YELLOW NUTSEDGE (CYPERUS ESCULENTUS) CONTROL AND USE OF GRANULAR HERBICIDES IN SPANISH PEANUTS (ARACHIS HYPOGAEA)

By

JOHN M. FENDERSON

Bachelor of Science in Agriculture

Oklahoma State University

Stillwater, Oklahoma

1979

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
MASTER OF SCIENCE
May, 1982

YELLOW NUTSEDGE (CYPERUS ESCULENTUS) CONTROL AND USE OF GRANULAR HERBICIDES IN SPANISH PEANUTS (ARACHIS HYPOGAEA)

Thesis Approved:

Don S. Murray
Thesis Adviser

Eddie Basler

Gordon V. Johnson

Norman N. Durham
Dean of the Graduate College

ACKNOWLEDGMENTS

I would like to thank my major adviser, Dr. Don Murray, for his assistance, patience, and guidance during my course of study. Appreciation is extended to the members of my graduate committee, Dr. Eddie Basler and Dr. Gordon Johnson, for their assistance.

Appreciation is extended to the Department of Agronomy at Oklahoma State University for the use of facilities, land, and equipment which made research possible. In addition, thanks to Mr. Don Hooper, Mr. Larry Bull, and Mr. Wayne Whitmore, for their assistance.

Sincerest thanks to my parents, Mr. and Mrs. Gail Fenderson, for their never-ending encouragement, and especially to my dad, who inspired my career. Thanks to my wife, Peggy, for standing behind me and helping me during the writing of this thesis.

TABLE OF CONTENTS

LIST OF TABLES

Table		Page
XII.	Spray Conditions and Plot Information (Nutsedge Study II-Mangum, Oklahoma).	51
XIII.	Spray Conditions and Plot Information (Nutsedge Study III-Mangum, Oklahoma)	52
XIV.	Spray Conditions and Plot Information (Granular Study I-Stillwater, Oklahoma)	53
XV.	Spray Conditions and Plot Information (Granular Study II-Ft. Cobb, Oklahoma).	54
XVI.	Spray Conditions and Plot Information (Granular Study III-Ft. Cobb, Oklahoma)	55
XVII.	Spray Conditions and Plot Information (Granular Study IV-Ft. Cobb, Oklahoma).	56
XVIII.	Rainfall Data (Planting Date Through September) . . .	57

CHAPTER I

INTRODUCTION

Yellow nutsedge (*Cyperus esculentus* L.) is a perennial weed found in all but one of the contiguous United States (27, 62). It has been considered as one of the world's worst weeds and the nutsedges, yellow and purple nutsedge (*Cyperus rotundus* L.), have been considered as the world's worst weed complex (26). Yellow nutsedge thrives in warm, moist, fertile, sandy soils and is reported as a serious weed in numerous crops. Surveys conducted in the United States have indicated nutsedge populations were becoming more severe and widespread. Wax et al. (66) reported yellow nutsedge may not be as competitive as thought even though it grows profusely when uncontested.

Yellow nutsedge is present in all peanut producing areas of Oklahoma. It competes with peanuts for moisture, light, and nutrients but it is particularly detrimental in peanuts grown for seed purposes.

Control of yellow nutsedge is very difficult due to the method by which it propagates. Tubers, which may sprout several times through the growing season (4, 27, 50, 51, 56, 59) are the primary propagative structure. Tillage was noted to cause nutsedge tubers to sprout more, even though it can also control nutsedge growth (54, 56). An insect, *Bactra verutana*, has shown some biological activity against yellow nutsedge (19). Some herbicides have shown ability for partial season control, but few have provided sufficient late season control.

Since control of yellow nutsedge by a single method is difficult, an integration of available control methods are needed. Three types of weed control are generally practiced: cultural, biological, and chemical. Wax et al. (66) reported crop rotation, tillage, and use of available herbicides could significantly reduce yellow nutsedge populations. Crop rotation in Oklahoma peanut producing areas may be an unacceptable practice due to the lack of an alternate high dollar value crop.

The objectives of this study were: (a) determine the most effective herbicides and herbicide combinations for yellow nutsedge control in Spanish peanuts, and (b) evaluate the hooded sprayer as a means of applying herbicides for the control of yellow nutsedge in Spanish peanuts.

Granular Herbicides

Granular herbicide use has declined in recent years, even though they have been found to be as effective as sprays for weed control under most conditions (12, 13, 14, 31, 39, 47, 63). Granular herbicides usually are more costly than liquids because shipping costs are higher (10, 49). Also, recommended application rates of granular herbicides usually exceed the amount required for weed control. Application equipment output fluctuates reducing or increasing application rate. In order to maintain weed control higher rates are recommended so adequate herbicide is present in areas where application equipment fluctuates to low output levels (18).

Granular herbicides have benefits sprays do not have. Selectivity of granular herbicides may be one of its prime advantages. Starker (49) reported the physical selectivity of granular herbicides allows their use on emerged crops, where use of the same chemical in liquid form could cause phytotoxic damage. Buchanan et al. (10) also noted that the lack of herbicide retention by the crop was a distinct advantage of granular herbicides.

The objectives of this research were to: (a) determine if crop selectivity could be achieved by using granular herbicides applied postemergence, and (b) determine if crop growth stage affects selectivity.

CHAPTER II

LITERATURE REVIEW

Yellow nutsedge (Cyperus esculentus L.) is native to Oklahoma and North America (41). It is found throughout the tropical and temperate areas of the world (50), and grows best in warm, moist soils (5). This would indicate that it would be present in the same environment and on the same soils used for peanut production. Since the propagative characteristics of yellow nutsedge make it difficult to control, an understanding of its propagative mechanisms are needed.

Yellow nutsedge propagates by seed, rhizomes, basal bulbs, and tubers (4, 50, 51, 52). Even though yellow nutsedge may produce many viable seeds, this is not a prime means of spread, and seedling plants are effectively controlled with dinitroaniline herbicides (57). To control yellow nutsedge in Oklahoma, a knowledge of its seasonal growth habits are needed.

Physiology

Yellow nutsedge tubers start sprouting when temperatures reach 12°C or higher (50). This indicates growth would begin in late March or April in Oklahoma. Peanut planting usually occurs throughout the month of May. Therefore, nutsedge plants would be emerging before planting and would continue to emerge throughout the growing season.

Tubers of yellow nutsedge usually have two to seven buds (51, 56). Bendixen (4) noted that buds were produced one per node at successive nodes, with the largest bud being the oldest and most basipetal. Buds break domancy in acropetal order starting with the oldest bud (4). Stoller et al. (51) found that more than one bud may break dormancy at a time, but only during the first germination. The size of the tuber does not effect the number of buds per tuber, but larger tubers give rise to more vigorous plants (51). Plant size and vigor decreases with each successive sprouting. Smaller and less vigorous plants are produced after the first germination because 60% of the food reserves of the tuber are lost during the first germination (51). Tubers found as deep as 20.3 cm may sprout and have successively later emergence dates as depth increases (52). Stoller and Wax (52) reported a tuber viability increase with increased soil depth. They also found very little shoot emergence from tubers planted 2.5 cm deep or less. Tumbleson and Komendahl (60) discovered that exposing tubers to the sun, heat, wind, and cold reduces tuber viability rapidly. This helps explain the lack of shoot emergence from shallow tubers.

Sprouting tubers produce only rhizomes, no roots (51). Rhizomes grow toward the soil surface until light is encountered (50). When light contact is made, rhizomes form basal bulbs (50, 51). Garg et al. (20) found that all rhizomes either differentiate into a basal bulb or a tuber. During the early and the middle part of the growing season when photoperiods are long, Garg et al. (20) found rhizome differentiation into basal bulbs was promoted. When shorter photoperiods occurred, tuber formation was promoted.

Jansen (27) reported that the basal bulb was the center of vegetative growth and either shoots or rhizomes are produced by the basal bulb. Jansen (27) also noted that rhizomes may differentiate into secondary basal bulbs; thus, one parent plant could produce a complete system of lower order shoots, all of which eventually would produce rhizomes with tubers. Jansen (27) found parent shoots produce an average of 15 rhizomes with peripheral shoots of the first, second, and third order producing an average of seven, four, and four rhizomes, respectively. Tumbleson and Kommendahl (59) observed one tuber growing in a silt loam soil produced more than 1,900 plants and almost 6,900 tubers in one year. This exemplifies the prolific nature of yellow nutsedge.

Tubers are produced by differentiating rhizomes, as mentioned previously. Plants emerging late in the summer may still produce viable tubers. Jansen (27) found short photoperiods (less than 12 hours) promoted tuber production by all indeterminant rhizomes and an average of 29 tubers were produced by lower order shoots.

Tubers that are produced in the summer lay dormant until spring. It is not clear whether a period of cold is necessary to promote tuber germination. Data indicated only 12% of fall collected tubers germinated, compared to 95% of spring colleged tubers (60). However, washing fall collected tubers in cold water increased germination to 85%. When tubers were placed in both distilled water and tuber extract, more shoots emerged from the distilled water. This may indicate a necessity of leaching germination inhibitors out of tubers before high germination levels are reached (60). Studies involving cold storage of fall harvested tubers have shown that cold temperatures do increase germination. Therefore, cold temperatures and leaching of inhibitory substances probably both contribute to breaking dormancy of yellow nutsedge tubers (60).

Since vegetative production centers around tubers, a method of control affecting tuber production and germination could be effective (4, 30, 59, 60). At present, control alternatives are primarily cultural and chemical, with some interest in biological control of yellow nutsedge.

Biological Control

Limited research has been conducted investigating biological control of yellow nutsedge. Frick (19) has reported the biological activity of insect *Bactra verutana* on yellow and purple nutsedge. Purple nutsedge appears to be a more suitable host plant for *Bactra verutana*. Studies have indicated more eggs were deposited and a greater number of insects were able to complete development on purple nutsedge. Since yellow nutsedge would not be the primary host, control with *Bactra verutana* does not appear obtainable.

Cultural Control

Tillage is very important in yellow nutsedge control, where food reserves in tubers are involved (66). Cultural controls have been effective in controlling yellow nutsedge (34, 50, 51, 55, 59). Tillage is the predominant cultural control practiced by farmers. Wax et al. (66) reported that several pre-planting tillages combined with delayed crop planting was helpful in reducing food reserves of tubers. Subsequent yellow nutsedge plants were less vigorous and are more susceptible to control measures than undisturbed yellow nutsedge plants (65).

Smith and Mayton (48) reported that tillage after one or two seasons in a fallow system reduced tuber numbers by inducing sprouting and exposing tubers to the soil surface where dessication or low temperatures killed them. Most tubers (99%) are produced in the top 25 cm of the soil (59) and 80% are produced in the top 15 cm (50). Tumbelson and Kommendahl (59) found exposing tubers to the soil surface for two days reduced germination 80%. Crop rotations with peanuts, corn (Zea mays L.), and cotton (Gossypium hirsutum L.), plus intensive cultivation, have controlled 97 to 99% of the yellow nutsedge after three years (24).

Research has indicated tillage encourages tuber sprouting (54). Thullen and Keeley (56) found removal of sprouts soon after emergence increased the average number of sprouts per tuber. Bendixen and Stroube (5) noted if sprouts were not disturbed, only two buds per tuber would normally break dormancy. Control of yellow nutsedge with cultivation alone is not economically feasible, since hand weeding is required (24). The control of nutsedge using cultivation will depend on the crop grown and economic factors involved.

Black et al. (6) have identified yellow nutsedge as a photosynthetically efficient plant in full sunlight, but greatly inhibited when shaded. Since yellow nutsedge does not tolerate shade well, crops that produce a thick canopy may limit yellow nutsedge growth considerably. Jordan-Molero and Stoller (30) reported 75% shade reduced weight of yellow nutsedge plants by 56 to 70%. Almost 100% correlation between dry matter production and quantity of sunlight received by yellow nutsedge has been observed (34). Even though peanuts provide some shade they are not well adapted for shading. Peanuts' low growth and inability to shade the entire soil surface until late in the growing season allow nutsedge to thrive during the early growing season.

Chemical Control

Extensive research into the chemical control of yellow nutsedge has been conducted. Several chemicals have been reported to suppress yellow nutsedge shoot growth, but none have successfully eradicated or given acceptable full season control. Research indicates different ecotypes of yellow nutsedge are spread over the United States (66), and these have responded differently to herbicides. Due to different ecotypes it becomes more difficult to identify a good chemical control. Preplant and postemergence herbicides often provide the most consistent weed control. Vernolate, a preplant incorporated (PPI) herbicide, has provided average to excellent partial season yellow nutsedge control (7, 22, 23, 61, 65). The common and chemical names of herbicides and surfactants reported in this thesis are listed in Table I. Thiocarbamates, other than vernolate, are also effective yellow nutsedge herbicides but are not suited for use on peanuts (65).

Hauser et al. (23) reported subsurface herbicide applications improved yellow nutsedge control when injected in the top 10 cm of the soil. Upchurch et al. (61) reported superior weed control could be achieved with a single postplant incorporated vernolate treatment, when compared with a single preplant incorporated treatment. Split postplant incorporated applications also lessened the chance of peanut

TABLE I

COMMON, TRADE, AND CHEMICAL NAMES OF HERBICIDES AND SURFACTANTS

Common Name	Trade Name	Chemical Name
		Herbicides
Acetochlor	Not released	2-chloro-N(ethoxymethyl)-6'-ethyl-o-acetotoluidide
Alachlor	Lasso	2-chloro-2',6'-diethyl-N-(methoxy-methyl) acetanilide
Chloramben	Amiben	3-amino-2,5-dichlorobenzoic acid
Cyanazine	Bladex	2-[[4-chloro-6-(ethylamino)-S-tri-azin-2-Yl]amino]-2-methylpropionitrile
Dicamba	Banvel	3,6-dichloro-o-anisic acid
2,4-D	Numerous	(2,4-dichlorophenoxy) acetic acid
Dinoseb	Numerous	2-sec-butyl-4,6-dinitrophenol
DSMA	Numerous	Disodium methanearsonate
Fluometuron	Cotoran	1,1-dimethy-3-(∞,∞,∞-trivluoro-m-tolyl)urea
Glyphosate	Roundup	N-(phosphonomethyl) glycine
Metolachlor	Dual	2-chloro-N(2-ethyl-6-methylphenyl)-N-(2-methoxy-lmethylethyl) acetamide
Metribuzin	Sencor or Lexone	4-amino-6-tert-butyl-3-(methythio)-as-triazin-5(4H)-one
MSMA	Numerous	monosodium methanearsonate
Naptalam	Alanap	N-1-napthylphthalamic acid
Oxadiazon	Ronstar	2-tert-butyl-4-(2,4-dichloro-5-iso-propoxyphenyl)-Δ^2-1,3,4-oxadiazolin-5-one
Oxyfluorfen	Goal	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluromethyl) beuzene
Paraquat	Paraquat	1,1'-dimethyl-4,4'-bipyridinium ion
Simazine	Princep	2-chloro-4,6-bis(ethylamino)-s-triazine
Trifluralin	Treflan	∞-∞-∞-trifluro-2-6-dinitro-N,N-dipropyl-p-toludine
Vernolate	Vernam	S-propyl dipropylthiocarbamate

TABLE I (Continued)

Common Name	Trade Name	Chemical Name
		Surfactants
AG-98	AG-98	alkyl aryl poloxyethylene glycol
DA-77	SA-77	d-limonene
Crop Oil	Atplus 411F	Not released
X-77	X-77	Alkylarylpolyoxyethylene, Fatty acids, Isopropanol

injury. Boyle and Hammons (8) found avoidance of soil disturbance by cultivation was desirable to minimize peanut disease.

Reports indicate good early season yellow nutsedge control in Oklahoma with incorporated vernolate treatments (7, 67). Wax (65) reported that the location of vernolate in relation to the tuber was more important than the application method. Wax found vernolate applied above and around the tuber provided the best control; however, applying herbicides near deep tubers is not feasible (54). Early season control with single applications of vernolate are possible; however, late season or full season control and tuber death have not been obtained with its use.

Alachlor is a commonly used yellow nutsedge herbicide in peanuts (17). Alachlor may be applied preplant incorporated, preemergence, or early postemergence for control of yellow nutsedge (2, 17, 64, 65). Armstrong et al. (3) reported alachlor suppressed shoot growth, but did not kill tubers or basal bulbs. A minimum of 3.4 kg/ha of alachlor was required to control yellow nutsedge (2). Data indicates increased control with alachlor when rates were increased from 2.2 to 6.7 kg/ha (23, 64). Duncan et al. (17) and Wax (65) found shallow preplant incorporated treatments provided superior control when compared to preemergence treatments. They also reported delayed rainfall of 10 days or more after alachlor application reduced yellow nutsedge control. Excellent yellow nutsedge control (90% or greater) six to eight weeks after treatment has been reported under normal rainfall with both incorporated or preemergence applications of alachlor (2, 38, 40, 65, 66). Excellent late season control with single alachlor applications have not been obtained.

Metolachlor recently was labeled for use on peanuts in Oklahoma. Metolachlor and alachlor are both acetanilide herbicides and perform similarly. Metolachlor has provided excellent yellow nutsedge control applied preemergence or as a shallow preplant incorporated treatment (9, 16, 25, 40, 42, 43, 44, 46, 64). Preemergence control with metolachlor may be decreased with delayed rainfall of 10 days or more after treatment (42). Reports have shown metolachlor controls yellow nutsedge at rates of 2.2 to 6.7 kg/ha (16, 42, 44, 64). Ninety percent control or greater of yellow nutsedge early in the growing season has been observed (40, 64). Lewis (40) and Obrigawitch et al. (43) have reported good full season control of yellow nutsedge with 3.4 kg/ha metolachlor. Higgins et al. (25) observed 84% yellow nutsedge control 120 days after metolachlor treatment. The average growing season for peanuts in Oklahoma is approximately 140 days (35), indicating potential season long nutsedge control with metolachlor.

Treatments with metolachlor, lightly incorporated, generally provided better control than surface applied treatments. Higgins et al. (25) observed an increase in yellow nutsedge control with both alachlor and metolachlor when incorporated. However, metolachlor provided better late season control (40, 64).

The hooded sprayer allows use of non-selective, postemergence, foliar herbicides to be applied in row crops with little or no injury to the crop. Jordan (28) reported that use of glyphosate through a hooded sprayer was very effective in controlling perennial weeds such as bermudagrass (Cynodon dactylon L.) and nutsedge in cotton. Jordan (29) found glyphosate, MSMA, and paraquat could be applied to cotton and soybeans (Glycine max L.) without injury.

Organic arsenical herbicides applied postemergence have been used to control yellow nutsedge. Keeley and Thullen (32) observed 98% control with MSMA, compared to only 57% control with DSMA. Tidwell et al. (58) observed 80% yellow nutsedge control with a 2.2 kg/ha rate of MSMA. Keeley and Thullen (33) reported MSMA controlled 95 to 100% of the yellow nutsedge dry matter when applied at 1.7 to 3.4 kg/ha, with or without 0.5% surfactant. Three week old nutsedge plants treated with 3.4 kg/ha MSMA failed to produce tubers and tuber sprouting was significantly reduced when 8 to 13 week old plants were treated (32). Kogan and Gonzalez (37) found a 1.5% solution of MSMA reduced tuber and rhizome production 86% when applied at the 9 to 11 leaf stage.

Glyphosate is a non-selective, translocated, foliar herbicide (1). Data indicates glyphosate controls yellow nutsedge under normal environmental conditions (11). Tidwell et al. (58) and Stoller et al.

(53) reported 3.4 kg/ha glyphosate controlled 90 to 100% of the yellow nutsedge. Kogan and Gonzalez (37) observed the best yellow nutsedge control when yellow nutsedge was in the 9 to 11 leaf stage. Control of yellow nutsedge with 2.2 kg/ha glyphosate has been observed on plants up to 15.2 cm tall but not taller (24). Derting et al. (15) reported a minimum of 3.4 kg/ha glyphosate was required to control yellow nutsedge or repeat applications are required. Grichar et al. (21) reported preplant applications of glyphosate at 1.1 and 3.4 kg/ha controlled 49 and 97% of the yellow nutsedge, respectively, after one year. After three years of preplant applications of 1.1 and 3.4 kg/ha glyphosate, yellow nutsedge control was 94 and 97%, respectively (21).

Kogan (37) found glyphosate at 0.5 to 1.5% solution v/v reduced subterranean growth 98% when applied at the 9 to 11 leaf stage. He also reported tuber production per plant was reduced from 55 per plant to less than one per plant.

Granular Herbicides

There are numerous advantages and disadvantages for the use of granular herbicide formulations (10, 36). Advantages noted were: (a) no need of water for application, (b) limited herbicide drift, (c) relatively inexpensive application equipment, (d) physical selectivity, and (e) low equipment maintenance requirement. Disadvantages noted were: (a) bulkiness, causing higher shipping costs, (b) ease of movement of herbicide granules by wind and water, (c) higher recommended rates, and (d) inferior uniformity of distribution when compared to sprays (36, 49). Savage and McCormick (47) stated granules or pellets capable of releasing herbicides to the soil at a controlled rate offer the potential of making more efficient use of existing herbicides.

Buchanan et al. (10) reported that apparently there is no loss of effectiveness when herbicides are formulated as granules. Advantages of granules have rejuvenated interest in them, according to Buchanan. Benefits of using herbicide granules are unimportant, however, if crop tolerance and weed control equal to or greater than sprays cannot be achieved.

Erbach et al. (18) have described radius of control for granular herbicides as the area around a granule within which plants are effectively controlled. They found control decreased with increasing distance from the granule, but the decrease was less when good soil moisture is present. It was also noted that, as the number of granules per unit area increased, control would increase because granule area-of-influence would overlap. This emphasizes the need for even distribution of granular materials.

Most granular herbicides used are applied as preplant incorporated or preemergence treatments. Robinson et al. (45) reported low rates of incorporated granular fluometuron under abundant rainfall did not provide acceptable weed control, but sprayable applications provided excellent weed control. This probably correlated to uneven distribution of granular fluometuron since granules performed as well as sprays preemergence. Lewis (39) reported the best crabgrass (Digitaria sanguinalis L.) control in turfgrass with granular formulations. Significant increases in crabgrass control with all granular herbicides compared to sprays were observed in one study (39). Jordan et al. (31) reported granular formulations are equal to sprays for preemergence weed control under normal rainfall. They also observed superior weed control with preemergence granules versus incorporated granules. Derting et al. (14) found acetochlor granules as effective as sprays on grasses and small seeded broadleaf weeds and more effective in controlling nutsedge. Currey et al. (12, 13) reported granular applications of alachlor, cyanazine, and chloramben applied four, six, and eight weeks after peanut planting improved weed control and increased peanut yields 16 to 55% over conventional treatments. Buchanan et al. (10) observed no difference between spray and granular formulations of alachlor and reported excellent early season weed control with both formulations.

Granular herbicides have also been reported to be effected less by adverse rainfall conditions (31, 39, 45). Lewis (39) noted weed control with sprays was more adversely effected by delayed rainfall than granules. Jordan et al. (31) reported superior weed control with all granular herbicides under hot dry conditions. If granular herbicides perform better under stress conditions than sprays, granular use may be better suited for late season applications in Oklahoma because of normally high temperatures and low rainfall.

Selectivity with granular herbicides applied postemergence to the crop has received little attention. Most comparisons of granular and sprayable herbicide formulations for crop selectivity have been applied preplant incorporated or preemergence. Robinson et al. (45) reported cotton injury with a 3.4 kg/ha sprayable application of fluometuron, but no cotton injury with a 3.4 kg/ha application of fluometuron granules.

Yield reductions of cotton were reported when 1.1 or 3.4 kg/ha of alachlor was applied as a spray, but no yield reduction was reported with corresponding rates of alachlor granules. Buchanan et al. (10) observed more phytoxic effects with a postemergence application of sprayable alachlor in peanuts than with granular alachlor. Verma and Smith (63) also found pelleted alachlor and simazine less phytoxic to gladiolus (*Gladiolus spp*. L.) than sprayable formulations.

CHAPTER III

METHODS AND MATERIALS

Yellow Nutsedge Studies

Studies were conducted in the summer of 1980, at the Sandyland Research Station near Mangum, Oklahoma, to evaluate yellow nutsedge control in Spanish peanuts. A natural infestation of yellow nutsedge was uniformly distributed over the entire experimental area. A broadcast application of trifluralin at 0.55 kg/ha was applied preplant incorporated over all experimental areas to control annual grasses and small seeded broadleaf weeds. Supplemental water was not applied to any nutsedge experiment.

The general layout of all experiments was similar. Unless mentioned otherwise, the experiments were conducted as follows: experimental design was a randomized block with four replications, plot size was two rows wide by 9.1 m in length, crop row spacing was 1.0 m wide, and the peanut cultivar was Pronto. Herbicides were applied preplant incorporated (PPI), preemergence (PRE), and postemergence (POST). PPI and PRE treatments were applied using a compressed air sprayer and a carrier volume of 142 l/ha. POST treatments were applied with a compressed air sprayer or a hooded sprayer using 284 l/ha. POST granular treatments were applied with a cone type granular applicator.

Data collected from all yellow nutsedge experiments consisted of visual ratings for yellow nutsedge control and peanut injury. These ratings were taken several times during the growing season. Ratings were made on a 0 to 10 scale and converted to percent control or injury. Yield data was taken were peanut stands permitted. All data was analyzed with analysis of variance. If the F test was significant at the 95% probability level, data was further compared with least significant differences (LSD) values also at the 95% probability level.

Three nutsedge studies were conducted in 1981. Studies hereafter will be referred to as Nutsedge Study I through III.

Rainfall Data

Rainfall data for all studies conducted is shown in Table XVIII of the Appendix.

Nutsedge Study I

Single and sequential herbicide applications were applied as PPI, PRE, and POST treatments. A complete treatment list showing all herbicides and rates is shown in Table II. Incorporation was made with a tandem disk incorporating approximately 7.5 cm deep within three hours after application. Sprayable POST treatments were applied over-the-top to peanuts and nutsedge. Peanuts were 7.5 to 10 cm in height and nutsedge was 5.0 to 7.5 cm tall when treatments were applied. Plots that received only a single POST application were hand weeded prior to treatment because postemergence applications were effective only on germinating and emerging weeds. POST applications were made to extend control through the later part of the growing season. Application

TABLE II

SPANISH PEANUT RESPONSE AND YELLOW NUTSEDGE CONTROL WITH SINGLE AND SEQUENTIAL HERBICIDE APPLICATIONS (NUTSEDGE STUDY I-MANGUM, OKLAHOMA)

			Injury		Control				
		Method of	Peanuts		Yellow Nutsedge				In Shell
Treatment	Rate	Application	6/18	7/23	6/18	7/8	7/23	9/3	Yield
	kg/ha		(%)						kg/ha
Vernolate	2.8	PPI	10	0	88	68	63	53	1641
Vernolate + Alachlor	2.8+3.4	"	15	0	83	75	60	68	1004
Vernolate + Metolachlor	2.8+2.8	"	10	0	83	80	75	70	953
Alachlor	3.4	PRE	13	0	98	75	63	45	1281
Metolochlor	2.8	"	10	0	100	90	88	83	936
Vernolate;Alachlor	2.8;3.4	PPI;PRE	25	0	100	80	73	50	817
Vernolate;Alachlor 15G	2.8;3.4	"	13	0	95	88	75	68	755
Vernolate;Metolachlor	2.8;2.8	"	18	0	100	95	98	85	1045
Vernolate;Metolachlor 15G	2.8;2.8	"	25	0	98	85	85	75	831
Vernolate;Alachlor	2.8;3.4	PPI;POST	13	0	-	88	85	88	1166
Vernolate;Alachlor 15G	2.8;3.4	"	13	0	-	83	75	83	1114
Vernolate;Metolachlor	2.8;2.8	"	5	0	-	78	73	95	1444
Vernolate;Metolachlor 15G	2.8;2.8	"	15	0	-	80	80	68	1543
Alachlor 15G	3.4	POST	0	0	-	55	33	50	1030
Metolachlor 15G	2.8	"	0	0	-	40	13	70	960
Weed Free Check	-	-	0	0	100	100	100	100	1279
Check	-	-	0	0	0	0	0	0	1457
LSD (0.05)			13	-	11	17	24	31	NSD
CV (%)			88	-	9	16	25	32	36

[1/] PPI=preplant incorporated using a tandem disk on May 28; PRE=preemergence broadcast applied on May 28; POST=postemergence applied over-the-top on June 19.

of POST herbicides were made approximately three weeks after PPI treatments were applied, corresponding with the approximate time yellow nutsedge control with PPI or PRE treatments would be failing. Peanuts were mechanically harvested and threshed with a small plot peanut combine, and in-shell peanut yields were recorded. Pertinent application and plot information is shown in Table XI of the Appendix.

Nutsedge Study II

Herbicides were applied POST using a hooded sprayer. POST herbicides were foliar active and were applied banded to the area between the crop rows up to the peanut row. Peanuts were 10 to 15 cm in height and yellow nutsedge was 5 to 25 cm tall at treatment time. A complete treatment list is shown in Table III. Glyphosate was applied at rates of 1.7 and 3.4 kg/ha with spray additives. Paraquat was also applied at 0.55 kg/ha with spray additives. Pertinent application and plot information is shown in Table XII of the Appendix.

Nutsedge Study III

Tank mixtures of foliar and soil active herbicides were applied using a hooded sprayer. Herbicides were applied to the area between the crop row up to the peanut row. A complete treatment list is shown in Table IV. Foliar herbicides were applied to remove existing foliage, while the soil active herbicides were evaluated for residual nutsedge control. Peanuts were 15 to 20 cm in height and nutsedge was 15 to 30 cm tall when treatments were applied. Tank mixtures included glyphosate, paraquat, or MSMA with alachlor or metolachlor. A glyphosate treatment was applied alone for comparison with tank mixtures.

Pertinent application and plot information is shown in Table XIII of the Appendix.

TABLE III

EFFECTS OF HERBICIDES AND HERBICIDE ADDITIVES ON YELLOW NUTSEDGE CONTROL WITH APPLICATIONS MADE USING A HOODED SPRAYER (NUTSEDGE STUDY II-MANGUM, OKLAHOMA)

Treatment	Rate (kg/ha)	Nutsedge Control 7/09 (%)	7/23
Glyphosate + AG-98	1.7 + 0.5% v/v	15	68
Glyphosate + AG-98	3.4 + 0.5% v/v	50	60
Glyphosate + SA-77	1.7 + 0.5% v/v	33	50
Glyphosate + SA-77	3.4 + 0.5% v/v	35	45
Glyphosate + Sun Crop Oil	1.7 + 2.4 l/ha	25	48
Glyphosate + Sun Crop Oil	3.4 + 2.4 l/ha	58	53
Paraquat + AG-98	0.55 + 0.5% v/v	23	38
Paraquat + SA-77	0.55 + 0.5% v/v	33	33
Paraquat + Atplus 411F	0.55 + 0.5% v/v	20	43
Check	--	0	0
LSD (0.05)		25	24
CV (%)		59	38

Note: Treatments were applied on June 24.

Granular Studies

Field experiments were conducted at two locations to evaluate Spanish peanut response to postemergence applied granular and sprayable herbicide formulations. In 1980, experiments were conducted at both the Agronomy Research Station near Stillwater and at the Caddo

Research Station near Ft. Cobb. In 1981, two experiments were conducted at the Caddo Research Station near Ft. Cobb.

TABLE IV

YELLOW NUTSEDGE CONTROL WITH HERBICIDE TANK MIXTURES APPLIED USING A HOODED SPRAYER (NUTSEDGE STUDY III-MANGUM, OKLAHOMA)

Treatment[1]	Rage (kg/ha)	Nutsedge Control 7/23 (%)	Nutsedge Control 9/03 (%)
Glyphosate	1.7	20	40
Glyphosage	3.4	65	40
Glyphosate + Alachlor	1.7 + 2.3	30	63
Glyphosate + Alachlor	1.7 + 4.5	28	55
Glyphosate + Metolachlor	1.7 + 2.3	23	75
Glyphosate + Metolachlor	1.7 + 3.4	28	75
Paraquat[2] + Alachlor	1.1 + 2.3	80	18
Paraquat[2] + Alachlor	1.1 + 4.5	78	18
Paraquat[2] + Metolachlor	1.1 + 2.3	85	70
Paraquat[2] + Metolachlor	1.1 + 3.4	83	73
MSMA[3] + Alachlor	1.1 + 2.3	65	25
MSMA[3] + Alachlor	1.1 + 4.5	58	33
MSMA[3] + Metolachlor	1.1 + 2.3	60	63
MSMA[3] + Metolachlor	1.1 + 3.4	55	48
Check	--	0	0
LSD (0.05)		18	28
CV (%)		25	42

[1]Treatments were applied postemergence on July 9.

[2]Paraquat tank mixtures were applied with 0.5% v/v X-77.

[3]MSMA tank mixtures were applied with 0.5% v/v AG-98.

The layout of all experiments was similar. Unless mentioned otherwise, the experiments were conducted as follows: experimental design was a randomized block with four replications, plot size was two rows wide by 9.1 m in length, and crop row spacing was 91 cm. All herbicides were applied POST to the crop. Granular herbicides were applied with a cone type granular applicator and sprays with a compressed air sprayer using a carrier volume of 284 l/ha.

Data collected from experiments included visual ratings for peanut injury, and yields when moisture and weeds allowed. Visual ratings were taken several times during the growing season. Ratings were made on a 0 to 10 scale and converted to percent injury. All data was analyzed with analysis of variance. If the F test was significant at the 95% probability level, data was further compared with less significant differences (LSD) values also at the 95% probability level.

Four granular studies were conducted in 1980 and 1981. Studies hereafter will be referred to as Granular Studies I through IV.

Granular Study I

The initial granular versus sprayable formulation experiment was first conducted comparing many herbicides. A complete treatment list is in Table V. Crop response was the only factor considered in this experiment. The experimental area was planted with Spanish peanuts, cultivar Tamnut, and irrigated for stand establishment. Plots were 0.9 m wide by 1.8 m long and were replicated three times. Peanuts were 7.5 cm to 10 cm tall when herbicides were applied. Supplemental irrigation of approximately 2.5 cm was applied about 48 hours after herbicide treatment for chemical activation. Visual ratings were made eight days and four weeks after treatment. Pertinent application and plot information is shown in Table XIV in the Appendix.

TABLE V

SPANISH PEANUT RESPONSE TO POSTEMERGENCE APPLIED GRANULAR AND SPRAYABLE HERBICIDE FORMULATIONS (GRANULAR STUDY I-STILLWATER, OKLAHOMA)

		Peanut Injury			
		Early		Late	
		Granular	Spray	Granular	Spray
Treatment	Rate (kg/ha)	(%)			
Alachlor	2.3	0	7	0	3
Alachlor	4.5	7	0	3	0
Chloramben	2.3	17	7	30	0
Chloramben	4.5	7	13	0	0
Cyanazine	0.55	0	23	10	23
Cyanazine	1.1	10	20	20	3
Dicamba	0.55	57	50	63	43
Dicamba	1.1	77	80	80	73
2,4-D	0.55	7	100	7	0
2,4-D	1.1	20	33	3	0
Metribuzin	0.55	67	50	33	80
Metribuzin	1.1	37	57	67	100
Oxadiazon	1.7	13	47	0	10
Oxadiazon	3.4	3	30	7	30
Oxyfluorfen	0.55	27	33	3	7
Oxyfluorfen	1.1	40		27	17
Simazine	2.3	13		40	33
Simazine	4.5	7		37	53
CV (%)		65		98	
LSD (0.05)	Herbicide	16		22	
	Formulation	7		NSD	
	Rate	NSD		NSD	

Note: Treatments were applied on August 5.

Granular Study II

The second granular versus sprayable experiment was conducted at Ft. Cobb and utilized larger plots and fewer herbicides (Table VI). A complete treatment list is shown in Table VII. Both crop response and weed control were to be evaluated in this experiment, but the "cracking stage" application of alachlor + dinoseb + alanap at 2.3 + 0.55 + 1.1 kg/ha controlled weeds throughout the growing season over the entire experimental area. Plot size was two rows wide by 7.6 m long. One-half of the plots were cultivated prior to herbicide application to remove existing weeds. Herbicides were applied when peanuts were 10 cm in height. Sprinkler irrigation was applied approximately 48 hours after herbicides were applied and throughout the remainder of the growing season as needed. Peanuts were mechanically harvested when they reached maturity and in-shell peanut yields were recorded. Pertinent application and plot information is shown in Table XV of the Appendix.

Granular Study III

Granular Study III was conducted at Ft. Cobb. Selected treatments from Granular Study II were repeated in Granular Study III. A complete treatment list is given in Table VIII. All plots were hand weeded prior to treatment to remove existing weeds because treatments were known to have little activity on emerged weeds. However, only peanut injury ratings are presented due to erratic weed stand. Sprinkler irrigation was applied approximately 48 hours after herbicides were applied and throughout the remainder of the growing season as needed. Pertinent application and plot information is in Table XVI in the Appendix.

TABLE VI

SPANISH PEANUT RESPONSE TO GRANULAR AND SPRAYABLE METRIBUZIN FORMULATIONS (GRANULAR STUDY II-FT. COBB, OKLAHOMA)

			Peanut Injury			
			8/6		8/19	
Treatment	Rate	Cultivation	Granule	Spray	Granule	Spray
			(%)			
Metribuzin	0.55	yes	33	68	3	43
Metribuzin	1.11	yes	28	80	8	63
Metribuzin	0.55	no	15	85	3	65
Metribuzin	1.11	no	35	73	3	63
CV (%)			53		46	
LSD (0.05	NSD	NSD	20		11	

Note: Treatments were applied on June 24.

Granular Study IV

Granular Study IV was conducted at Ft. Cobb. Four rates of granular metribuzin and oxyfluorfen plus one sprayable treatment were applied to peanuts at three growth stages. Peanuts were planted on May 19, June 8, and June 16 to establish the three growth stages. Herbicides were then applied when 50% of the peanuts planted on June 16 had cracked. The staggered planting dates and uniform treatment date resulted in plants 20 to 25, 10 to 15, and 0 to 5 cm tall at herbicide application. Staggered planting dates, rather than staggered treatment dates, allowed uniform environmental conditions on all treatments. Treatment lists are shown in Tables IX and X. Plots were hand weeded prior to herbicide application to remove existing weeds. Sprinkler irrigation was applied approximately 48 hours after treatment and throughout the remainder of the growing season as needed. Pertinent application and plot information is shown in Table XVII of the Appendix.

TABLE VII

SPANISH PEANUT YIELD RESPONSE TO POSTEMERGENCE APPLIED GRANULAR AND SPRAYABLE HERBICIDE FORMULATIONS (GRANULAR STUDY II- FT. COBB, OKLAHOMA)

		Peanut Yield			
		Cultivated		Non-Cultivated	
Treatment	Rate (kg/ha)	Granular	Spray (kg/ha)	Granular	Spray
Alachlor	0.0	2799	2799	2947	2947
Alachlor	2.3	3960	2881	3490	2815
Alachlor	4.5	3285	3465	4034	3565
Metolachlor	0.0	2799	2799	2947	2947
Metolachlor	1.7	3048	2058	3523	3053
Metolachlor	3.4	3054	2305	2824	2849
Metribuzin	0.0	2799	2799	2947	2947
Metribuzin	0.55	2041	2041	3120	1951
Metribuzin	1.1	1540	1161	2609	1975
Oxadiazon	0.0	2799	2799	2947	2947
Oxadiazon	1.7	3021	3153	3259	2255
Oxadiazon	3.4	2115	4099	3301	2849
Oxyfluorfen	0.0	2799	2799	2947	2947
Oxyfluorfen	0.55	3104	3722	3565	3532
Oxyfluorfen	1.1	2453	3598	3194	2544
CV (%) = 43					
LSD (0.05)	Herb.-1740 kg/ha Rate-NSD Cultivation-NSD Formulation-NSD				

Note: Treatments were applied on June 24.

TABLE VIII

SPANISH PEANUT RESPONSE TO POSTEMERGENCE APPLIED GRANULAR AND SPRAYABLE HERBICIDE FORMULATIONS (GRANULAR STUDY III-FT. COBB, OKLAHOMA)

		Peanut Injury			
		7/16		8/04	
		Granular	Spray	Granular	Spray
Treatment	Rate (kg/ha)	(%)			
Alachlor	2.3	0	0	0	0
Alachlor	4.5	18	0	20	0
Metribuzin	0.55	50	60	80	68
Metribuzin	1.1	75	100	90	100
Oxadiazon	1.7	0	0	3	0
Oxadiazon	3.4	0	0	3	0
Oxyfluorfen	0.55	0	1	0	0
Oxyfluorfen	1.1	0	0	0	0
CV (%)		63		55	
LSD (0.05)	Herbicide	9		9	
	Rate	7		6	
	Herbicide x Rate	19		NSD	
	Formulation	NSD		NSD	

Note: Treatments were applied on June 18.

TABLE IX

SPANISH PEANUT RESPONSE TO METRIBUZIN APPLIED AT THREE PEANUT GROWTH STAGES (GRANULAR STUDY IV-FT. COBB, OKLAHOMA)

		Peanut Injury					
		Growth Stage I[1]		Growth Stage II[2]		Growth Stage III[3]	
		7/16	8/04	7/16	8/04	7/16	8/04
Treatment	Rate (kg/ha)	(%)					
Metribuzin 5G	0.3	65	60	60	68	35	38
Metribuzin 5G	0.55	90	95	85	90	48	75
Metribuzin 5G	1.1	100	100	100	90	73	100
Metribuzin 5G	1.7	100	100	98	100	95	98
Metribuzin WP	0.85	100	100	100	100	75	100
CV (%)		32	12	32	12	32	12
LSD (0.05) Growth Stage		38	13	38	13	38	13
Rate		38	16	38	16	38	16

[1]Peanuts were planted on June 16.

[2]Peanuts were planted on June 8.

[3]Peanuts were planted on May 19.

TABLE X

SPANISH PEANUT RESPONSE TO OXYFLUORFEN APPLIED AT THREE PEANUT GROWTH STAGES (GRANULAR STUDY IV-FT. COBB, OKLAHOMA)

		Peanut Injury					
		Growth Stage I[1]		Growth Stage II[2]		Growth Stage III[3]	
Treatment	Rate (kg/ha)	7/16	8/04	7/16	8/04	7/16	8/04
		(%)					
Oxyfluorfen 2G	0.3	0	10	0	8	0	3
Oxyfluorfen 2G	0.55	0	15	0	0	0	10
Oxyfluorfen 2G	1.1	8	15	0	3	0	0
Oxyfluorfen 2G	2.3	5	20	8	18	0	5
Oxfluorfen EC	0.85	30	23	35	43	25	13
CV (%)		156	94	156	94	156	94
LSD (0.05) Growth Stage		NSD	NSD	NSD	NSD	NSD	NSD
Rate		16	16	16	16	16	16

[1]Peanuts were planted on June 16.

[2]Peanuts were planted on June 8.

[3]Peanuts were planted on May 19.

CHAPTER IV

RESULTS AND DISCUSSION

Nutsedge Study I-Mangum, Oklahoma (1981)

Several herbicide treatments provided good to excellent yellow nutsedge control early in the growing season (Table II). Peanut stunting also occurred early in the growing season but had disappeared six to eight weeks after treatment.

PPI and PRE perennial weed control experiments must be conducted on areas that were naturally infested the previous year. Weed stand uniformity cannot be predicted before treatments are applied. Because uneven nutsedge stands are common in experiments variation among treatments is often noted. This is reflected in high coefficients of variation in the statistical analysis.

All herbicide treatments except POST applications of alachlor and metolachlor granules provided good early season yellow nutsedge control. However, single applications of vernolate (2.8 kg/ha) PPI and alachlor (3.4 kg/ha) PRE did not provide sufficent late season control. Metolachlor (2.8 kg/ha) PRE provided significantly higher nutsedge control at the late rating than alachlor (PRE) or vernolate (PPI). Vernolate tank mixed with alachlor or metolachlor PPI (2.8 + 3.4 or 2.8 kg/ha) did not improve late season yellow nutsedge control over vernolate alone applied PPI. Vernolate (2.8 kg/ha) PPI with alachlor (3.4 kg/ha) or metolachlor (2.8 kg/ha) POST provided excellent late season yellow nutsedge control. However, vernolate (2.8 kg/ha) applied PPI followed by a sequential application of metolachlor (2.8 kg/ha) PRE or POST provided the best and most consistent yellow nutsedge control.

Peanut yields were not significantly affected by any herbicide treatments. However, yields from vernolate treated plots were higher than when sequentials of metolachlor or alachlor were applied with vernolate. Even though yield differences were not significant, data may not be representative of true peanut-yellow nutsedge yield relationship because dry weather conditions inhibited peanut and yellow nutsedge growth.

Nutsedge Study II-Mangum, Oklahoma (1981)

Low levels of peanut injury occurred with both herbicides in this experiment. Peanuts quickly recovered when rainfall occurred, however. Small peanut plants at treatment time failed to keep hoods of the sprayer running between rows properly, resulting in plant exposure to the spray.

Yellow nutsedge control was not sufficient with any herbicide treatments at either rating date (Table III). Glyphosate treatments generally provided better control than paraquat, but were well below acceptable control levels. Comparison between herbicide surfactants also showed no significant increase in yellow nutsedge control. Hot, dry conditions at application time probably resulted in low levels of yellow nutsedge control.

Nutsedge Study III-Mangum, Oklahoma (1981)

Herbicide treatments in this experiment applied with the hooded sprayer caused no appreciable injury to peanuts. Paraquat tank mixtures with alachlor or metolachlor provided the best yellow nutsedge control at the early rating (Table IV). Glyphosate tank mixtures with alachlor or metolachlor provided poor yellow nutsedge control at the early rating, but control increased appreciably by the late rating date. Metolachlor (2.3 and 3.4 kg/ha) tank mixtures with paraquat, MSMA, and glyphosate controlled yellow nutsedge better than the same tank mixtures with alachlor by the late rating date. Paraquat plus metolachlor tank mixtures provided significantly higher yellow nutsedge control than paraquat plus alachlor tank mixtures at the late rating date. Consistently higher residual control with metolachlor was evident with all tank mixtures in this experiment.

Granular Study I-Stillwater, Oklahoma (1980)

Visual peanut injury ratings were made eight days (early) and four weeks (late) after herbicide treatments were applied. Several herbicides caused peanut stunting, chlorosis, and necrosis (Table V). Significant differences between treatment means was noted at the early and late rating dates. Metribuzin and dicamba at rates of 0.55 and 1.1 kg/ha caused severe peanut injury at the early and late rating dates. Oxyfluorfen spray and granules at 0.55 and 1.1 kg/ha also caused considerable injury at the early rating but most of the injury had dissipated by the late rating. There was a significant difference between granular and sprayable herbicide formulations at the early rating date. Cyanazine, metribuzin, oxadiazon, oxyfluorfen, and simazine sprayable formulations caused significantly higher injury at the early rating than did the granular formulations. No significant difference between formulations was noted at the late rating date. There were no significant differences between herbicide rates at either rating time.

Granular Study II-Ft. Cobb, Oklahoma (1980)

Metribuzin was the only herbicide that injured peanuts (see Table VI). This data was taken out of Study II and analyzed separately. The sprayable formulations of metribuzin at 0.55 and 1.1 kg/ha caused significantly higher injury to peanuts on the August 6 and August 19 rating dates. Injury to peanuts treated with granular metribuzin formulations had declined to insignificant levels by the August 19 rating date. There were no differences in peanut injury levels due to herbicide rates or cultivation. The sprayable formulation of metribuzin at 1.1 kg/ha + cultivation significantly reduced peanut yields over that of the non-cultivated check (see Table VII).

Yield data was taken from all treatments. No visual injury occurred with any treatment, with the exception of metribuzin, and in shell yields were used for final comparisons. None of the herbicide treatments applied significantly increased peanut yields over the check plots. The average yield for alachlor, oxadiazon, and oxyfluorfen treatments was greater than the average for all treatments. The average yield for metribuzin treatments were 575.5 kg/ha less than the mean for all treatments. Metribuzin granules generally reduced yields less than did sprays. Significant differences between metribuzin treatments was noted between the cultivated spray at 1.1 kg/ha (1161 kg/ha) and the granular non-cultivated treatment at 0.55 kg/ha (3120 kg/ha). Significant yield differences were also found between oxadiazon treatments. The cultivated granular and sprayable treatments of oxadiazon at 3.4 kg/ha was significantly different, with yields being 2115 and 4099 kg/ha, respectively. No significant yield differences were found among alachlor, metolachlor, or oxyfluorfen treatments.

Granular Study III-Ft. Cobb (1981)

Selected treatments from Granular Study II were repeated in Granular Study III. Visual ratings indicated metribuzin treatments caused the most severe peanut injury (see Table VIII). Peanut injury of 50 to 100% occurred on the July 16 rating date when 0.55 or 1.1 kg/ha metribuzin was applied as a granular or spray treatment. Alachlor granules at 4.5 kg/ha was the only other treatment that caused appreciable peanut injury at the early rating. Herbicide by rate interaction was present at the early rating. Both formulations of metribuzin caused significantly higher peanut injury at 1.1 kg/ha than at the 0.55 kg/ha rate.

Peanut injury was significantly higher in metribuzin treated plots at the second rating than was apparent with any other herbicide treatment. There also was a significant difference between metribuzin rates. The 1.1 kg/ha rate of metribuzin caused significantly higher peanut injury than the 0.55 kg/ha rate.

Due to the severe infestation of annual grasses throughout the growing season, which these treatments did not successfully control, peanut yields were not taken.

Granular Study IV-Ft. Cobb, Oklahoma (1981)

Five rates of metribuzin and oxyfluorfen were applied at three peanut growth stages to determine if crop selectivity could be achieved at different herbicide rates and planting dates. Data from Granular Study IV is divided into two sections: metribuzin and oxyfluorfen, due to interest in differences within herbicides and simplicity of presentation.

Granular metribuzin caused considerable injury to peanuts at all growth stages and application rates, but was generally less injurious to the peanuts treated at growth stage III (see Table IX). Metribuzin at rates greater than 0.55 kg/ha resulted in 90% or greater injury to peanuts at the late rating and all early ratings except growth stage III.

Metribuzin granules at 0.3 kg/ha caused the least peanut injury at all three growth stages. However, there was no difference in peanut injury at the three respective growth stages averaged over all herbicide rates on either rating date. Metribuzin sprayable at 0.85 kg/ha and granular at 1.7 kg/ha were significantly more injurious at the first rating than the 0.3 kg/ha rate averaged over all growth stages. All rates caused significantly higher peanut innury than the 0.3 kg/ha application at the second rating.

Oxyfluorfen granular treatments caused minimal peanut injury (see Table X). No differences were noted between growth stages averaged over all rates. However, the sprayable formulation of oxyfluorfen caused significantly higher injury averaged over all growth stages at the early rating. Sprayable oxyfluorfen at 0.85 kg/ha and granular at 2.3 kg/ha caused significantly higher peanut injury than all other rates averaged over all growth stages at the second rating.

CHAPTER V

SUMMARY

Yellow Nutsedge Studies

Yellow nutsedge studies were carried out in 1981 to evaluate single, sequential, and hooded sprayer herbicide applications. Due to dryland production under adverse weather conditions, only one experiment of three was harvested.

Statistical analysis of data was conducted at the 95% confidence level. Since a high significance level was used, some treatments which were statistically better may not have been better from a practical production standpoint. Differences between treatment means in this thesis are based only on statistical differences.

Single applications of vernolate (2.8 kg/ha) PPI, and alachlor (3.4 kg/ha) PRE failed to provide acceptable control (80% control or greater) late in the growing season. Vernolate PPI followed by sequential applications of alachlor POST and metolachlor PRE or POST gave acceptable last season control of yellow nutsedge. Nutsedge control levels late in the season may have been higher than normal, since low rainfall would not have appreciably leached chemicals from the soil. Peanuts are normally grown under irrigation where abundant moisture is present, and considerable leaching can occur. High levels of yellow nutsedge control are necessary to prevent reinfestation the following growing season. Late season control may not be necessary for maximum yields, since no herbicides in Nutsedge Study I significantly increased peanut yields over that of the weed free check plot. All herbicides did provide good early season yellow nutsedge control. This may indicate early season control is the most critical time to control nutsedge in order to obtain maximum yields. These results are similar to those of Wilhm (67), who found no yield increases with chemical treatments compared to a weed free check. These studies were conducted on areas with a moderate nutsedge stand. If experiments had been conducted on heavily infested areas characteristic of nutsedge "hot spots," differences in yields due to chemical treatments may have been found.

Hooded sprayer treatments did not provide acceptable yellow nutsedge control. These results differ from those of Wilhm (67), who reported excellent yellow nutsedge control using the hooded sprayer under irrigated conditions. Rates applied in these studies may not have been high enough to affectively control yellow nutsedge. However, extremely hot, dry weather may have caused cessation of growth, inhibiting herbicide control. No difference in yellow nutsedge control was noted when surfactants were applied with glyphosate or paraquat. Addition of residual herbicides, alachlor, and metolachlor to glyphosate, MSMA, or paraquat did improve control. Metolachlor provided superior residual nutsedge control with all foliar herbicides. Hooded sprayer use in small peanuts should be avoided. In order for the hooded sprayer to work properly, the crop must be large enough to guide hoods between the rows. Hooded sprayer use may be impractical on a broadcast basis; however, use on yellow nutsedge "hot spots" is ideally suited for the hooded sprayer. Hooded sprayer treatments failed to provide the control desired in these experiments, but its use should be further investigated to determine where and if it fits into an integrated nutsedge control system.

Granular Studies

Granular studies were conducted in 1980 and 1981 to evaluate effects of granular and sprayable herbicide formulations applied postemergence to Spanish peanuts. Weed control information was also evaluated but, due to inconsistent weed stands and infestation by annual grasses when only broadleaf herbicides were applied, this data was omitted.

Experiments conducted comparing peanut injury with granular and sprayable formulation differences were found between formulations only in Granular Studies I and II. Sprays were consistently more injurious to peanuts in Granular Study I at the first rating. Higher injury by sprays may have been a result of extremely high temperatures and foliar retention of sprays opposed to no herbicide granule retention. No differences were found between formulations on the second rating date. Only metribuzin treatments produced injury in Granular Study II. High levels of metribuzin injury may have been related to coarse textured soils and low organic matter in the experimental area. Granular treatments were substantially less harmful than sprays in this study. No differences between metribuzin formulations was noted in Granular Study III, indicating injury was the result of root uptake primarily and not foliar absorption. Metribuzin injury with granules and sprays was substantial in Granular Study IV. However, oxyfluorfen granules caused only slight peanut injury. Larger and older peanuts generally were injured less by herbicides. Since older peanuts were generally injured less by postemergence applied herbicides, treatments at later application dates should be investigated for peanut phytotoxic response.

Overall, metribuzin use on all growth stages of peanuts tested was unacceptable. Alachlor, metolachlor, oxadiazon, and chloramben granular and sprayable formulations appear to be non-injurious to peanuts applied postemergence. Oxyfluorfen caused peanut injury soon after application, but peanuts appeared to recover quickly.

Almost all peanut injury conclusions were drawn from visual ratings. Yields were obtained from only one study (Granular Study II) and peanut yields indicated no difference between sprayable and granular formulations. More documentation is needed to determine if yields are affected by POST applied herbicide formulations. Some herbicides tested offer special weed control potential in peanuts applied POST if they can be used without serious yield reductions.

LITERATURE CITED

(1) Anonymous. 1979. Herbicide Handbook of the Weed Science Society of America. Fourth ed. 479 pp.

(2) Armstrong, T. F., W. F. Meggitt, and D. Penner. 1973. Yellow nutsedge control with alachlor. Weed Sci. 21:354-357.

(3) Armstrong, T. F., W. F. Meggitt, and D. Penner. 1973. Absorption, translocation, and metabolism of alachlor by yellow nutsedge. Weed Sci. 21:357-360.

(4) Bendixen, L. E. 1973. Anatomy and sprouting of yellow nutsedge tubers. Weed Sci. 21:501-503.

(5) Bendixen, L. E. and E. W. Stroube. 1977. Two weed species of worldwide significance. Weeds Today. 9(1):9, 15.

(6) Black, C. C., T. M. Chen, and R. H. Brown. 1969. Biochemical basis for plant competition. Weed Sci. 17:338-344.

(7) Boswell, T. E., M. G. Merkle, and W. J. Grichar, Jr. 1976. Nutsedge control in peanuts. Proc. S. Weed Sci. 29:149.

(8) Boyle, L. W. and R. D. Hammons. 1956. Cultural prlblems with respect to peanut yields and Southern blight and root rot. Georgia Ag. Exp. Sta. Mimeogr. Series N. S. 31.

(9) Brashears, A. D., J. R. Abernathy, and J. V. Schrib. 1976. An evolution of yellow nutsedge control techniques in west Texas cotton. Proc. S. Weed Sci. Soc. 29:150.

(10) Buchanan, G. A., J. Street, B. Bryant, J. Starling, and H. Ivey. 1978. Granular herbicides work as well as sprays. Highlights of Ag. Res., Auburn Univ. 2:14.

(11) Chase, R. L. and N. P. Appleby. 1979. Effects of humidity and moisture stress on glyphosate control of Cyperus rotundus L. Weed Res. 19:241-246.

(12) Currey, W. L., D. H. Teem, D. W. Corbet, and K. A. Conlin. 1978. Herbicide granules for Florida beggarweed control in peanuts. Proc. S. Weed Sci. Soc. 31:124.

(13) Currey, W. L., D. H. Teem, B. J. Brecke, D. W. Colbert, and K. A. Conlin. 1979. Timing of granular herbicide application for control of Florida beggarweed in peanuts. Proc. S. Weed Sci. Soc. 32:139.

(14) Derting, C. W., O. N. Andrews, Jr., R. G. Duncan, K. R. Frost, Jr., F. D. Timmons, and G. W. Selleck. 1972. Field evaluations of acetochlor on peanuts and soybeans. Proc. S. Weed Sci. Soc. 25:131-140.

(15) Derting, C. W., O. N. Andrews, Jr., R. G. Duncan, and K. R. Frost, Jr. 1973. Two years of perennial weed control investigations with glyphosate. Proc. S. Weed Sci. Soc. 26:44-50.

(16) Dill, T. R. and S. W. Dumford. 1978. Metolachlor as a peanut herbicide. Proc. S. Weed Sci. Soc. 31:120.

(17) Duncan, R. G., O. N. Andrews, F. D. Timmons, and G. W. Selleck. 1971. Alachlor and alachlor combinations in peanuts. Proc. S. Weed Sci. Soc. 24:110.

(18) Erbach, D. C., W. G. Lovely, and G. W. Bockhop. 1976. Area-of-influence of herbicide granules. Weed Sci. 24:170-174.

(19) Frick, K. E., R. D. Williams, P. C. Quimby, Jr., and R. F. Wilson. 1979. Comparative biocontrol of purpose nutsedge (Cyperus rotundas) and yellow nutsedge (C. esculentus) with Bactra veruntana under greenhouse conditions. Weed. Sci. 27:178-182.

(20) Garg, D. K., L. E. Bendixen, and S. R. Anderson. 1967. Rhizome differentiation in yellow nutsedge. Weed Sci. 15:124-128.

(21) Grichar, W. J., T. E. Boswell, and M. G. Merkle. 1979. Three year effects of herbicide treatments upon yellow nutsedge populations in peanuts. Proc. Am. Peanut Res. and Ed. Soc. 11(1):59.

(22) Hauser, E. W., J. L. Butler, J. L. Shepard, and S. A. Parham. 1966. Response of yellow nutsedge, Florida pusley, and peanuts to thiocarbamate herbicides as affected by method of placement in soil. Weed Res. 6:338-345.

(23) Hauser, E. W., L. E. Samples, and S. A. Parham. 1969. Incorporated versus subsurface vernolate for weed control in peanuts. Weed Res. 9:173-184.

(24) Hauser, E. W., C. C. Dowler, M. D. Jellum, and S. R. Cecil. 1974. Effects of herbicide-crop rotation on nutsedge, annual weeds and crops. Weed Sci. 22:172-176.

(25) Higgins, E. B., M. G. Schnappinger, and S. W. Pruss. 1976. CGA 24705 plus atrazine for yellow nutsedge control in corn. Proc. N. E. Weed Sci. Soc. 30:65-70.

(26) Holm, L. 1969. Weed problems in developing countries. Weeds. 17:113-118.

(27) Jansen, L. L. 1971. Morphology and photoperiodic response of yellow nutsedge. Weed Sci. 19:210-219.

(28) Jordan, T. N. 1977. Hooded sprayer for glyphosate application in cotton. Proc. S. Weed Sci. Soc. 30:417.

(29) Jordan, T. N. 1978. Development of a hooded sprayer for agronomic crops. Proc. S. Weed Sci. Soc. 31:333.

(30) Jordan-Molero, J. E. and E. W. Stoller. 1978. Seasonal development of yellow and purple nutsedges. Weed Sci. 26:614-618.

(31) Jordan, L. S., J. M. Lyons, W. H. Isom, and B. F. Day. 1968. Factors affecting performance of preemergence herbicides. Weed Sci. 16:457-462.

(32) Kelley, P. E. and R. J. Thullen. 1970. Vitality of tubers of yellow nutsedge treated with arsenical herbicides. Weed Sci. 18:437-439.

(33) Keeley, P. E. and R. J. Thullen. 1971. Control of nutsedge with organic arsenical herbicides. Weed Sci. 19:601-606.

(34) Keeley, P. E. and R. J. Thullen. 1978. Light requirements of yellow nutsedge (Cyperus esculentus) and light interception by crops. Weed Sci. 26:10-16.

(35) Kirby, J. 1982. Personal interview. Stillwater, Oklahoma. January 25.

(36) Klingman, G. C. 1961. Weed control: As a science. John Wiley and Sons, Inc. New York. 421 pp.

(37) Kogan, M. and M. I. Gonzalez. 1979. Yellow and purpose nutsedge vegetative propagule. Proc. Western Soc. of Weed Sci. 32:87-92.

(38) Kurtz, W. L. and E. W. Strobe. 1975. Control of yellow nutsedge by various herbicides. Proc. N. Cent. Weed Control Conf. 30:59.

(39) Lewis, W. M. 1965. Preemergence crabgrass control comparisons of spray and granular applications. Proc. S. Weed Sci. Soc. 18:118-127.

(40) Lewis, W. M., L. Thompson, Jr., H. D. Coble, and A. D. Worgham. 1979. Alachlor and metolachlor comparisons in corn, soybeans and peanuts. Proc. S. Weed Sci. Soc. 32:125.

(41) Muenscher, W. C. 1935. Weeds, 2nd ed. Macmillan Co. New York. 560 pp.

(42) McMahon, A., P. E. Holt, and J. M. Thomas III. 1979. Metolachlor for weed control in peanuts in the southest. Proc. S. Weed Sci. Soc. 32:127.

(43) Obrigawitch, T., J. R. Gipson, and J. R. Abernathy. 1979. Metolachlor, alachlor, EPTC, and fluridone efficacy on yellow nutsedge. Proc. S. Weed Sci. Soc. 32:66.

(44) Obrigawitch, T., J. R. Gipson, J. R. Abernathy, and F. M. Miltous. 1979. Activity of metolachlor in three west Texas soils on yellow nutsedge. J. Range and Wildlife Mgt. 10:38.

(45) Robinson, E. L., O. B. Wooten, and J. R. Williford. 1970. Herbicides applied as liquids, sprays, and granules for weed control in cotton. Weed Sci. 18:751-753.

(46) Saunders, P., R. Talbert, and L. Hodges. 1979. Control of yellow nutsedge in gladiolus. Proc. S. Weed Sci. Soc. 32:141.

(47) Sauage, K. E. and C. L. McCormick. 1977. Edaphic evaluation of controlled release formulations of metribuzin. Proc. S. Weed Sci. Soc. 30:374.

(48) Smith, E. V. and E. L. Mayton. 1938. Nutgrass eradication studies: The eradication of nutgrass, Cyperus rotundus L., by certain tillage treatments. J. American Soc. Agr. 30:18-22.

(49) Starker, C. H. 1962. A new machine for broadcast application of granular herbicides to horticultural crops. Proc. S. Weed Sci. Soc. 15:127.

(50) Stoller, E. W. 1975. Growth development and physiology of yellow nutsedge. Proc. N. Central Weed Control Conf. 30:124-125.

(51) Stoller, E. W., D. P. Nema, and V. M. Bahn. 1972. Yellow nutsedge tuber germination and seedling development. Weed Sci. 20:93-97.

(52) Stoller, E. W. and L. M. Wax. 1973. Yellow nutsedge shoot emergence and tuber longevity. Weed Sci. 21:76-81.

(53) Stoller, E. W., L. M. Wax, and R. L. Matthiesen. 1975. Response of yellow nutsedge and soybeans to bentazon, glyphosate, and pesfluidone. Weed Sci. 23:215-221.

(54) Taylorson, R. B. 1967. Seasonal variation in sprouting and available carbohydrates in yellow nutsedge tubers. Weed Sci. 15:22-24.

(55) Thomas, P. E. L. 1969. Effects of dessication and temperative on survival of Cyperus esculentus tubers and Cynodon dactylon tubers. Weed Res. 9:1-8.

(56) Thullen, R. J. and P. E. Keeley. 1975. Yellow nutsedge sprouting and resprouting potential. Weed Sci. 23:333-337.

(57) Thullen, R. J. and P. E. Keeley. 1978. Purple and yellow nutsedge seed production, germination and control. Proc. Western Soc. of Weed Sci. 31:142-145.

(58) Tidwell, J., G. W. Dickersln, and C. Harvey. 1975. Control of nutsedge in west Texas. Proc. S. Weed Sci. Soc. 28:203.

(59) Tumbleson, M. E. and T. Kommendahl. 1961. Reproductive potential of Cyperus esculentus by tubers. Weeds. 9:646-653.

(60) Tumbleson, M. E. and T. Kommendahl. 1962. Factors affecting dormancy in tubers of Cyperus esculentus. Botanical Gazette. 123:186-189.

(61) Upchurch, R. P., F. L. Selmon, and H. L. Webster. 1968. Incorporated vernolate and other weed control treatments for peanut production. Weed Sci. 16:317-323.

(62) U.S. Deparmment of Agr., Agr. Res. Serv., Fed. Ext. Serv., and Economic Res. Serv. 1968. Extent and cost of weed control with herbicides and an evaluation of important weeds. 1965. ARS 34-102. 85 pp.

(63) Verma, B. P. and A. E. Smith. 1976. Field results with slow release herbicide. S. Nurserymans Assoc. Res. Conf. 21:129-131.

(64) Warholic, D. T. and R. D. Sweet. 1978. A comparison of alachlor and metolachlor for control of yellow nutsedge. Proc. N. E. Weed Sci. Soc. 32:124-128.

(65) Wax, L. M. 1975. Control of yellow nutsedge in field crops. Proc. North Central Weed Control Cont. 30:125-128.

(66) Wax, L. M., E. W. Stoller, F. W. Slife, and R. N. Anderson. 1972. Yellow nutsedge control in soybeans. Weed Sci. 20:194-201.

(67) Wilhm, J. L. 1981. Chemical yellow nutsedge (Cyperus esculentus) control in peanuts (Arachis hypogaea). (Unpub. M.S. thesis, Oklahoma State University.)

APPENDIX

TABLE XI

SPRAY CONDITIONS AND PLOT INFORMATION
(NUTSEDGE STUDY I-MANGUM, OKLAHOMA)

Method of Application	PPI	PRE	POST
Treatment Date	May 28, 2981	May 28, 1981	June 19, 1981
Row Spacing (cm)	100	100	100
Spray Volume (l/ha)	142	142	284
Pressure (g/cm^2)	1125	1125	1160
Ground Speed (km/hr)	4.8	4.8	4.8
Tip Size	8002	8002	9504
Tip Spacing (cm)	45.7	45.7	45.7
Air Temperature ( )	31	31	29
Soil Temperature (C)	30	30	27
Soil Moisture	Good	Good	Good
Sky	Cloudy	Cloudy	Clear
Wind (km/hr)	3.2 to 4.8	3.2 to 4.8	3.2 to 8.0
Crop Growth Stage (cm)	-	-	7.5 to 10.1
Crop Variety	Spanish 'Pronto'	Spanish 'Pronto'	Spanish 'Pronto'
Date Planted	May 28, 1981	May 28, 1981	May 28, 2981
Planting Depth (cm)	2.5	2.5	2.5
Soil Type	Meno and Altus loamy fine sand; 0 to 1% slope Arenic Haplustalf		
% Sand	81		
% Silt	10		
% Clay	9		
% OM	0.4		
pH	6.9		
CEC	3.7		

TABLE XII

SPRAY CONDITIONS AND PLOT INFORMATION
(NUTSEDGE STUDY II-MANGUM, OKLAHOMA)

Method of Application	Post-Hooded Sprayer
Treatment Date	June 24, 1981
Row Spacing (cm)	100
Spray Volume (l/ha)	284
Pressure (g/cm^2)	1687
Ground Speed (km/hr)	4.75
Tip Size	8004
Tip Spacing (cm)	35.6
Air Temperature (C)	33
Soil Temperature (C)	31
Soil Moisture (C)	Fair
Sky	Clear
Wind (km/hr)	11 to 13
Crop Growth Stage (cm)	10 to 15
Crop Variety	Spanish "Pronto"
Date Planted	May 28, 1981
Planting Depth (cm)	2.5
Soil Type	Meno and Altus loamy fine sand; 0 to 1% Slope Arenic Haplustalf
% Sand	81
% Silt	10
% Clay	9
% OM	0.4
pH	6.9
CEC	3.7

TABLE XIII

SPRAY CONDITIONS AND PLOT INFORMATION (NUTSEDGE STUDY III-MANGUM, OKLAHOMA)

Method of Application	Post-Hooded Sprayer
Treatment Date	July 9, 1981
Row Spacing (cm)	100
Spray Volume (l/ha)	284
Pressure (g/cm^2)	1828
Ground Speed (kg/hr)	4.8
Tip Size	8004
Tip Spacing (cm)	35.6
Air Temperature (C)	36.7
Soil Temperature (C)	37.8
Soil Moisture (C)	Fair
Crop Growth Stage (cm)	15 to 20
Nutsedge Growth Stage (cm)	15 to 30
Crop Variety	Spanish "Pronto"
Date Planted	May 28, 1981
Planting Depth (cm)	2.5
Soil Type	Meno and Altus loamy fine sand; 0 to 1% Slope Arenic Haplustalf
% Sand	81
% Silt	10
% Clay	9
% OM	0.4
pH	6.9
CEC	3.7

TABLE XIV

SPRAY CONDITIONS AND PLOT INFORMATION
(GRANULAR STUDY I-STILLWATER,
OKLAHOMA)

Method of Application	Post (Spray)	Post (Granular)
Treatment Date	August 5, 1980	August 5, 1980
Row Spacing (cm)	61	61
Spray Volume (l/ha)	284	--
Pressure (g/cm^2)	2531	--
Ground Speed (km/hr)	4.8	--
Tip Size	9503	25.4 cm row banders
Tip Spacing (cm)	51	25.4
Air Temperature (C)	34	34
Soil Temperature (C)	36	36
Soil Moisture	Good	Good
Wind (km/hr)	0	0
Crop Growth Stage (cm)	7.5 to 10.1	7.5 to 10.1
Crop Variety	Spanish "Tamnut"	Spanish "Tamnut"
Date Planned	July 15, 1980	July 15, 1980
Planting Depth (cm)	2.5	2.5
Soil Type	Port silty clay loam; 0 to 1% slope Cumulic Haplustolls	
% Sand	36	
% Silt	38	
% Clay	26	
% OM	0.4	
pH	6.0	
CEC	8.2	

TABLE XV

SPRAY CONDITIONS AND PLOT INFORMATION
(GRANULAR STUDY II-FT. COBB,
OKLAHOMA)

Method of Application	Post (Spray)	Post (Granular)
Treatment Date	June 24, 1980	June 24, 1980
Row Spacing (cm)	91	91
Spray Volume (l/ha)	284	--
Pressure (g/cm^2)	1547	--
Ground Speed (km/hr)	4.8	--
Tip Size	11003	25.4 cm row banders
Tip Spacing (cm)	51	25.4
Air Temperature (C)	33	33
Soil Temperature (C)	28	28
Soil Moisture	Good	Good
Sky	Clear	Clear
Wind (km/hr)	6.5 to 10.5	6.5 to 10.5
Crop Growth Stage (cm)	10.2	10.2
Crop Variety	Spanish "Pronto"	Spanish "Pronto"
Date Planted	June 3, 1980	June 3, 1980
Planting Depth (cm)	2.5	2.5
Soil Type	Cobb fine sandy loam; 1 to 3% slope Udic Haplustalf	
% Sand	70	
% Silt	15	
% Clay	15	
% OM	0.6	
pH	7.4	
CEC	3.8	

TABLE XVI

SPRAY CONDITIONS AND PLOT INFORMATION (GRANULAR STUDY III-FT. COBB, OKLAHOMA)

Method of Application	Post (Spray)	Post (Granular)
Treatment Date	June 18, 1981	June 18, 1981
Row Spacing (cm)	91	91
Spray Volume (l/ha)	284	--
Pressure (g/cm^2)	1406	--
Ground Speed (km/hr)	4.8	--
Tip Size	9504	25.4 cm row banders
Tip Spacing (cm)	45.7	25.4
Air Temperature (C)	28	28
Soil Temperature (C)	23	23
Soil Moisture	Good	Good
Sky	Clear	Clear
Wind (km/hr)	9.7 to 12.9	9.7 to 12.9
Crop Growth Stage (cm)	15.2 to 20.3	15.2 to 20.3
Crop Variety	Spanish "Comet"	Spanish "Comet"
Date Planted	May 19, 1981	May 19, 1981
Planting Depth (cm)	3.8	3.8
Soil Type	Cobb fine sandy loam; 1 to 3% slope Udic Haplustalf	
% Sand	70	
% Silt	15	
% Clay	15	
% OM	0.6	
pH	7.4	
CEC	3.8	

TABLE XVII

SPRAY CONDITIONS AND PLOT INFORMATION (GRANULAR STUDY IV-FT. COBB, OKLAHOMA)

Method of Application	Post (Spray)	Post (Granular)
Treatment Date	June 23, 1981	June 23, 1981
Row Spacing (cm)	91	91
Spray Volume (l/ha)	284	--
Pressure (g/cm^2)	1266	--
Ground Speed (km/hr)	4.8	--
Tip Size	9504	25.4 cm row banders
Tip Spacing (cm)	45.7	25.4
Air Temperature (C)	32	32
Soil Temperature (C)	33	33
Soil Moisture (C)	Good	Good
Sky	Clear	Clear
Wind (km/hr)	3.2 to 4.8	3.2 to 4.8
Crop Growth Stage (cm)	2.5 to 5.0, 10.1 to 15.2, 20.3 to 25.4	2.5 to 5.0, 10.1 to 15.2, 20.3 to 25.4
Crop Variety	Spanish "Comet"	Spanish "Comet"
Date Planted	May 19, June 8, June 16, 1981	May 17, June 8, June 16, 1981
Planting Depth (cm)	5.0	5.0
Soil Type	Cobb fine sandy loam; 1 to 3% slope Udic Haplustalf	
% Sand	70	
% Silt	15	
% Clay	15	
% OM	0.6	
pH	7.4	
CEC	3.8	

TABLE XVIII

RAINFALL DATA (PLANTING DATE THROUGH SEPTEMBER)

Ft. Cobb (1980)		Stillwater (1980)		Ft. Cobb (1981)		Mangum (1981)	
Date	cm	Date	cm	Date	cm	Date	cm
6/07	0.2	7/26	0.1	5/26	0.5	5/29	1.9
6/08	0.3	8/12	0.4	5/27	1.0	5/30	0.03
6/18	0.3	8/18	5.6	5/28	0.08	5/31	0.13
6/19	0.1	8/21	2.2	5/29	0.4	6/02	2.0
6/20	3.1	8/22	0.5	5/30	Tr	6/03	1.6
6/22	5.6	8/23	Tr	6/01	1.5	6/04	4.4
8/17	0.8	8/31	Tr	6/02	0.3	6/06	3.0
8/20	3.9	9/02	Tr	6/03	5.5	6/16	1.7
8/28	0.1	9/25	1.4	6/05	0.03	6/30	0.4
9/09	0.8	9/27	0.5	6/15	1.6	7/01	1.2
9/13	Tr	9/28	1.7	6/29	0.9	7/05	Tr
9/16	0.3			6/30	0.3	7/09	0.5
9/23	1.5			7/02	0.5	7/28	0.13
9/25	Tr			7/03	1.1	7/29	2.1
9/26	0.3			7/27	3.1	7/30	0.6
9/27	1.3			7/28	2.3	7/31	0.13
9/28	0.2			7/29	1.4	8/01	0.15
9/29	Tr			8/06	0.3	8/07	0.15
				8/10	0.3	8/11	0.01
				8/11	0.08	8/12	1.6
				8/12	0.3	8/13	2.5
				8/13	0.5	8/15	0.4
				8/26	2.3	8/16	1.4
				9/01	1.9	8/27	1.3
				9/05	Tr	9/06	1.0
				9/12	Tr	9/24	0.08
				9/14	1.5	9/25	0.2
				9/23	0.05		
				9/25	0.3		
				9/27	0.6		

VITA

John M. Fenderson

Candidate for the Degree of

Master of Science

Thesis: YELLOW NUTSEDGE (CYPERUS ESCULENTUS) CONTROL AND USE OF GRANULAR HERBICIDES IN SPANISH PEANUTS (ARACHIS HYPOGAEA)

Major Field: Agronomy

Biographical:

Personal Data: Born July 11, 1957, in Shawnee, Oklahoma, the son of Gail and Lil Fenderson.

Education: Graduated from Meeker High School, Meeker, Oklahoma, in May, 1975; received Bachelor of Science degree in Agriculture from Oklahoma State University, Stillwater, Oklahoma, with a degree in Agronomy, in May, 1979; completed the requirements for Master of Science degree at Oklahoma State University in May, 1982.

Experience: Raised and worked on the family farm near Meeker, Oklahoma; employed as a farm laborer during the summer, near Altus, Oklahoma, 1976-78; employed by Banner Co-op, June-July, 1979; employed by Oklahoma State University, August 1979 to May, 1982.

Professional Organizations: Southern Weed Science Society.