GRAFTING FOR MANAGEMENT OF BACTERIAL WILT AND ROOT-KNOT NEMATODES IN TOMATO

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Bacterial wilt of tomato caused by the soil-borne bacterium *Ralstonia solanacearum* race 1 (biovar 1, phylotype II) is widely distributed in the southeastern United States and causes considerable crop losses of upto 50-100% under ideal conditions for disease incidence. Crop rotation as a disease management strategy is effective but can be difficult because *R. solanacearum* can infect over 200 plant species. Although resistance is available in tomato cultivars 'Hawaii 7996', 'Hawaii 7997', and 'Hawaii 7998', these cultivars have not been widely accepted due to poor horticultural traits such as small fruit, a trait linked with bacterial wilt disease resistance. Root-knot nematodes (*Meloidogyne* spp.) are also a major issue in tomato production that can lead to high yield losses. For decades root-knot nematodes have been managed with soil fumigants, primarily methyl bromide. The use of methyl bromide is nearly finished in the United States due to its phase out under the Montreal Protocol. Producers are currently seeking alternatives to soil fumigation to manage soil-borne pests in tomato. Many recent studies worldwide have pointed out the possibilities of using grafting with resistant rootstocks as a sustainable and eco-friendly practice for bacterial wilt and root-knot nematode management. The study presented here was focused on testing numerous new hybrid rootstocks available to growers and evaluated in two geographic locations, Florida and Virginia for resistance to tomato bacterial wilt and root-knot nematodes.

Experiments. Field studies were conducted at the University of Florida, North Florida Research and Education Center, Quincy, Florida; and Virginia Tech, Eastern Shore Agricultural Research and Extension Center, Painter, Virginia. In all trials the tomato variety 'BHN 602' (BHN Seed, Immokalee, FL) was used as a scion for grafted treatments as well as the non-grafted and self-grafted control. All trials included non-grafted and self-grafted treatments. **Bacterial wilt trials:** The 2009 spring trial in Virginia included two rootstocks; 'RST-04-105-T' (DP seeds, Yuma, AZ) and 'RST-04-106-T' (DP seeds). The 2010 spring trial in Virginia included six rootstocks; 'RST-04-106-T', 'Cheong Gang' (Seminis Vegetable Seeds, St. Louis, MO), 'Jjak Kkung' (Seminis Vegetable Seeds), 'BHN 998' (BHN Seed), 'BHN 1053' (BHN Seed), and 'BHN 1054' (BHN Seed). The spring 2010 trial in Florida included 'RST-04-106-T', 'Cheong Gang', 'Jjak

Kkung', and 'Hawaii 7998' (Public breeding material, University of Florida). The fall 2010 Florida trial included 'RST-04-106-T', 'Cheong Gang', 'Jjak Kkung', 'BHN 998', 'BHN 1053', 'BHN 1054', and 'Hawaii 7998'. **Root-knot nematode trials.** Two trials were conducted in 2011 in Florida and Virginia. In both the trials the tomato variety 'BHN 602' was used as a scion for grafted treatments. All trials included non-grafted and self-grafted treatments. The 2011 fall trials in Florida and Virginia included three rootstocks; 'RST-04-106-T', 'BHN 998' and 'BHN 1054'.

Bacterial wilt trial findings. The use of rootstocks with resistance to bacterial wilt had a significant effect on tomato fruit yield and bacterial wilt incidence in the conducted field studies. Studies illustrated the benefits of grafting susceptible tomato scions onto resistant hybrid rootstocks when planted into soils heavily infested with *R. solanacearum*. Disease incidence was greatly reduced and tomato fruit yield was maintained at levels acceptable to commercial producers. These data indicate that several commercially available hybrid rootstocks have high levels of bacterial wilt resistance. 'Cheong Gang', 'BHN 1054', and 'BHN 998' were the most adapted rootstocks with respect to bacterial wilt resistance and resulting tomato fruit yield. **Root-knot nematode trial findings.** In the Florida field trials hybrid rootstocks 'RST-04-106-T', 'BHN 998' and 'BHN 1054' had significantly lower Root-Gall-Index (RGI), than self-grafting control and non-grafted 'BHN 602'. There were significant differences in tomato yields of 'BHN 998' and 'BHN 1054' treatments compared to 'self-grafted' and 'non-grafted' treatments. 'RST-04-106-T' did not have a significant yield impact compared to the 'non-grafted control'. In the Virginia trial, there were varying levels of root-knot nematode resistance between rootstocks. Plants grafted on 'RST-04-106-T' had the lowest RGI, followed by 'BHN 998', and 'BHN 1054'. 'BHN 1054' had the highest RGI among rootstocks. There were significant differences in tomato yields between treatments for all yield categories, although yields were very low. All treatments grafted on resistant rootstocks had similar marketable yields. In addition, plants grafted on 'RST-04-106-T' and 'BHN 998' had higher marketable tomato yields than the non-grafted 'BHN 602'.

Conclusion. Studies presented here illustrate the benefits of grafting in reducing bacterial wilt and root-knot nematode damage of a susceptible tomato variety 'BHN 602'. Disease incidence was greatly reduced and tomato fruit yield was effectively maintained using grafting as a management practice. Data indicate that several commercially available hybrid rootstocks have high levels of resistance to bacterial wilt and root-knot nematodes.