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2010 Southeastern Peanut Research Initiative
Final Report

Title: Influence of harvest date and maturity profile on peanut seed germination and vigor

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Over the past 20 years, enhanced efforts have been made to develop peanut cultivars that are resistant to tomato spotted wilt virus, leaf spot, and other diseases. The resulting cultivars possess a striking level of resistance to these diseases while also showing excellent yield potential. Many of these cultivars were developed from PI 203396, an early peanut introduction, including C99-R, DP-1, Georgia Green, Georgia-01R, and more recently Georgia-06G). Although these cultivars share many impressive agronomic characteristics, some share the commonly reported problem of poor germination and emergence after planting, most notably DP-1, Georgia-01R, and Georgia-06G (to lesser extent). Due to this flaw, many promising cultivars have been discarded before having the opportunity to positively impact southeastern peanut production.

The reason (or reasons) for poor germination and emergence are not fully understood. Recent research has shown that these cultivars have specific storage and handling requirements. But this fact alone doesn't fully explain the field level inconsistency that is commonly observed. Calcium is known to cause poor germination and many controlled experiments have demonstrated the link between calcium deficiency and poor pod development. However, the link between soil test calcium and pod available calcium has not been demonstrated successfully, leading some to believe that calcium is not the single factor effecting germination either. Another theory is that the cultivars under question are not allowed to fully mature in the field prior to harvest. The more problematic cultivars such as DP-1 and Georgia-01R are known to be late-maturing, as much as 3 to 4 weeks later than the industry standard Georgia Green. Late plantings, poor weather, and general mis-management could lead to premature digging of these cultivars. High yields and good grades are misleading as to the actual maturity of the resulting seed of these late maturing cultivars. Lack of full maturity often does not impact baseline germination, but seedling vigor may be greatly compromised.

Pod blasting and color profiling peanut maturity has been widely accepted across the southeast to target optimum harvest timing. This process is scientifically sound and provides volumes of data with regard to peanut physiology. However, the assumption of this procedure is that all peanuts mature at the same rate and in the same way. The profile board was developed using 'Florunner' and seems to match the maturity status of mid-maturing cultivars (Georgia Green) very well. The profile board does not as accurately predict the best digging date of later-maturing cultivars due to the less determinant growth habit. This could lead seed producers to dig too early, thereby compromising seed quality.

Therefore, experiments were conducted to determine the relationship between harvest date and pod color, yield, grade, and seedling vigor.

Materials and Methods

Three peanut cultivars (Georgia-06G, York, and Georgia Green) were planted the last week of April in Gainesville, FL. All plots were managed according to standard fungicide and fertility practices and maintained weed free throughout the season. Then starting at 120 days after planting, peanuts were harvested at 7 day intervals from through 155 days. With each harvest, 5-10 plants were randomly selected for maturity profiling. Pods were

blasted with a pressure washer and laid on the profile board according to color class. The traditional color board allows, and suggests, that black pods can be moved from one class to another to ensure that the slope relative to "days to digging" will be achieved. For these experiments, no pods were moved and "days to digging" was determined by the last category containing 3 or more pods. Additionally, all pods from each class were counted and a ratio of brown/black pods, relative to all pods, was determined. This was done to determine if this method, which is simpler and faster than the board methods, would be indicative to optimum yield and grade.

Each plot was harvested for yield determination and samples dried to 9% moisture. A sample was collected (approx. 3 lbs) for official grade determination. In addition, a sample of pods was collected, shelled, and approx. one lb of medium-sized seed were tested for seed quality (germination and vigor). Each maturity profile will then be matched against optimum harvest yield and seed quality. This experiment was conducted with 6 replications to minimize inherent variability.

Results

GA 06G is considered a mid-maturity cultivar, which was not necessarily validated in Table 1. Yield from 06G reached the numerical maximum yield at 148 d, however, this was not significantly greater than yields obtained at 134 d. The color profile board ranged between 12 d (at 134 d after planting) to 5 d (at 155 d after planting). No significant differences were detected for GA 06G yield or crop value, regardless of digging time. This was surprising, but a large degree of variability was observed between reps for this cultivar. We knew that variability can be problematic in peanuts, thus we employed 6 replications to mitigate these effects. Regardless, since yield did not vary with respect to digging time, it doesn't appear that the color profile board was either inhibitory or beneficial.

GaGreen, also a mid-maturity cultivar, followed a more typical pattern of yield and value with respect to digging date. The highest yields were observed at 134 d after planting, which then dropped off precipitously at 155 d. Peanuts dug at 120 or 155 d had lower yields than those dug at 134 d. But it should be noted that the profile board did not accurately predict the highest yield. At 134 d, the profile board suggested waiting an additional 9 days until digging. Additional digging times were accomplished near this prediction of 144 d, but found no statistical reduction in yield or crop value over the 134 d timing. Although the profile board did not predict the optimum digging date, it was not inhibitory to overall crop value or yield.

For both GaGreen and GA 06G, the % brown/black pods (relative to total pods) provides an interesting contrast to the profile board. Two separate individuals will often place the same set of pods in different columns as it can be difficult to agree on the degree of "blackness" on a given pod. However, agreement that a pod is brown, black, or other is easier to settle upon. For both of these cultivars, a brown/black ratio of 60-73% coincided with the highest levels of yield. It is possible that this simple technique, which is likely more reliable and rapid than the traditional profile board, is a simple and powerful alternative.

York, which is considered a late-maturity cultivar, had the greatest yield response relative to digging date. This was expected since it is the latest maturing entry in this test. The profile board predicted the proper digging date fairly well with 3 d occurring at both 148 and 155 days. Surprisingly, the brown/black ratio never reached 60%, even at the latest digging date. Considering that yield consistently increased with each week, and that this is a late cultivar, it is questioned if optimum yield was obtained with York. If additional dates were included and the brown/black ratio of >60% was achieved, it is unknown how yield would have been affected. But regardless of digging date, TSMK was surprisingly low.

One of the key questions for this project was how digging date affected seed germination and quality. It has been our hypothesis that the poor emergence characteristics from some cultivars is potentially due to early harvest dates when the peanut kernels are not totally mature. Although germination may be high, the immature kernel may not have sufficient vigor to emerge consistently. Regrettably, this objective was not accomplished. These data were being collected at the USDA National Peanut Lab and was nearing completion when budget reductions led to staff reductions. The principle collaborator has since been reassigned and the data set is not available.

Table 1. Relationship between peanut harvest time, projected time of harvest and peanut yield/grade.

	harvest (days)	projected days until dig[a]	% brown/black	Yield[b]	TSMK	Value $/A[c]
GA06G	120	14	43	4163 a	74.7	637 a
	127	17	40	4301 a	74.5	649 a
	134	12	55	4916 a	75.7	742 a
	141	8	58	4900 a	76.3	895 a
	148	3	64	5238 a	77.5	979 a
	155	5	65	5161 a	77.7	803 a
Ga Green	120	7	51	4800 b	75.7	878 b
	127	7	60	4992 ab	76.1	769 ab
	134	9	63	5338 a	77.2	991 a
	141	4	69	5184 ab	76.2	950 ab
	148	4	73	4928 ab	77.8	927ab
	155	5	75	3648 c	76.2	437 c
York	120	10	36	3226 e	68.3	539 b
	127	14	41	3725 d	70.3	637 b
	134	8	47	4211 c	70	799 a
	141	9	49	4672 b	71.3	802 a
	148	3	55	4506 bc	71.5	783 a
	155	3	54	5466 a	69.5	914 a

[a]Projected days to harvest as determined by the color profile board.
[b]Yield is represented as ± the standard error of the mean.
[c]Crop value as calculated by USDA metric considering a market price of $355/ton. Yield, production cost, and all grade factors were used to determine this value.