UTILIZATION OF GRAFTED TOMATO SEEDLINGS FOR BACTERIAL WILT RESISTANCE IN OPEN FIELD PRODUCTION

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U.S. growers have been dealing with increasing incidence of bacterial wilt (*Ralstonia solanacearum*) as well as other soil-borne diseases in tomato. In many cases decades of monoculture have aggravated the problem and growers often have few methods to deal with these issues. Preliminary research has illustrated the potential for the use of grafted in open field production. These experiments as well as ongoing research focus on the utility and implementation of using grafted tomato seedlings.

Two tomato trials were established during the spring of 2010 that included plants grafted to rootstocks claiming resistance to bacterial wilt. One trial was placed in a commercial tomato field with a high native population of *R. solanacearum* in Painter, VA. The second trial was located in a field that was inoculated at transplanting at the North Florida Research and Education Center (NFREC) in Quincy, FL. In the Florida trial, each plant hole was inoculated with an aqueous solution containing 10^7 cfu/ml of *R. solanacearum* one day prior to transplanting. Seedlings were grafted utilizing a tube graft at the two-leaf stage and healed in a high humidity healing chamber for one week before returning to the greenhouse to harden off. Seedlings remained in the greenhouse for one more week prior to transplanting. Four rootstocks were used in the Florida trial and six were used in the Virginia trial. Grafted seedlings were transplanted into raised beds covered with black polyethylene mulch on 20 April, 2010 in Florida and 30 April, 2010 in Virginia. Experimental plots consisted of a single row 9.1 m long with between-row spacing of 1.8 m and in-row spacing of 45.7 cm. The experiment was arranged as a randomized complete block with four replications. A similar experiment with the exception of the use of white polyethylene mulch was established in Florida and grafted seedlings were transplanted on August 18, 2010. This experiment was place on the NFREC and experimental plots were inoculated with an aqueous of *R. solanacearum* containing 10^7 cfu/ml. Experimental plots were maintained throughout the season with standard crop protection practices for commercial tomato production. Tomato fruit were harvested at maturation and graded by U.S. Dept. Agr. Grades.

RESULTS AND DISCUSSION

Rootstock had a significant effect on bacterial wilt incidence and tomato fruit yield at both trial locations. Disease incidence was highest in the un-grafted entry in the Florida trial and in the self-grafted entry in the Virginia trial. Disease

incidence was severe in the Virginia trial and differences were observed in disease resistance between rootstocks. Plants grafted onto 'BHN 1054', 'Cheong Gang', 'BHN 998', and 'RST 106' exhibited the highest level of disease resistance. These entries also were among the greatest producers of tomato fruit. Plants grafted to 'RST 106', 'Jjak Kkung', and 'Cheong Gang' yielded significantly greater than un-grafted 'BHN 602' in the Florida trial despite low disease incidence. All entries grafted onto resistant rootstocks exhibited less disease incidence compared to the un-grafted and self-grafted entries in Florida. There were no differences in disease resistance between rootstocks. In both locations the greatest numerical yield was obtained from 'BHN 602' grafted to 'RST 106'. Though the differences were not significant this trend was also observed in a grafting trial performed in Virginia in 2009 (data not presented). Tomato fruit yield from plants grafted to 'Hawaii 7998' was among the lowest in the Florida trial. The difference was not significant but this data suggests that there may be a benefit from hybrid rootstocks. Data from the fall trial will be presented in November. These trials illustrate that bacterial wilt can be managed with hybrid rootstocks in open field production. These trials also suggest that overall tomato yield may also be increased by the use of hybrid rootstocks. Although the cost of grafted tomato plants may be substantial, they would likely be economically beneficial when *R. solanacearum* populations are high in the soil.

Literature Cited

Rivard, C.L. and Louws, F.J. 2008. Grafting to manage soilborne diseases in heirloom tomato production. Hortsci. 43:2104-2111.

Table 1. Performance of tomato seedlings grafted onto rootstocks claiming bacterial wilt resistance in open field production. The trial area was located in a field naturally infested with bacterial wilt in Painter, Virginia, USA. Experiments were performed during the spring of 2010.

Entry	Yield (kg/ha)				Bacterial wilt incidence % mortality
	Medium	Large	Extra large	Total marketable yield	
BHN 602 / RST 106	5133 a [1]	19173 a	56105 ab	80450 a	13.0 c
BHN 602 / BHN 1054	5420 a	16370 ab	58110 ab	79951 a	5.0 c
BHN 602 / Cheong Gang	4108 ab	14207 bc	60604 a	78926 a	6.5 c
BHN 602 / BHN 998	4645 a	15313 bc	55617 ab	74308 ab	10.5 c
BHN 602 / BHN 1053	2455 b	9849 c	46553 ab	58864 ab	43.5 b
BHN 602 / Jjak Kkung	4352 ab	9952 c	35815 b	50126 b	56.0 ab
BHN 602 un-grafted	474 c	1935 d	13958 c	16370 c	85.5 ab
BHN 602 / BHN 602	0 c	0 d	0 c	0 c	97.0 a

[1] Means not followed by the same letter are not significantly different at $P \leq 0.05$ by Duncan's multiple range test.

Table 2. Performance of tomato seedlings grafted onto rootstocks claiming bacterial wilt resistance in open field production. The trial area was located in a field inoculated with bacterial wilt in Quincy, Florida, USA. Experiments were performed during the spring of 2010.

Entry	Yield (kg/ha)				Bacterial wilt incidence % mortality
	Medium	Large	Extra large	Total marketable yield	
BHN 602/ RST 106	4022 b[1]	10065 b	40840 a	54927 a	0.0 c
BHN 602/ Cheong Gang	4171 ab	11895 a	36129 ab	52195 a	0.0 c
BHN 602/ Jjak Kkung	4575 ab	10170 ab	36049 ab	50794 a	0.0 c
BHN 602/ BHN 602	5162 ab	8179 c	33532 ab	46874 ab	2.7 b
BHN 602/ Hawaii 7998	6019 a	9682 bc	30164 b	45865 ab	0.0 c
BHN 602 un-grafted	3589 b	8567 bc	28263 b	40419 b	7.5 a

[1] Means followed by the same letter are not significantly different at $P \leq 0.05$ by Duncan's multiple range test.