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National Peanut Board / Southeast Peanut Research Initiative – Executive Summary for 2017 NPB Project # 457, entitled “Evaluation of weed control and injury to peanut cultivars with paraquat in various herbicide combinations in irrigated vs non-irrigated conditions” – Univ. of Georgia, by R. Scott Tubbs.

Many weed control programs for peanut include paraquat (Gramoxone) as a postemergent (POST) herbicide. Paraquat is used in tank-mixtures with other herbicides to broaden the weed control spectrum. While the use of paraquat is common, the introduction of new peanut cultivars calls for more information on their tolerance when paraquat is applied alone and in tank-mixtures. Even with nearly half of the state growing peanut in rainfed conditions, there is little information available on the effects irrigation has on peanut injury from paraquat. The use of safeners in tank-mixtures has been shown to reduce phytotoxicity. This research project is designed to highlight paraquat’s efficiency in weed control and provide insight into herbicidal injury in irrigated and non-irrigated situations for current high-yield potential cultivars that have not been previously tested for their tolerance to paraquat.

Irrigated and rainfed experiments were planted near Ty Ty, GA and Plains, GA. Six herbicide treatments included 1) Prowl + Valor (PRE) followed by Gramoxone alone (POST), 2) Prowl + Valor (PRE) followed by Gramoxone + Storm (POST), 3) Prowl + Valor (PRE) followed by Gramoxone + Storm + Dual Magnum (POST), 4) Prowl + Valor (PRE) followed by Gramoxone + Storm + Warrant (POST), 5) Prowl + Valor (PRE) only, and 6) non-treated check (handweeding only). Cultivars included 1) Georgia-06G, 2) Georgia-14N, and 3) TUFRunner™ ‘511’ at the Ty Ty location, and those three plus a fourth (FloRun™ ‘157’) at the Plains location.

Injury from all herbicide treatments decreased over time for both experiments, showing the peanut crop’s ability to recover from paraquat injury. Including Storm in the tank-mixture with paraquat reduced visible injury to peanut. Grade variation between irrigated and rainfed trials demonstrates that water is certainly a limiting factor. These trials demonstrated that FloRun™ ‘157’ does not appear to be a competitive cultivar in Georgia compared to what is already commercially available. Georgia-06G and TUFRunner™ ‘511’ were the most consistent cultivars in producing good yield and grade. With the given supporting data, the use of the herbicide tank-mixtures from these experiments can be recommended with the given runner-type peanut cultivars without fear of negative yield impact for irrigated and non-irrigated peanut.

Data related to this project were presented at the 2018 American Peanut Research and Education Society meeting in July 2018, the 2017 Southern Weed Science Society meeting in February 2017, at the 2017 ASA, CSSA, and SSSA International Meeting in October 2017, and the 2016 Sigma Xi Research Conference in November of 2016. The lead graduate student on this project (Ms. Kayla Eason) placed 2nd at the American Peanut Research and Education Society meeting in the Joe Sugg Graduate Student Competition, 1st place in the C3 Division – Graduate Student Poster competition at the 2017 ASA, CSSA, and SSSA international meeting, and 1st place in the Agricultural, Soil, and Natural Resources Division at the Sigma Xi Student Research Conference, a national competition.

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NATIONAL PEANUT BOARD / SOUTHEAST PEANUT RESEARCH INITIATIVE

Summary
FINAL REPORT – 2017 funding cycle for work done under project agreement entitled:
“Evaluation of weed control and injury to peanut cultivars with paraquat in various herbicide combinations in irrigated vs non-irrigated conditions”.

Proj ID # 457
NPB Budget ID # 1535
SID # GA-176
UGA Account #2521RF328167

INSTITUTION: University of Georgia
Principle Investigator: Dr. R. Scott Tubbs
EXPIRATION DATE: 30 June 2018
SPRI CONTACT: Joy Purvis, Hannah Jones
NPB CONTACT: Bob Parker

Final Report: In 2017, approximately half of the state’s peanut production was non-irrigated. In the Southeast, weed control programs for peanut include paraquat (Gramoxone) as a postemergent (POST) herbicide. Paraquat is used in tank-mixtures with other herbicides to broaden the weed control spectrum. While the use of paraquat is common, the introduction of new peanut cultivars calls for more information on their tolerance when paraquat is applied alone and in tank-mixtures. Even with nearly half of the state growing peanut in rainfed conditions, there is little information available on the effects irrigation has on peanut injury from paraquat. Paraquat is known to cause injury to peanut foliage; however cultivars have been able to overcome the foliar damage without loss of yield or grade. The use of safeners in tank-mixtures has been shown to reduce phytotoxicity. This research project is designed to highlight paraquat’s efficiency in weed control and provide insight into herbicidal injury in irrigated and non-irrigated situations for current high-yield potential cultivars that have not been previously tested for their tolerance to paraquat.

Experiments were planted at the University of Georgia’s Ponder Farm near Ty Ty, GA and the Southwest GA Research and Extension Center in Plains, GA. At each location two trials were conducted, one irrigated and one rainfed. A split-plot design with main plot effects in a randomized complete block with 4 replications was used. The main-plot treatment effect was herbicide treatments. Six herbicide treatments included 1) Prowl + Valor (PRE) followed by Gramoxone alone (POST), 2) Prowl + Valor (PRE) followed by Gramoxone + Storm (POST), 3) Prowl + Valor (PRE) followed by Gramoxone + Storm + Dual Magnum (POST), 4) Prowl + Valor (PRE) followed by Gramoxone + Storm + Warrant (POST), 5) Prowl + Valor (PRE) only, and 6) non-treated check (handweeding only). The sub-plot effect of cultivars included 1) Georgia-06G, 2) Georgia-14N, and 3) TUF-Runner™ ‘511’ at the Ty Ty location, and those

three plus a fourth (FloRun™ ‘157’) at the Plains location. Planting, digging, and harvest date information are presented in Tables 1 and 3.

Irrigated Trial – There were no interactions between herbicide and cultivar. Herbicide treatment did not have a significant effect on grade. Cultivar only had a significant effect on yield and grade. Leaf burn and stunting reduced over time across all herbicide treatments. Including storm in the tank-mixture with paraquat significantly reduced leaf burn at 3 and 7 days after treatment. By 14 days after treatment, all herbicide treatments showed less than 3% injury. Overall, there were negligible differences in vegetative injury between warrant and dual magnum. For yield, gramoxone was no different than the control (Table 2). Georgia-06G and TUF-Runner™ ‘511’ yielded more than Georgia-14N and FloRun™ ‘157’. FloRun™ ‘157’ had the lowest grade.

Table 1. Planting, digging, and harvest dates for irrigated paraquat tank-mixture trials at Ty Ty and Plains, GA in 2016 and 2017.

	Ty Ty, GA		Plains, GA	
	2016	2017	2016	2017
Planting	May 12, 2016	May 30, 2017	May 16, 2016	May 2, 2017
Digging	Oct. 7, 2016	Oct. 17, 2017	Oct. 12, 2016	Sept. 27, 2017
Harvest	Oct. 11, 2016	Oct. 27, 2017	Oct. 17, 2016	Oct. 4, 2017

Table 2. Peanut yield (kg/ha) and grade (% TSMK) for irrigated peanut herbicide treatments and cultivars at Plains, GA and Ty Ty, GA for 2016 and 2017. Means within a column not followed by the same letter are significantly different at P = 0.05 level.

	Yield	Grade
— Herbicide Treatment —	— kg/ha —	— % TSMK —
Gramoxone	4850 b	NS
Gramoxone + Storm	5065 ab	NS
Gramoxone + Storm + Warrant	5170 ab	NS
Gramoxone + Storm + Dual Magnum	5320 a	NS
PRE	5250 ab	NS
NTC	4680 b	NS
— Cultivar —	— kg/ha —	— % TSMK —
Georgia-06G	5310 a	73 a
Georgia-14N	4820 b	73 a
TUF-Runner ‘511’	5380 a	73 a
FloRun™ ‘157’	4720 b	71 b

^a Abbreviations: PRE, preemergence; NTC, nontreated control; NS, not significant.

Rainfed Trial - There were no significant interactions between herbicide and cultivar effects for any variable. Herbicide treatment was significant for all injury (leaf burn and stunting) ratings but not yield or grade. No differences were observed for injury ratings for the cultivar treatment effect, but there were differences for yield and grade. Overall, including storm in the tank-mixture resulted in a reduction in injury and stunting when compared to gramoxone alone. By the final injury rating (14 days after treatment), herbicide treatments including storm had less than 5% stunting while gramoxone treated peanuts still had a 15% reduction in size. Herbicide treatment had no effect on yield or grade though. TUFRunner™ ‘511’ yielded more than Georgia-14N and FloRun™ ‘157’, which is similar to the irrigated trial (Table 4). TUFRunner™ ‘511’ and Georgia-14N had better % TSMK than Georgia-06G.

Table 3. Planting, digging, and harvest dates for rainfed paraquat tank-mixture trials at Ty Ty and Plains, GA in 2016 and 2017.

	Ty Ty, GA		Plains, GA	
	2016	2017	2016	2017
Planting	May 11, 2016	May 30, 2017	May 16, 2016	May 2, 2017
Digging	Oct. 18, 2016	Oct. 20, 2017	Oct. 18, 2016	Sept. 27, 2017
Harvest	Oct. 21, 2016	Oct. 27, 2017	Oct. 24, 2016	Oct. 4, 2017

Table 4. Peanut yield (kg/ha) and grade (% TSMK) for rainfed peanut cultivars at Plains, GA and Ty Ty, GA for 2016 and 2017. Means within a column not followed by the same letter are significantly different at P = 0.05 level.

— Cultivar —	Yield	Grade
	— kg/ha —	— % TSMK —
Georgia-06G	3506 ab	65 a
Georgia-14N	3268 b	63 b
TUF-Runner ‘511’	3643 a	66 a
FloRun™ ‘157’	3147 b	64 ab

^a Abbreviations: PRE, preemergence; NTC, nontreated control; NS, not significant.

Summary – Injury from all herbicide treatments decreased over time for both experiments, showing the peanut crop’s ability to recover from paraquat injury. Including storm in the tank-mixture with paraquat reduced visible injury to peanut. Grade variation between irrigated and rainfed trials demonstrates that water is certainly a limiting factor. These trials did demonstrate that FloRun™ ‘157’ does not appear to be a competitive cultivar in Georgia compared to what is already commercially available. Georgia-06G and TUF-Runner™ ‘511’ were the most consistent cultivars in producing good yield and grade. With the given supporting data, the use of the herbicide tank-mixtures from these experiments can be recommended with the given runner-type peanut cultivars without fear of negative yield impact for irrigated and non-irrigated peanut.

Presentation of data - Data related to this project was presented at the 2018 American Peanut Research and Education Society meeting in July 2018, the 2017 Southern Weed Science Society meeting in February 2017, at the 2017 ASA, CSSA, and SSSA International Meeting in October 2017, and the 2016 Sigma Xi Research Conference in November of 2016. The lead graduate student on this project (Ms. Kayla Eason) placed 2nd at the American Peanut Research and Education Society meeting in the Joe Sugg Graduate Student Competition. She also was awarded 1st place in the C3 Division – Graduate Student Poster competition at the 2017 ASA, CSSA, and SSSA international meeting. Finally, she was awarded 1st place in the Agricultural, Soil, and Natural Resources Division at the Sigma Xi Student Research Conference, a national competition.