Yield and Plant Growth Response of Peanut to Midseason Forage Harvest

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Introduction

Peanut (*Arachis hypogaea* L.) is mainly harvested for the edible legume (kernel) which is used extensively for human consumption. The foliage by-product is returned back to the soil as organic matter or baled, stored, and fed to cattle as a feed supplement. Irrigated and non-irrigated peanut in the southeast can have excessive vine growth such that rows cannot be distinguished at harvest resulting in yield loss due to digging inefficiencies. Application of the plant growth regulator Prohexadione Calcium (PHDC: Ca salt of 3, 5-dioxo-4-propionylcyclohexanecarboxylic acid) can reduce internode length thereby reducing plant canopy size without reducing photosynthetic area and yield. Peanut leaf defoliation during the growing season can occur as a result of biological and mechanical damage. Loss of leaf area will reduce transpirative area which may have a negative effect on plant responses such as reproduction, pod set, and eventual pod yield and quality. There are currently no models relating loss of plant foliage to peanut pod yield or grade especially when foliage is removed by mechanical means.

Objectives

- Measure total mass of foliage removed from a traditional peanut crop
- Determine pod yield and grade response to mechanical mid-season forage removal
- Document the economic revenue of peanut with and without forage removal.

Materials and Methods

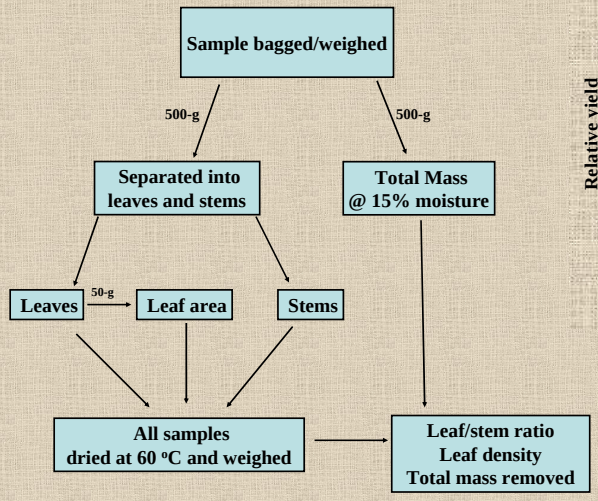
- Sasser, GA – 2005 and 2006; Clean tilled – cultivar 'Georgia green'
- Planted 01 to 06 May; Harvested 12 to 29 September, 2005 and 2006, respectively
- Row center 0.91-m – planted using twin-row orientation
- Weed/disease control was according to accepted BMP by Univ. of GA
- Peanut foliage removed at 20-cm height using power hedge trimmer
- PHDC applied twice at recommended rates
- Irrigation supplied using subsurface drip irrigation; 188 (2005) and 394 mm (2006).
- Irrigation was determined using ET replacement ($ET_a = ET_p * K_c$)
- Peanuts harvested using conventional two-row equipment
- RCB design; ANOVA by Statistix 9 at $P \leq 0.05$; independent by year.

Treatments

Table 1. Harvest timing (days after planting- DAP), number of forage harvests, and PHDC applied during 2005 and 2006. Peanut plants were harvested for forage at 20 cm height at 60, 90, and 120 DAP. PHDC was applied twice during the growing season.

Harvest timing	Forage harvests	PHDC
- DAP -		
No harvest	0	-
PHDC	0	Yes
60	1	-
90	1	-
120	1	-
60, 90	2	-
60, 120	2	-
90, 120	2	-
60, 90, 120	3	-

Mid-season harvest flowchart

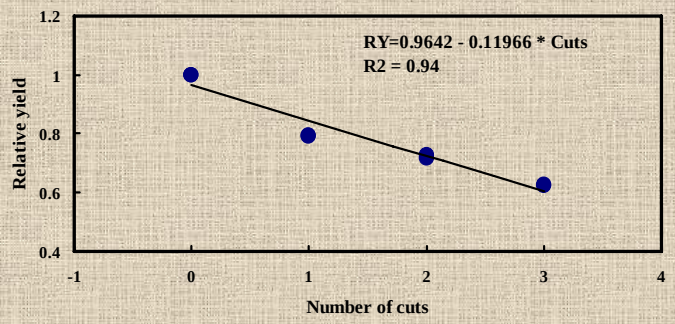


Results

Table 2. Forage removed during the growing season, peanut yield, farmer stock grade, and gross revenue determined by pod yield and grade for the 2005 and 2006 growing season. TSMK = total sound mature kernels, OK= other kernels, and nd = no data.

Treatment	Plant mass	Pod yield	TSMK	OK	Gross pod revenue	Gross hay revenue	Total revenue
	----- kg ha^{-1} -----		-------- % --------		---------- $ ha^{-1} ----------		
2005							
No harvest	nd	4354ab	71.4abc	5.8bc	1703ab	nd	1703ab
PHDC	nd	4824a	72.3a	4.3c	1897a	nd	1897a
60	538b	3315cd	70.3bcd	6.1b	1277cd	47d	1325cd
90	1482a	3711c	69.7cd	7.1ab	1425c	130c	1555bc
120	1633a	3838bc	71.3abc	6.3b	1503bc	144bc	1646ab
60-90	1487a	2608e	69.7cd	7.2ab	1000e	131c	1131d
60-120	2112a	3800bc	71.6ab	5.8bc	1488bc	186ab	1674ab
90-120	2392a	3441cd	69.7cd	7.4ab	1321cd	210a	1532bc
60-90-120	1817a	2858de	68.8d	8.1a	1090de	160abc	1250d
2006							
No harvest	nd	2620a	68.5a	8.4bcd	995a	nd	995a
PHDC	nd	2383ab	68.2a	7.7d	898ab	nd	898ab
60	597b	2271abc	67.6ab	9.6bc	853ab	53b	905ab
90	1879a	1725d	66.4abc	10.6ab	642c	165a	807ab
120	1579a	1971bcd	66.2abc	10.2b	728bc	139a	867ab
60-90	1945a	1704d	66.9abc	10.2bc	636c	171a	807ab
60-120	2153a	1772cd	65.4bc	11.0ab	650c	189a	839ab
90-120	2092a	1990bcd	65.6bc	11.0ab	736bc	184a	920ab
60-90-120	2052a	1566d	64.6c	12.6a	571c	181a	751b

Figure 4. Linear regression analysis and algorithm predicting the relative pod yield versus the number of mid-season harvests taken during the growing season for 2005 and 2006. Relative yield values were determined using pod yield from forage harvest divided by pod yields from non-forage harvested for each year.



Conclusions

- Forage mass lowest in early season and increased as season progress.
- Forage mass for one cut at 90- or 120 DAP is equal to multiple cuts.
- Pod yield decreased about 12% for each mid-season harvest.
- Pod yield and grade highest for no-harvest or single harvest consequently total revenue (pod+forage) was highest for these systems.
- Forage yields need to be >1160 kg ha^{-1} to cover cost of custom harvest.

Mention of trade names or commercial products is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the U.S. Department of Agriculture.

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