The study was repeated in 2010 and 2011.

S. aethiopicum–grafted plants were the least vigorous, and had the lowest yield and highest disease severity at both locations. In contrast, 'Beaufort'-grafted plants had the greatest stem diameter and plant height and the lowest disease severity at both locations, even though interveinal chlorosis, v-shaped necrosis, and wilting were observed in 'Beaufort'-grafted plants and *V. dahliae* was isolated from stem tissue. Plant dry weight varied among treatments at both locations each year. Total marketable weight of 'Beaufort'-grafted eggplant was 45% greater than the other treatments in 2010 and 28% greater in 2011. The reduced disease severity in combination with increased yields of 'Beaufort'-grafted eggplant suggests that 'Beaufort' rootstock is tolerant rather than resistant to Verticillium wilt, and may still contribute to build-up of the pathogen in the soil.

For grafting to be a viable pest management alternative, cost of production for grafted transplants must also be affordable. Production costs are impacted by survival rate of grafted transplants. Healing chambers provide high relative humidity and reduce transpiration of the scion until normal water transport between the rootstock and scion vascular tissue is restored. However, healing chambers also affect production costs based on their construction and management.

Thus, the impact of three healing chamber environments on the survival of grafted eggplant, tomato and watermelon was also studied. The experimental design was a randomized complete block replicated three times with 72 plants of each crop per treatment per replicate. The three healing chamber designs were: 1) A frame covered by plastic sheeting and shade cloth with a humidifier that misted plants for 20 seconds every five minutes (research design); 2) A frame covered by

plastic sheeting and shade cloth with hand misting every two days (industry design); and 3.) A frame covered by shade cloth with hand misting twice daily (control). Three vegetable crops, 'Epic' eggplant, 'Cherokee Purple' heirloom tomato, and 'Crisp'n Sweet' triploid watermelon were self-grafted using the splice grafting technique, placed in the healing chambers for 7 days, and then acclimated over 4 days to ambient greenhouse conditions. Plants were evaluated daily for signs of wilting, and graft failure for 14 days following grafting.

Average temperature was approximately the same for all 3 healing chambers (23-25^{o} C) while average relative humidity levels varied: 82% in Trt. 1, 98% in Trt. 2, and 53% in Trt. 3. Tomato survival did not differ due to treatment (96-98%), suggesting that tomato grafting can be successful with minimal healing chamber infrastructure. Although eggplant survival was 90% in Trts. 1 and 2 and 60% in Trt.3, this difference was not significant. Watermelon survival in all treatments was very low: 6% in Trt. 1, 15% in Trt. 2, and 0 in Trt. 3. Low survival was likely due to the use of the splice grafting technique which is not optimal for watermelon, but needed to be used to maintain consistency among the three crops.

The results from these studies indicate that grafting eggplant onto vigorous disease-tolerant rootstocks can reduce Verticillium wilt severity without compromising yield or vigor and may be an effective alternative to soil fumigation. Grafted transplants can be produced successfully in a mild temperate climate such as Washington using a low-input healing chamber design, which may be more cost effective than designs that include a humidifier. Grafted tomato appeared to be tolerant of lower relative humidity and variable temperatures during the healing period while watermelon was intolerant and eggplant was intermediate.