Comparison of three transgenic peanut lines with improved Sclerotinia blight (*Sclerotinia minor* Jagger) resistance with their parents for agronomic and physiological characteristics

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- **Peanut (*Arachis hypogea* L.) is an important cash crop in the Virginia-Carolina (VC) region, but cool and wet falls may result in significant yield reductions due to Sclerotinia blight, caused by *Sclerotinia minor* Jagger, a major disease in the region. Transgenic lines expressing a barley oxalate oxidase were previously shown to provide improved resistance (Livingstone *et al*., 2005; Partridge-Telenko *et al*., 2011).**

- **<u>The objective</u> of this research was to compare N70, P39, and W73 transgenic lines for oxalate oxidase with their non-transgenic parents, NC 7, Perry, and Wilson for yield, grading factors, and physiology. They were further compared with Bailey, the most popular peanut cultivar grown in the VC region with partial resistance to Sclerotinia blight, and with CHAMPS, a sensitive cultivar to this disease.**

- **<u>Materials and methods</u> consisted in evaluations of developmental stages (Boote, 1982), canopy temperature differential (CTD; T_c-T_a), Tomato spotted wilt virus and Sclerotinia blight incidence, pod yield and brightness, and grading traits, i.e., % extra large kernels (ELK), % sound mature kernels (SMK), % damaged kernels (DK), % sound split kernels (SS), and % total meat (TM).**
- **Replicated 8.8 m^2 plots were planted at Holland, VA, in 2009 and 2010.**
- **ANOVA and Tukey HSD were used in GLM procedure of SYSTAT 12.**

<u>Results</u> showed that in absence of disease and any biotic and abiotic stress (Table 1) the transgenic lines were statistically comparable with their parents, Bailey, and CHAMPS for pod yield (Table 2), maturity, gross value, and pod brightness (data not shown).

Table 1. Tomato spotted wilt virus, Sclerotinia blight incidence, and canopy temperature differential of three virginia-type transgenic lines (N70, P39 and W73), their non-transgenic parents (NC 7, Perry, and Wilson), and CHAMPS and Bailey cultivars averaged (8 replications) in 2009 and 2010.

Genotype	Tomato spotted wilt		Sclerotinia blight		CTD (T_{canopy} – T_{air})	
					°C	
	2009	2010	2009	2010	June 2010	Sep 2010
Bailey	1.00 a	0.00 a	0.00 a	1.13 a	0.58 a	1.63 a
CHAMPS	2.25 a	0.13 a	0.38 a	2.25 a	1.51 a	2.29 a
N70	4.13 a	0.50 a	0.00 a	1.75 a	1.48 a	1.77 a
NC-7	3.75 a	0.00 a	0.25 a	4.13 a	1.99 a	2.24 a
P39	2.75 a	0.13 a	0.25 a	3.00 a	2.07 a	1.47 a
Perry	2.75 a	0.00 a	0.13 a	2.63 a	1.81 a	2.15 a
W73	2.13 a	0.00 a	0.00 a	1.29 a	1.38 a	1.99 a
Wilson	1.13 a	0.13 a	0.25 a	3.00 a	1.56 a	2.12 a
Mean	2.48	0.11	0.16	2.41	1.55	1.96
Tukey-HSD$_{0.05}$	3.25	0.56	0.39	3.20	2.93	2.26
P-level	0.037	0.093	0.148	0.083	0.829	0.920

P39 consistently showed less ELK and jumbo pod content than Perry and the other genotypes. N70 and NC 7, on the other hand, had the highest ELK (Table 2) and Jumbo pod content (data not shown).

Table 2. Pod yield, the sound mature kernels (SMK), extra-large kernels (ELK), damaged kernels (DK), sound split kernels (SS), and total meat (TM) of three virginia-type transgenic lines (N70, P39 and W73), their non-transgenic parents (NC 7, Perry, and Wilson), and CHAMPS and Bailey cultivars averaged (8 replications) in 2009 and 2010.

Genotype	Pod yield	SMK	ELK	DK	SS	Total meat	Pod yield	SMK	ELK	DK	SS	Total meat
	kg ha^{-1}	%					kg ha^{-1}	%				
	2009						2010					
Bailey	5632 a	65.70 ab	43.63 bc	1.50 a	1.80 ab	73.05 a	4793 a	64.81 bc	39.50 ab	2.68 ab	3.45 a	72.39 ab
CHAMPS	6115 a	67.10 a	42.75 b-d	1.63 a	2.05 ab	73.70 a	4279 ab	62.69 cd	36.63 ab	3.59 a	2.10 ab	70.30 bc
N70	5959 a	67.69 a	46.63 ab	1.35 a	1.26 b	72.51 a	3842 ab	67.79 ab	44.50 a	1.44 b	1.63 ab	71.81 b
NC-7	6171 a	66.85 a	51.00 a	1.61 a	1.75 ab	73.11 a	4203 ab	65.49 a-c	42.13 a	2.53 ab	2.69 ab	71.91 b
P39	5522 a	65.23 ab	33.25 e	1.26 a	1.89 ab	72.71 a	3895 ab	69.58 a	35.50 ab	1.84 b	1.28 b	74.36 a
Perry	5775 a	64.55 ab	42.75 b-d	2.04 a	2.61 a	73.01 a	3686 b	64.90 bc	39.75 ab	3.55 a	2.15 ab	72.18 b
W73	6240 a	64.13 ab	39.13 cd	1.34 a	1.50 b	70.19 b	4374 ab	61.70 cd	31.38 b	2.24 ab	1.21 b	67.61 d
Wilson	5936 a	62.55 b	37.25 de	2.20 a	1.45 b	70.11 b	4399 ab	59.56 d	32.38 b	3.73 a	2.94 ab	68.19 cd
Mean	5919	65.47	42.05	1.62	1.79	72.30	4184	64.60	37.72	2.70	2.18	71.09
P-level	0.151	0.001	<.0001	0.521	0.007	<.0001	0.027	<.0001	0.0004	<.0001	0.008	<.0001

<u>In conclusion</u>, our data suggest that overall the transgenic lines had similar yield and grading characteristics with their parents, Bailey, and CHAMPS, which indicates their suitability for commercial production in the VC region.

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References:

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