# EFFECT OF VARIETY AND HERBICIDE PROGRAM ON FRESH POD YIELD OF STRIP-TILL PEANUT AND WEED CONTROL IN TWO MULTIPLE CROPPING SYSTEMS.

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## ABSTRACT

Two separate experiments were conducted to determine fresh pod yield and weed control for six varieties of peanut (*Arachis hypogaea*) during 2000. One experiment used rye (*Secale cereale*) as the preceding crop and the other used lupin (*Lupinus angustifolius*) as the previous crop. The six varieties included 'Georgia Green', 'Andru 93', Sunoleic 97R', 'Florida MDR-98', 'C-99-R', and 'Florunner'. There was significance at the p = 0.01 level among varieties and between herbicides for fresh pod yield of peanut in both experiments and there was no interaction between varieties and herbicides. Sunoleic 97R produced the greatest yield for both systems (rye = 5074 lb/A; lupin = 4499 lb/A) and Andru produced the lowest yield in both systems (rye = 4160 lb/A; lupin = 3006 lb/A). Plots treated with Cadre yielded higher than plots treated with Gramoxone Max + Storm in both experiments. No interaction occurred between variety and herbicide for the rye experiment, and both were significant at the p = 0.01 level. Weed control was much greater in the Sunoleic 97R and Florunner varieties than in the other varieties, with the Cadre plots maintaining better control than Gramoxone Max + Storm. However, for the lupin experiment, there was an interaction between variety and herbicide. Weed control was greatest with the Florunner and Sunoleic 97R varieties coupled with Cadre (83% and 79% control, respectively) and these were the only treatment combinations to have higher than 50% weed control in the lupin experiment.

### INTRODUCTION

Conservation tillage systems are gaining in popularity in the southeastern U.S. During the mid-1990's, acreage dedicated to conservation tillage increased nearly five-fold in the state of Florida (CTIC Staff, 1998). Some reasons for the increasing acceptance include savings in energy, labor, and time. Conservation tillage also helps prevent soil losses due to erosion and residues hold more water after rain or irrigation thus providing more moisture to crops. There are also reduced equipment costs from smaller inventory as well as less upkeep (Gallaher, 1980; Teare, 1989; Whitehead et al., 1999).

There have been numerous positive results associated with growing peanut (*Arachis hypogaea* L.) in strip-till management systems. Strip-till peanut in the early 1980's displayed favorable results (Costello, 1984; Costello and Gallaher, 1985; Gallaher, 1983), yet this management practice was not widely adopted. However, the renewed interest in the last decade has led to more research with promising results. Brenneman et al. (1999) showed equal yields for peanut planted with conventional tillage, peanut strip-tilled into rye (*Secale cereale* L.), and peanut strip-tilled in a stale seedbed. Those experiments, averaged over 5 years of data, had yields close to 3,000 pounds/acre. Similar research was conducted by Tubbs et al. (1999) comparing five tillage treatments (1. strip-till into undisturbed rye straw, 2. strip-till - rye straw mowed and removed, 3. strip-till - rye straw mowed and left, 4. strip-till - rye straw mowed then removed followed later by mechanical cultivation, and 5. a conventional tillage treatment). There were no significant differences among tillage treatments and high yields were observed, as much as 6,200 pounds/acre.

Additional research on strip-till peanut with chemical weed control provided good results with yields reaching 3,900 pounds/acre in 1998 (Edenfield et al., 1999). Above average yields (up to 4,000 lb/acre) were also reported using strip-till and no-till management methods for two years by Baldwin et al. (1999). Peanut yields in excess of 6,000 pounds/acre are possible with proper management and pest control (Overman and Gallaher, 1990).

Continued research can hopefully lead to competitive results for reduced tillage systems to benefit our environment and our peanut producers as well. The objectives of these experiments were to determine pod yield and annual grass control of six peanut varieties with two herbicide management programs using two double cropping systems. One experiment involved growing peanut strip-tilled into a winter cover crop of rye and the other experiment involved growing peanut strip-tilled into a winter crop of lupin (*Lupinus angustifolius* L.).

## MATERIALS AND METHODS

Experiments were conducted at Green Acres Agronomy Field Research Laboratory in Gainesville, FL during 2000 on an Arredondo fine sand (Sandy Siliceous Thermic Paleudult) (Soil Survey Staff, 1994). Rye and lupin were planted on 20 November 1999 at 60 and 30 pounds seed/acre, respectively. Both areas were fertilized with 150 pounds/acre of 12-4-8 ($N$-$P_2O_5$-$K_2O$), 200 pounds/acre K-Mag, and 150 pounds/acre KCl (muriate of potash, 60% $K_2O$) on 20 January 2000. The experiments were set up as identical split-plot designs with six replications and two row (5 foot x 20 foot) plots. The main-plot effect was peanut variety which included 'Georgia Green', 'Andru 93', 'Sunoleic 97R', 'FL MDR-98', 'C-99-R', and 'Florunner'. The sub-plot effect consisted of two herbicide treatments: (A) Gramoxone Max (paraquat) + Storm (bentazon + acifluorfen) + Activate Plus and (B) Cadre (imazapic) + Activate Plus. The rye received an additional 85 pounds N/acre on 21 February.

Peanuts were initially planted on 10 May, but due to a poor stand from equipment malfunction, peanuts were burned down with Roundup Ultra (glyphosate) at 2 quarts/acre on 2 June. Strip-till rows were spaced 30 inches apart using the Brown-Harden in-row-subsoil planter on 7 June followed by re-planting of the peanuts on 8 June.

Roundup Ultra was applied to kill remaining vegetation on 9 June. On 15 June, KCl was applied at 50 pounds/acre according to soil test recommendations. The herbicide treatments (A) Gramoxone Max (0.125 lb ai/acre) + Storm (0.75 lb ai/acre) + Activate Plus (0.25 % v/v) and (B)

Cadre (0.063 lb ai/acre) + Activate Plus (0.25 % v/v) were applied to their respective plots on 5 July. Insects and diseases were controlled using labeled rates of Bravo (chlorothalonil), Lannate (methomyl), Folicur (tebuconazole), and Solubor (6.2% Boron). A single application of 900 pounds gypsum/acre in a 12 inch band over the row was made 25 July. Weed control evaluations were conducted 18 October 2000.

Peanuts were inverted on 25 October and thrashed on 30 October. Pods were weighed for fresh yield and then sub-samples (1000 g) were collected from each plot and dried in a forced air seed dryer at 100 degrees F for 48 hours. These sub-samples were removed and weighed to determine moisture loss.

Data were prepared using Quattro Pro Spreadsheets (Anon., 1993). MSTAT (Freed et al., 1987) was used to perform analysis of variance and mean separation for a split-plot design with whole plots in a randomized complete block design. Mean separation was by Duncan's New Mulriple Range Test at p = 0.05 for six peanut varieties and LSD at p = 0.05 for two herbicide treatments.

## RESULTS AND DISCUSSION

No interactions occurred with variety and herbicide for pod yield in both experiments. Significance was detected at p = 0.01 for pod yield at 10% moisture among varieties and between herbicides (Table 1). The greatest yields in both experiments were from the Sunoleic 97R variety (rye = 4794 lb/acre, lupin = 4209 lb/acre). Varieties Andru 93 (rye = 3945 lb/acre, lupin = 2821 lb/acre) and FL-MDR-98 (rye = 4090 lb/acre, lupin = 2723 lb/acre) produced the lowest yields for the two double cropping systems. Plots treated with Cadre produced greater yields than those treated with Gramoxone Max + Storm in both systems.

The two weeds present in these experiments included fall panicum *(Panicum dichotomiflorum* L.) and large crabgrass (*Digitaria sanguinalis* L.). No interaction was observed in the rye experiment between peanut variety and herbicide for annual grass (fall panicum + large crabgrass) control (Table 2). Annual grass control among varieties and between herbicides was significant at p = 0.01. Sunoleic 97R (87%) had better annual grass control than the other varieties, and Florunner (74%) had the second highest annual grass control rating. Andru 93 plots (35%) had the least annual grass control. Cadre (76%) provided much greater control than Gramoxone Max + Storm (34%) for the rye experiment.

An interaction occurred in the lupin experiment between variety and herbicide for annual grass control (Table 3). No difference occurred between varieties with Gramoxone Max + Storm treatments. All treatment combinations (variety x Gramoxone Max + Storm) controlled 20% of the weeds or less (average = 9% for Gramoxone Max + Storm plots). Cadre treatments on the Sunoleic 97R and Florunner provided greater control (79% and 83% control, respectively) than Cadre on the other varieties and were the only treatment combinations to provide greater than 50% control. Andru 93 treated with Cadre resulted in the least annual grass control of the variety x Cadre combinations. Cadre plots averaged 48% annual grass control for the lupin experiment.

Sunoleic 97R produced high pod yields in both systems, and Cadre plots yielded higher than plots treated with Gramoxone Max + Storm. Sunoleic 97R and Cadre also had the best annual grass control in the rye experiment. The treatment combinations of Sunoleic 97R with Cadre and Florunner with Cadre provided the best annual grass control in the lupin experiment. Andru 93 yields were the lowest in both studies. Annual grass control in the rye study was lower for Andru 93 than for any other variety. Data from the lupin study revealed that Andru 93 treated with Cadre provided the least annual grass control of all variety x Cadre combinations.

Results indicate a positive correlation between weed control and peanut yield. Plots with the greatest weed pressure yielded the lowest while plots with good weed control provided much higher yields. More research would be necessary to determine whether weed control or differences in varieties are the causes of the yield differences.

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**Table 1. Total pod yield for six varieties of peanut averaged over replication and herbicide treatment, and two herbicide treatments averaged over replication and variety, Gainesville, FL, 2000.**

| | Rye system | Lupin system |
|---|---|---|
| Peanut Variety | ----------- lb/ac at 10% moisture | --------------------- |
| Georgia Green | 4324 cd | 3683 ab |
| Andru 93 | 3945 e | 2821 c |
| Sunoleic 97R | 4794 ab | 4209 a |
| FL-MDR-98 | 4090 de | 2723 c |
| C-99-R | 5063 a | 3430 b |
| Florunner | 4586 bc | 3696 ab |
| Significance | *** | *** |
| Herbicide | | |
| A | 4282 | 2937 |
| B | 4653 | 3917 |
| Significance | *** | *** |
| CV | 10.16 | 17.72 |

Herbicide A = Gramoxone Max + Storm + Activate Plus; Herbicide B = Cadre + Activate Plus.

Values among varieties in the same column not followed by the same letter are significantly different at p = 0.05 according to Duncan's New Multiple Range Test.

**Table 2. Percent annual grass control using rye cover crop for six peanut varieties averaged over replication and herbicide, and two herbicide treatments averaged over replication and variety, Gainesville, FL, 2000.**

| | Annual grass control % |
|---|---|
| Peanut Variety | |
| Georgia Green | 39 cd |
| Andru 93 | 35 d |
| Sunoleic 97R | 87 a |
| FL-MDR-98 | 45 cd |
| C-99-R | 50 c |
| Florunner | 74 b |
| Significance | *** |
| Herbicide | |
| A | 34 |
| B | 76 |
| Significance | *** |
| CV | 33.93 |

Herbicide A = Gramoxone Max + Storm + Activate Plus; Herbicide B = Cadre + Activate Plus.

Values among varieties not followed by the same letter are significantly different at p = 0.05 according to Duncan's New Multiple Range Test.

The two main weeds present in this experiment were fall panicum (*Panicum dichotomiflorum*) and large crabgrass (*Digitaria sanguinalis*).

**Table 3. Percent annual grass control using lupin cover crop averaged over 6 replications, an interaction between variety and herbicide, Gainesville, FL, 2000.**

| Peanut Variety | Herb. A | Herb. B | Significance | Average |
|---|---|---|---|---|
| Georgia Green | 5 a | 22 c | NS | 14 |
| Andru 93 | 4 a | 13 c | NS | 9 |
| Sunoleic 97R | 12 a | 79 a | * | 46 |
| FL-MDR-98 | 9 a | 44 b | * | 27 |
| C-99-R | 4 a | 45 b | * | 25 |
| Florunner | 20 a | 83 a | * | 52 |
| Average | 9 | 48 | | |

Level of significance for varieties = ***; for herbicide = ***; for interaction = ***.
Herb. A = Gramoxone Max + Storm + Activate Plus; Herb. B = Cadre + Activate Plus.

Values among varieties within a herbicide treatment not followed by the same letter are significantly different at p = 0.05 according to Duncan's New Multiple Range Test.

Values between herbicides within a variety are significant at p = 0.05 (*) or not significant (NS).

The two main weeds present in this experiment were fall panicum (*Panicum dichotomiflorum*) and large crabgrass (*Digitaria sanguinalis*).