THE EFFECTS OF *SOLANUM* SPP.
INTERFERENCE ON PEANUTS
(*ARACHIS HYPOGAEA*)

By

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PART I

INTERFERENCE OF HORSENETTLE (*SOLANUM CAROLINESE*) WITH PEANUTS (*Arachis hypogaea*)

INTERFERENCE OF HORSENETTLE (*Solanum carolinense*)

WITH PEANUTS (*Arachis hypogaea*)

Abstract. Two different types of field experiments were used to evaulate horsenettle (*Solanum carolinense* L.) interference with peanuts (*Arachis hypogaea* L.). The first series of experiments involved measuring the effects of duration of horsenettle inteference with Spanish 'Pronto' peanut in 1981 and 1982 and 'Florunner' peanuts. The experimental site contained approximately 28 ± 10 horsenettle stems per m^2 from a well established, natural infestation. Interference treatments consisted of weed free maintenance or weed interference for 0, 2, 4, 6, 8, 10 and 12 weeks after crop emergence. Fruit contamination of the harvested in-shell peanuts was determined by counting the number of berries passing through the peanut thresher. A second type of experiment involved measuring the effects of full season interference of specific horsenettle densities on Spanish 'Pronto' peanuts. Horsenettle seedlings were transplanted adjacent to the crop row at densities of 0, 4, 8, 16 or 32 plants per 10 m of crop row and allowed to interfere with the crop for the entire season. Horsenettle dry weights from each plot were determined approximately 3 weeks before harvest. Results from the duration experiment with the weed interference treatments were quite variable for both cultivars. Statistically significant effects from weed free maintenance treatments in the duration experiments were not observed with the Spanish cultivars in either year. Yields from the

weed free maintenance treatments with the Florunner cultivar were obtained only for 1982. Florunner peanut yield was significantly reduced only from full season horsenettle interference when compared to other weed free maintenance treatments. In 1981, treatments involving late season weed removal effects were not statistically significant for the Spanish cultivar. In 1982, late season weed removal resulted in reduced yields after 6 weeks of interference, but only 8 and 12 weeks of interference produced significantly less in-shell peanut yields than the weed free check. In the late season weed removal treatments 8 weeks of horsenettle interference was required before Florunner yield was significantly reduced. Results from the density experiment showed that 32 horsenettle plants per 10 m of crop row were required to significantly reduce Spanish peanut yields. Total horsenettle weed weights, determined from the density study, did not increase at densities of 16 plants per 10 m of crop row and greater.

Key Words: 'Pronto', 'Florunner', perennial competition

INTRODUCTION

Horsenettle is a perennial broadleaf species with a deep penetrating root system, which may be propagated by seeds, root cuttings and creeping roots. Horsenettle is adapted to all soil types, but it appears to be especially adapted to the coarse textured soils usually associated with peanut production. Horsenettle has been a long-term problem to peanut producers in the Southwestern United States. A single plant is capable of producing as many as 100 berries (8) and the presence of the fleshy and high moisture content horsenettle fruit as foreign material affects peanut quality and grade (9). These high moisture content berries frequently cause spoilage of stored peanuts. Results from several experiments have described the effects of weed competition on peanut yield, however, these experiments have dealt primarily with annual species.

Hill and Santelmann (7), conducted interference experiments with large crabgrass [Digitaria sanguinalis (L.) Scop.] and smooth pigweed (Amaranthus hybridus L.) on Spanish peanuts. They reported that peanut yields were not reduced if the peanuts were maintained weed free for 6 or more weeks after crop emergence. Yield reductions did occur if weeds were allowed to compete longer than 3 weeks after crop emergence and the competitive effects of the weeds increased each week thereafter. Hauser et al. (6) reported that peanuts ('Tifspan' or 'Florunner') kept free of Florida beggarweed [Desmodium tortuosum (Siv) DC.] and sicklepod (Cassia obtusifolia L.) for 4 weeks produced normal yields. Competition for 10 to 14 weeks was necessary to reduce the yield of in-shell nuts. Hauser and Parham (5) reported results from experiments conducted over an 8 year period with three Spanish cultivars ('Dixie', 'Argentine', 'Starr') grown in a mixed natural stand of Florida pusley (Richardia scabia L.) and large crabgrass. An average yield reduction of 20 percent was reported over an eight year period, but losses in individual years ranged from 1 to 50 percent. No significant yield reduction occurred in 5 of the 8 years.

York and Coble (10) observed severe competition from fall panicum (Panicum dichotomiflourm Michx.). Their results showed depressed seed yield in 'Florigiant' peanuts from as little as 2 weeks of fall panicum interference and they concluded that control for 8 weeks or longer was necessary to avoid yield reduction. Drennan and Jennings (4) reported that the critical period of weed competition in irrigated cotton (Gossypium hirsutum L.) and peanuts ('Ashford') was between 4 and 10 weeks after crop emergence. Peanuts tolerated only 10 percent weed cover before yields were reduced. Chamblee et al. (3) reported no signficant yield reduction in 'Florigiant' peanuts if broadleaf signalgrass [Brachiaria platyphylla (Griseb) Nash.] was removed anytime during a period of within 6 weeks after planting.

Buchannan et al. (2) reported that under full season interference with Florida beggarweed and sicklepod, one cultivation, 4 weeks after crop emergence signficantly increased yields when compared to uncultivated peanuts. If peanuts were kept weed free 4 to 8 weeks, cultivation had no effect. Cultivation is of limited use after peanut pegging and it does not appear to be a viable control measure for horsenettle because of its extensive and deep penetrating root system. Cultivation may actually lead to a gradual spread of this weed by dragging root fragments to new locations in the field (8).

Banks et al. (1) reported that several herbicides gave good to excellent control of horsenettle, however, all caused visible injury to the peanut plant. An understanding of the competitive relationship of horsenettle with peanuts is important because adequate control of this weed is difficult to obtain in peanuts. The objectives of this research were (a) to determine the effects of different periods of weed free maintenance and weed interference on Spanish and Florunner peanuts and (b) to determine the effect of full season interference of specific horsenettle densities on peanuts.

MATERIALS AND METHODS

Treatments in all experiments were arranged in a randomized complete block design with four replications. These experiments were conducted near Perkins, OK on a Teller loam (fine-loamy, mixed, thermic udic arguistolls). Soil fertility was tested by the Soil, Water and Plant Analysis Laboratory at OSU and all nutrients were considered adequate. The soil pH at this site was 6.1 and there was 0.9 percent organic matter. Supplemental irrigation by over-head side roll system was available and was used throughout the duration of the experiments, however, rigid irrigation schedules were not followed. The experiments reported in this manuscript will be described as duration experiments and density experiments and these will be described more fully under the preceeding sub-headings.

Individual plots were 4 rows, each 10 m long (with the two center rows used for harvest). Peanuts were planted on flat-bed culture with a row spacing of 91 cm. Plots were harvested on October 1 in 1981 and October 26 (Spanish), November 16 (Florunner) in 1982 using a Lilliston peanut digger and a small plot thresher. Crop stand counts, horsenettle stem counts and horsenettle fruit counts were taken. Peanut quality, on selected plots was evaluated by determining percent sound mature kernals (% SMK) and percent sound splits (% SS) after in-shell weights were recorded.

Duration Experiments. Duration experiments in 1981 and 1982 were conducted on a site with a well established, natural infestation of horsenettle of 28 ± 10 stems per m^2. In 1981, 'Pronto' Spanish peanuts were planted. Trifluralin [α,α,α-trifluro-2,6-dinitro-N,N-dipropyl-ptoluidine] was applied preplant incorporated at .56 kg/ha 4 weeks before planting peanuts. The experiment was expanded in 1982 to include 'Florunner' peanuts. Excessive precipitation in May of the second year delayed planting until June 11. In 1982, metolachlor [2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2methoxy-1-methylethyl)acetamide] was applied premergence at 1.68 kg/ha to control indigenous weeds. The experimental area was scouted weekly and all escapes were removed by hand.

Weed removal sequences in the duration experiments were used to determine the maximum allowable interference (MAI) and early weed free requirement (EWFR) of horsenettle with peanuts. The EWFR of peanuts to horsenettle interference was determined by keeping the peanuts free of horsenettle competition early in the season by hand weeding for various periods of time (0, 2, 4, 6, 8, 10, 12 weeks after crop emergence) at the beginning of the crop season. After the specified early season weed free maintenance period, the horsenettle plants were allowed to emerge and compete with the peanuts. Conversely, MAI by horsenettle was determined by allowing horsenettle to infest the peanut plots early in the season and then at specified times, (0, 2, 4, 6, 8, 10, 12 weeks after crop emergence) the horsenettle plants were removed by hand and kept out for the remainder of the season.

Density Experiment. In 1981 an attempt was made, without success, to establish a density experiment using horsenettle seedlings started in the greenhouse. Horsenettle seedlings were transplanted at the time of peanut planting on May 19, 1981. Because of hot, dry conditions at this time of year, most of the seedlings died. In 1982, seedlings were started in the greenhouse on March 9 by planting seeds in individual peat tablets. On April 12, 1982, approximately 2 months before planting peanuts, these seedlings were transplanted in pre-marked areas in the experimental site. Cooler weather and more favorable soil moisture conditions at this time of year permitted adequate stand establishment of horsenettle seedlings.

Seedlings selected for transplanting into the field were at the 5 to 6 true leaf stage. Plants were uniformly spaced 10 cm to the right along each of the two center rows of each four row plot at densities of 0, 4, 8, 16 and 32 plants per 10 m of peanut row. Care for the seedlings consisted of watering on a daily basis and the use of 5 percent carbaryl (1-naphthyl-N-methyl-carbamate) dust, as needed, to control the Colorado potato beetle (Leptinotarsa decemlineata Say). At crop emergence, all horsenettle topgrowth was removed by clipping the plants at the soil surface. The horsenettle was then allowed to resprout and grow with the peanuts for the remainder of the season. Approximately 3 weeks before harvest, horsenettle plants were clipped at ground level, dried and weighed.

RESULTS AND DISCUSSION

Duration Experiments. Analysis of weed free treatments, analyzed by year, showed no statistically significant treatment differences (Table 1). However, in 1981, in-shell yield showed an signficant increasing trend through 8 weeks of weed free maintenance but this trend was not signficant. In 1982, a similar trend was observed, with the increase in yield occurring through the first 12 weeks of weed free maintenance.

A combined analysis gave no indication of a treatment by year interaction. Treatment effects were statistically significant at the 10 percent level of probability. Eight weeks of weed free maintenance resulted in the highest average yield, but it was not significantly greater than 6, 10, 12, or full season weed free maintenance.

Results from the late season weed removal treatments with the Spanish cultivar were quite variable (Table 2). A statistical analysis of both years data revealed significant treatment effects. However, a significant treatment-by-year interaction at the 6 percent level of probability prevented differentiation of averaged treatment effects. Consequently, averages over years are not reported.

In 1981, statistically signficant treatment differences were not observed. Suprisingly, more than 8 weeks of horsenettle interference occurred before a noticeable yield reduction occurred. In 1982, 4 weeks of interference and the weed free check yielded approximately the same. Depressed yields were observed from 6 weeks through full season interference when compared to the weed free check, but only 8 and 12 weeks interference produced significantly lower yields. A reason for the low yields from 2 weeks interference in 1981 and 1982 was not found.

A comparison of the response of both cultivars to horsenettle interference would be of interest. In 1982, planting was delayed until June 14, 1982. This later planting date has a more detrimental effect on the Florunner cultivar since they require a long growing season for maximum yield development. Consequently, comparisons between the cultivars was not made.

Fruit production for the Spanish cultivar was determined in 1981. Statistical significance was observed for the weed free treatments Table 3). In 1982, fruit production was severely limited and the data are not presented. Weed free maintenance for 2 or more weeks after crop emergence signficantly reduced the number of horsenettle berries found in the threshed peanuts. As the length of the weed free maintenance period increased, the berry count decreased. Noticeable fruit production in the late season weed removal treatments was observed at 6 weeks. Treatment differences were not statistically signficant due to variability in individual plot counts. However, as the length of the competitive period increased, fruit production rose dramatically.

Results from the early season weed free treatments with Florunner peanuts indicate that weed free maintenance for 2 or more weeks after crop emergence signficantly increases in-shell peanut yield (Table 4). Conversely, 8 weeks of horsenettle interference after crop emergence occurred before there was a statistically significant reduction in in-shell peanut yield.

Density Experiment. Our results indicate that a density of 32 horsenettle plants per 10 m of peanut row is required to significantly reduce in-shell peanut yield (Table 5). Analysis of horsenettle dry weight, taken approximately 3 weeks before harvest indicates that at a density of 16 plants per 10 m of crop row weed weights do not continue to increase but stabilize possibly indicating intraspecific interference.

In order to determine if horsenettle interference affected peanut quality, selected samples from all experiments were analyzed by the OSU peanut quality lab in 1981 and the Oklahoma Federal State Inspection service in 1982. In both years, analyzing for percent SMK and percent SS gave no indication that horsenettle interference affected peanut quality.

Although somewhat inconsistent, our findings indicate that established horsenettle plants do not compete with peanuts under irrigated conditions as severely as once thought. Peanuts kept free of horsenettle 6 to 8 weeks produced near normal yields. This requirement is similar to that found for several annual species (3, 8). However, unlike many annual species, horsenettle is likely to resprout. This may lead to a sizable infestation at harvest and the potential for pegging and harvest interference must be considered. Depending on the degree of the infestation, additional control may be desirable to reduce this threat.

Hill and Santelmann (8) found that four to eight weeks of competition from large crabgrass and smooth pigweed were necessary to reduce the yield of peanuts. Hauser et al (7) reported that at least 10 weeks of interference from Florida beggarweed and sicklepod were required to cause a significant yield reduction. Our findings indicate that horsenettle interference may be allowed to occur for up to 8 weeks before any appreciable yield reduction is observed.

Because the duration and density experiments were conducted as separate experiments, direct comparisons cannot be made. Observations from these experiments did indicate some particulars which could be discussed. During the peanut digging operation we observed that a typical horsenettle root from a density study (first years growth), was quite fibrous. A root section from an established plant in the duration study was sparsely branched and extended down into the soil. During its first year horsenettle may be competing directly for moisture and nutrients with peanut roots. Irrigation, even supplemental, may lead to increased water availability for peanuts competing with established horsenettle while in the case of a developing horsenettle seedling, direct competition may occur.

The peanut producer has several considerations if his crop is infested with horsenettle. Seedling plants may pose the most serious threat to peanut yields. Established plants may not affect yield as much, but horsenettle fruit production must be eliminated. A management program established for horsenettle control in peanuts must include effective measures for seedling control and established plants must be kept from spreading and producing fruit.

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Table 1. Early weed free requirement of horsenettle with Spanish peanuts.

Weed free period	In-shell peanut yield[1]		
	1981	1982	Avg.
(Weeks)	(kg/ha)		
0 (full season interference)	1970a	1268a	1619c
2	2218a	1239a	1729bc
4	2305a	1117a	1711bc
6	2658a	1418a	2038ab
8	2869a	1419a	2144a
10	2243a	1458a	1850abc
12	2231a	1555a	1893abc
Weed free entire season	2237a	1444a	1340abc
C.V.(%)	19.2	17.3	19.4

[1]Means followed by the same letter within the same column do not differ significantly at the .10 level of probability by Duncan's multiple range test.

Table 2. Maximum allowable interference of horsenettle with Spanish peanuts.

Weed interference period	In-shell peanut yield[1] 1981	1982
(weeks)	(kg/ha)	
0 (weed free entire season)	2237a	1444 ab
2	1921a	1098 c
4	2286a	1512 a
6	2733a	1153 bc
8	2144a	781 d
10	1648a	1195 abc
12	2162a	1017 cd
Full season interference	1970	1268 abc
C.V.(%)	21.2	20.3

[1]Means followed by the same letter in the same column do not differ significantly at the .10 level of probability by Duncan's multiple range test.

Table 3. Horsenettle fruit production for various treatments-1981.

Weed free period (weeks)	Fruit count[1] (berries/ha)	Weed interference period (weeks)	Fruit count (berries/ha)
0	30,500 a	6	547a
2	11,800 b	8	2700a
4	11,500 b	10	5500a
6	2,200 b	12	37700a
C.V.,%	64.2		197.7

[1]Means followed by the same letter within the same column do not differ significantly at the .05 level of probability by Duncans multiple range test.

Table 4. Maximum allowable interference and early weed free requirement of horsenettle with Florunner peanuts - 1982.

Weed free period	In-shell yield[1]	Weed interference period	In-shell yield[1]
(Weeks)	(kg/ha)	(weeks)	(kg/ha)
0 (full season interference)	648 b	0 (weed free full season)	1224 bc
2	1183 a	2	1648 a
4	1221 a	4	1343 b
6	1404 a	6	1015 cd
8	1261 a	8	879 ed
10	1536 a	10	785 ed
12	1366 a	12	719 e
Weed free entire season	1224 a	Full season interference	648 e
C.V., %	21.3		19.9

[1]Means followed by the same letter within the same column do not differ significantly at the .10 level of probability by Duncans multiple range test.

Table 5. Effect of full season interference by specific densities of horsenettle on Spanish peanuts - yields and total weed weights.

Density per 10 m of row	In-shell yield[1]	Dry weed wt.[1]
	kg/ha	
0	1552 a	-
4	1225 ab	162 b
8	1284 ab	203 b
16	1314 ab	390 a
32	908 b	381 a
C.V.,%	20.0	23.4

[1]Means followed by the same letter within the same column do differ significantly at the .05 level of probability by Duncans multiple range test.

PART II

INTERFERENCE OF SILVERLEAF NIGHTSHADE (*SOLANUM ELAEAGNIFOLIUM*) WITH SPANISH PEANUTS (*ARACHIS HYPOGAEA*)

INTERFERENCE OF SILVERLEAF NIGHTSHADE (*SOLANUM ELAEAGNIFOLIUM*) ON SPANISH PEANUTS (*ARACHIS HYPOGAEA*)

Abstract. Interference of silverleaf nightshade (*Solanum elaeagnifolium* Cav.) with Spanish peanut (*Arachis hypogaea* L. 'Pronto') yield was evaluated during 1981 and 1982 in a naturally occurring weed population. Treatments consisted of weed free maintenance or weed interference for 0, 4, 8 and 12 weeks after crop emergence. Silverleaf nightshade stem counts were taken for weed regrowth determinations in treatments maintained weed free for 0, 4 and 8 weeks. Fruit contamination of the harvested in-shell peanuts was determined by counting the number of berries passing through the peanut combine.

In-shell peanut yield was reduced by an average of 17% with 4 weeks of silverleaf nightshade interference. Further yield reductions of 61, 71 and 67% were noted in treatments where interference occurred for 8, 12 and 20 weeks (full season), respectively. Regression analysis predicted that for each week of weed free maintenance there was an average 36 kg/ha yield increase. Conversely, for each week of weed interference there was a 75 kg/ha decrease in yield. Silverleaf nightshade stem counts per plot were reduced by an average of 19 and 36 percent for treatments maintained weed free for 4 to 8 weeks respectively, before regrowth was permitted, when compared to full season interference. Analysis of fruit contamination indicated a significant

difference between full season interference and weed free maintenance for 4 or more weeks. Differences in fruit contamination between 4, 8 and 12 weeks of weed free maintenance were not significant. Peanut quality disregarding contamination of harvested nuts by silverleaf nightshade berries was not affected by silverleaf nightshade interference.

INTRODUCTION

Silverleaf nightshade is a deep rooted perennial broadleaf species capable of propagation by seed, root segments, and creeping lateral roots (3, 7). Molnar (7) and Davis et al. (4) reported that the main vertical root of the weed penetrated at least 274 cm into the soil.

Silverleaf nightshade has been reported as a serious weed in several crops. Abernathy (1) reported that the weed infests more than 800,000 ha of cropland in Texas and Oklahoma. Smith and Wiese (9) reported that cotton (*Gossypium hirsutem* L.) and grain sorghum [*Sorghum bicolor* (L.) Moench] yield reductions were inversely proportional to silverleaf nightshade densities. Cuthbertson (3) observed a 12 percent reduction in grain sorghum yield from nine silverleaf nightshade plants per m^2. Davis et al. (4) reported that silverleaf nightshade was damaging to low growing crops such as canteloupes (*Cucumis melo* L.), watermelon (*Citullus vulgaris* Schrader ex Ecklon and Zeyher) and perennial pastures.

Much of the cropland infested with silverleaf nightshade in Oklahoma is located in the southern portion of the state, an area commonly associated with peanut and cotton culture. To date, no published literature has described the effects of silverleaf nightshade interference of peanuts. However, several researchers (2, 5, 6, 10) have reported their results from annual weed competition with peanuts. Hauser et al. (5) reported that no yield reduction occurred if 'Tifspan' or 'Florunner' peanuts were kept free of sicklepod (Cassia obtusifolia L.) or Florida beggarweed [Desmodium tortuosum (Siv.) DC.] for 4 weeks after crop emergence. Competition for 10 weeks was necessary before yields were reduced. York and Coble (10) observed a 25 percent yield reduction in Florigiant peanuts from one fall panicum (Panicum dichotomiflorum Michx.) per 4.9 m of row. Seed yield was reduced from as little as 2 weeks of fall panicum interference and peanuts kept weed free for 8 weeks after crop emergence still yielded less than peanuts kept weed free all season. Hill and Santelmann (6) reported yield reductions in Spanish peanuts when smooth pigweed (Amaranthus hybridus L.) and large crabgrass [Digitaria sanguinalis (L.) Scop.] were allowed to compete for 4 or more weeks. If peanuts were kept weed free for 6 weeks after crop emergence, yields were not reduced. Chamblee et al. (2) reported that natural infestations of broadleaf signalgrass [Brachiaria platyphylla (Griseb.) Nash] failed to significantly reduce yield of Florigiant peanuts if removed within 6 weeks of planting. If peanuts were kept free of broadleaf signalgrass for 6 weeks, no yield reduction occurred.

These findings demonstrate that weed species affect peanut yields differently. Smith and Wiese (9) pointed out that the advent of effective herbicides and reduced cultivation has aided the development of perennial broadleaf weeds. Several Solanum species, including silverleaf nightshade, are tolerant to trifluralin [α,α,α-trifluoro-2,6-dinitro-N,N-dipropyl-p-toliudine]. These tolerant species have not been suppressed, and in fact the wide use of trifluralin has actually caused the increase of tolerant species such as silverleaf nightshade.

The objective of our research was to determine the early weed free requirement and maximum allowable interference for silverleaf nightshade when grown in competition with Spanish peanuts.

MATERIALS AND METHODS

Field experiments were conducted during 1981 and 1982 near Stratford, Oklahoma on a Bethany loam (fine, mixed, thermic, pachic, paleustolls). Spanish peanuts (cult. 'Pronto') were grown under dryland conditions in both years. Soil fertility and pH in both years was satisfactory for the production of peanuts and therefore additions of fertilizer or lime to the soil were not made. Peanuts were planted in an area known to be infested with silverleaf nightshade. Trifluralin was applied preplant incorporated at .56 kg/ha approximately 5 weeks before planting to control indigenous annual grasses and pigweed.

Treatments were arranged in a randomized complete block design with four replications. Individual plots were four rows, spaced 91 cm apart by 10 m in length. Treatments consisted of weed free maintenance or weed interference for 0, 4, 8 and 12 weeks after crop emergence. Peanuts were maintained weed free by hand hoeing for the specified length of time (Table 2). At the end of the weed free period silverleaf nightshade was allowed to emerge and grow undisturbed. In the weed interference treatments, silverleaf nightshade was allowed to compete for the specified period of time before being removed by hand hoeing (Table 3). Once removed, the plots were maintained weed free by hoeing approximately every 10 days until harvest.

Peanuts were planted on May 22 in 1981 and June 14 in 1982. The later planting date in 1982 was due to more than 39 cm of precipitation in May. The crop was harvested on October 24 in 1981 and November 5 in 1982. Data taken included in-shell peanut yield, silverleaf nigthshade stem counts, silverleaf nightshade fruit count and peanut quality analysis. Fruit infestation was determined by counting the number of berries found in the threshed peanuts. Weed counts were determined by counting the number of above ground stems in the plots kept weed free for 0, 4, and 8 weeks after crop emergence. The weed population was determined within 2 weeks of harvest in both years. Silverleaf nightshade had reinfested the plots kept weed free for 12 weeks after crop emergence, but the regrowth was judged too erratic to warrant taking a count. Consequently, counts from 12 weeks of weed free maintenance were not made. Quality of the harvested peanuts was evaluated by determining the percent sound mature kernals (% SMK) and percent sound splits (% SS).

The data indicated that a linear regression analysis was reasonable. The model used allowed for differences in each replication and required the line fitted to the data in each replication to have the same slope. The square of the correlation coefficient (R^2) is a measure of the quality of the fitted line ignoring replication differences. If there was considerable variability among replications, as there should be, the total sums of squares includes this variability would therefore unfairly affect the R^2 values. The multiple correlation coefficient should measure the quality of the fitted line ignoring replication differences. In order to make the R^2 obtained not dependent on the number of replications values presented in this paper were calculated as follows:

$$R^2 = \frac{\text{linear MS - EMS}}{\text{trt MS - EMS}}$$

Regression analysis was performed for each year and by years combined (Table 1). The analysis of variance combined over years indicated that the treatment by years interaction was not significant. The observed signficance level (OSL) for the early season weed removal treatments was 16 percent and the OSL for the late season weed removal treatments was 59 percent. Consequently, the regression analysis discussed in this paper involves the use of combined data.

RESULTS AND DISCUSSION

In both years, in-shell peanut yield increased as the early season weed removal period increased (Table 2). Yields, averaged over both years indicated that in-shell peanut yield was reduced by 67, 47, 37, and 36 percent for 0, 4, 8, 12 weeks of weed free maintenance respectively when compared to season long weed free maintenance. Regression analysis performed on the data averaged over years predicted that for each week of weed free maintenance after crop emergence there was a 35.6 kg/ha avg. increase in in-shell peanut yield.

Late season weed removal severely affected in-shell peanut yield (Table 3). In both years the most severe yield reduction occurred after 4 weeks of silverleaf nighshade interference.Peanut yield was not affected after 12 weeks of weed interference when compared to season long interference. In fact, a slight increase in yield was observed when comparing 12 weeks of weed interference after crop emergence to season long interference. Data, that was averaged over both years, resulted in yield reductions of 17, 61, 71 and 67 percent for 4, 8, 12 and 20 weeks (full season) of weed interference after crop emergence. Since the competitive effects of silverleaf nightshade appeared to diminish after 8 weeks of interference with peanuts, linear regression was performed only on the data through 8 weeks of interference. This analysis resulted in a predicted yield reduction of 74.6 kg/ha for each week of weed interference after crop emergence. Silverleaf nightshade fruit production as well as above ground stem counts was determined in the early season weed removal treatments (Table 4). Berry counts from 1982 are not shown due to limited fruit production. Weed free maintenance for 4 or more weeks after crop emergence significantly reduced the number of silverleaf nightshade berries found in the in-shell peanuts. Differences in berry contamination between 4, 8 and 12 weeks of weed free maintenance were not signficant. As expected, above ground stem counts were reduced as the length of the weed free maintenance period increased. In 1981 weed counts were signficantly reduced by 8 weeks of weed free maintenance. In 1982 counts were higher and significant differences were not observed. Above ground stem counts, averaged over both years indicated that there was a 19 and 36 percent reduction in stem counts from 4 and 8 weeks of weed free maintenance, respectively.

Peanut quality was determined without the presence of silverleaf nightshade berries. Determination of % SMK and % SS indicated that peanut quality was not affected by silverleaf nightshade interference.

These data indicate that under dryland conditions silverleaf nightshade is a severe competitor with Spanish peanuts. Regression analysis predicted an average 35.6 kg/ha increase in yield for each week of weed free maintenance after crop emergence. Conversely, for each week of weed interference regression analysis predicted a 74.6 kg/ha yield reduction through 8 weeks of weed interference. This type of analysis allows us to make estimates of yield increases or decreases for a specific period of weed free maintenance or weed interference. However, since silverleaf nightshade is a perennial species, weed regrowth is important. Fruit production must also be considered in a management program.

A knowledge of potential yield reduction will help in determining at what point the weed can be allowed to grow or when the weed must be removed. This estimated time of removal must sufficiently reduce the threat of fruit production well as weed regrowth which may hinder the harvest operation.

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Table 1. Regression coefficients and models for weed free and weed interference experiments at Stratford, Ok.

Experiment type	slope of regression coefficient[a]	Est. Std. error	Fitted Model	R^2
	(kg/ha)	(kg/ha)		%
Weed free trts 1981	37.8**	9.3	Y=653.2 + 37.8X	79
1982	33.5**	5.2	Y=176.9 + 33.5X	91
combined	35.6**	5.2	Y=415.1 + 35.7X	95
Weed Interference trts				
1981	-82.4**	18.0	Y=1470.6-82.4X	96
1982	-66.8**	14.3	Y=885.2-66.8X	97
combined	-74.6**	11.4	Y=1177.9-74.6X	94

[a]** indicates significance at the 1% level.

Table 2. Effect of increasing periods of weed free maintenance on in-shell Spanish peanuts yields.

Weed free period	--In-shell-yield--- 1981	1982	AVG	Reduction
(Weeks)	(kg/ha)			(%)
0 (Weedy entire season)	519	259	389	66.6
4 (then weedy)	919	311	615	47.1
8 (then weedy)	1140	332	734	36.9
12 (then weedy)	941	544	743	36.1
20 (Weed free)	1413	913	1163	----
C.V.,(%)	27.2	32.2	29.9	----

Table 3. Effects of late season silverleaf nightshade removal on in-shell Spanish peanut yields.

Period of interference	In-shell yield 1981	1982	Avg.	Reduction
(weeks)	(kg/ha)			(%)
0 (weed free entire season)	1413	913	1163	--
4 (then weed free)	1261	672	967	16.8
8 (then weed free)	742	161	452	61.1
12 (then weed free)	488	192	340	70.7
20 (season long inteference)	519	259	389	66.6
C.V. (%)	34.2	49.0	39.6	

Table 4. Silverleaf nightshade fruit production and above ground stem counts of weed regrowth after several weed free intervals.

Weed free period	Fruit production 1981	Above Ground Stem count 1981	Above Ground Stem count 1982	AVG	Reduction
(weeks)	(berries/plot)	---(stems/plot)---			%
0 (weedy entire season)	35	256	267	262	--
4 (then weedy)	5	195	228	212	19
8 (then weedy)	1	132	200	166	36
12 (then weedy)	3	-	-	-	-
C.V. (%)	143	19.4	25.2	23.0	-
LSD (.05)	25.0	65.0	NS	75.6	

VITA 2

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