MANAGING BACTERIAL WILT OF TOMATO WITH GRAFTING IN NORTH CAROLINA

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Bacterial wilt is a common disease of tomato in North Carolina causing up to 30% annual loss in established tomato production fields. Bacterial wilt is caused by *Ralstonia solanacearum*, a soil borne bacterium ubiquitous in the southeastern United States. Managing this disease requires an integrated approach due to the indigenous nature of the pathogen in the soil. Grafting with disease resistant rootstocks is an old technique with new technologies that has reemerged in recent years. Our research is focused on evaluating disease resistant rootstocks under bacterial wilt disease pressure in on-farm trials across North Carolina. The aim of the evaluations is to develop better grafting rootstock recommendations for NC tomato growers to reduce yield loss and impact from this disease.

Grafting was conducted using the splice tube grafting method developed in Japan. Rootstocks and scion seedlings were grown at the same time in greenhouse conditions during the spring. Three weeks after germination the stems of the seedlings are 2mm diameter and ready for grafting. The graft union is held by the clip where good contact of scion and rootstock is visible within the clear silicon clip. Grafted plants are then healed in a humidity chamber for 7-10 days with low light, high humidity and cool temperatures. Plants are weaned back to standard growth condition after 10 days and return to the greenhouse to harden off before field transplant.

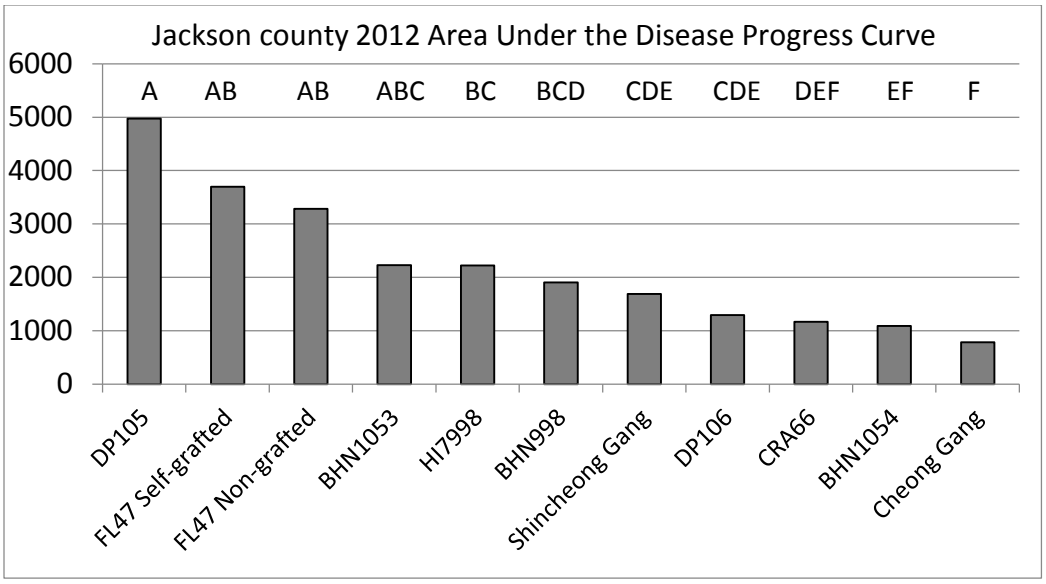
Four field trials were conducted 2012- 2013 summer seasons in three on-farm field locations across NC including Jackson county, Sampson county and Wake county. These trial locations were selected based on previous identified bacterial wilt pressure. Rootstocks and treatments in the experiments included: CRA66, HI7997, HI7998, DP105, DP106, BHN998, BHN1053, BHN1054, Shincheong gang, Cheong gang, Maxifort, Non-grafted and Self-grafted susceptible scion cultivar Florida 47. ‘Fletcher’ scion was selected by the Sampson county cooperator and used for the Sampson county trial. Field plots were organized in a complete random block design with 4 replicated plots per treatment per field

experiment. Grafting survival rate impacted the number of plants/plot and due to the reduced survival rate pre-transplant some treatments did not have 10 plants/plot desired for all experiments.

Plants were maintained post-transplant with stakes and were trained with 4-5 rows of twine during the growing season. Plants were maintained according to grower's management and fertilizer schedule. Transplant survival, plant height, plot vigor, disease incidence and survival were recorded during the growing season. Harvest was conducted on the plots and sorted according to grower specifications for marketability based on size, appearance and weight.

Trials conducted in Sampson county 2012 and Wake county 2013 did not have high bacterial wilt disease pressure but provide insight to the benefit of grafting in the absence of disease pressure. Sampson county 2012 trial produced relatively high yield even though the field was hit by Southern stem blight caused by *Sclerotium rolfsii*. Wake county 2013 trial was infected by soft rot and in the absence of bacterial wilt the yields from this trial were also relatively unaffected. Jackson county 2012 and 2013 trials were under high disease pressure and proved informative on the resistance of several rootstocks. Treatments with the highest level of disease in 2012 included DP105, Non-grafted and self-grafted controls. The 2012 treatments with the lowest levels of disease were Cheong gang, BHN1054, CRA66 and DP106. These four treatments also yielded well in the presence of bacterial wilt pressure with 62, 34, 24 and 30t/ha, respectively. In 2013 the same treatments exhibited low bacterial wilt incidence with the least incidence found in treatments CRA66, DP106, HI7997, Cheong gang, HI7998, and BHN1054. The treatments in 2013 with the highest disease incidence were DP105, Maxifort and the non-grafted and self-grafted controls. The highest yielding treatments in the 2013 trial of Jackson county were Cheong gang, DP106, CRA66 and BHN1054 with 63, 59, 55, and 46 t/ha, respectively.

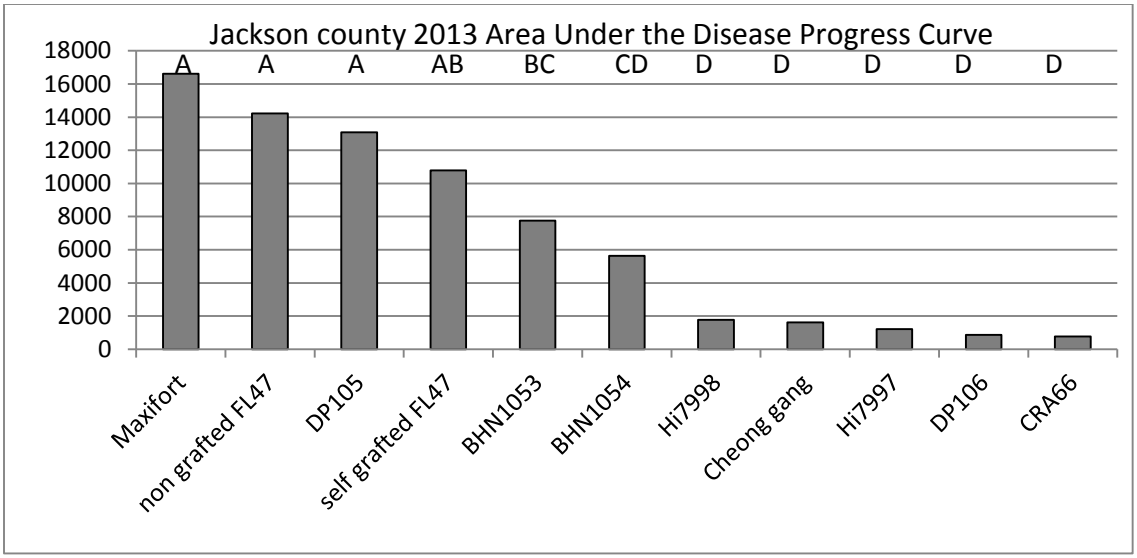
Higher yield was observed in grafted rootstock treatments compared to non-grafted controls in the presence of disease. Grafting was beneficial even in the absence of disease pressure with high yields collected across all grafted treatments. In the presence of disease a higher survival rate is accompanied with higher yield. Grafting alone is not sufficient to manage bacterial wilt in tomatoes. Grafting can be used to reduce bacterial wilt in tomatoes when coupled with host resistant rootstocks. We recommend Nc growers use DP106, Cheong gang, and BHN1054 rootstocks in a resistance rotation to help reduce bacterial wilt disease.



Disease Progress	2012	Jackson	county	NC		
DPT	**0**	**18**	**30**	**46**	**60**	**74**
Treatment	(%) Wilt	(%) Wilt	(%) Wilt	(%) Wilt	(%) Wilt	(%) Wilt
FL47 Non-grafted	0	12.5	25	52.5	90	100
FL47 Self-grafted	0	15	30	75	87.5	100
CRA66	0	3.5	7	17.75	32	42.75
HI7998	0	15	15	35	60	60
BHN998	0	5	20	45	40	45
BHN1053	0	15.5	18.75	40.75	53.5	53.5
BHN1054	0	2.5	7.5	20	30	32.5
DP105	0	45.75	62.5	87.5	100	100
DP106	0	0	7.5	30	35	35
Shincheong Gang	0	3	6	31	43.75	69
Cheong Gang	0	0	2.5	15	25	25

Yield 2012 Jackson county NC

Rank	Treatment	tons/ha	standard error
1	Cheong gang	62.00659097	17.6
2	BHN1054	34.2387517	9.53
3	DP106	30.4869349	6.77
4	CRA66	24.08192406	5.78
5	Shincheong gang	22.65920837	6.5
6	BHN998	14.25470916	6.57
7	BHN1053	13.62849787	4.65
8	HI7998	12.44196036	5.38
9	DP105	4.394524162	3.25
10	Non-grafted Florida 47	1.3448182	1.35
11	Self grafted Florida 47	0.79650716	0.8



Disease Progress	2013	Jackson	county	NC				
DPT	**0**	**14**	**21**	**28**	**36**	**42**	**56**	**77**
Treatment	% wilt	% wilt	% wilt	% wilt	% wilt	% wilt	% wilt	% wilt
non grafted FL47	0	2.5	27.50	50.00	60.00	62.50	67.50	70.00
self grafted FL47	0	2.5	17.50	42.50	52.50	52.50	62.50	62.50
CRA66	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.50
Hi7997	0	2.5	2.50	5.00	5.00	5.00	5.00	7.50
Maxifort	0	7.5	32.50	55.00	75.00	75.00	77.50	77.50
BHN1053	0	5	17.50	25.00	35.00	35.00	37.50	37.50
BHN1054	0	10	15.00	17.50	17.50	17.50	27.50	27.50
DP105	0	17.5	27.50	32.50	52.50	52.50	65.00	65.00
DP106	0	0	2.50	2.50	2.50	2.50	5.00	5.00
Hi7998	0	2.5	5.00	5.00	7.50	7.50	7.50	10.00
Cheong gang	0	0	0.00	5.00	7.50	7.50	7.50	10.00

Yield 2013 Jackson County

Rank	Treatment	tons/ha	Standard error
1	Cheong gang	63.545	5.27
2	DP106	59.3	1.86
3	CRA66	54.9	4.36
4	BHN1054	45.87	8.06
5	BHN1053	36.9	5
6	Hi7997	23.8	4.44
7	Self- grafted 'FL47'	22.95	6.37
8	Hi7998	22.6	4.9
9	Non- grafted 'FL47'	16.2	2.06
10	Maxifort	14.25	5.88
11	DP105	5.85	1.27