CHEMICAL YELLOW NUTSEDGE (*CYPERUS ESCULENTUS*) CONTROL IN PEANUTS (*ARACHIS HYPOGAEA*)

By

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CHEMICAL YELLOW NUTSEDGE (CYPERUS ESCULENTUS)

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CHAPTER I

INTRODUCTION

Yellow nutsedge (Cyperus esculentus L.) has been considered one of the "world's worst weeds (27, 28)." In 1970 it was found in all but one of the continental United States (60). A survey (28) has estimated that yellow nutsedge is a serious weed in over one-third of the world's crops, including peanuts (Arachis hypogaea L.). Yellow nutsedge is found at least to some extent in all of the major peanut producing areas of the U. S. It grows well on sandy soils frequently used for peanut production, and its growth is enhanced by high moisture levels from irrigation (6, 42, 60). Yellow nutsedge growth in peanuts is enhanced by factors such as reduced competition from other weeds which are easily controlled, added moisture from irrigation, and increased fertility levels (8, 12). Populations can become so large that many areas are no longer suited for peanut production.

Successful control of weeds, and more specifically yellow nutsedge, is an important aspect of peanut production. The nature of yellow nutsedge growth and physiology, particularly vegetative growth from tubers and rhizomes, is a major hinderance to successful control. Cultivation has often increased sprouting of tubers (52). In addition, cultivation has been shown to cause increased incidence of peanut diseases and limited growth of the young peanut plants (10). Biological control with the insect Bactra verutana has shown some limited but impractical success (39). Eradication of yellow nutsedge through chemical control has been unsuccessful. Control or management with herbicides has generally been limited to temporary growth suppression.

Hauser et al. (24) reported that yellow nutsedge can be eliminated from fields through an intensive crop rotation-herbicide program lasting several years; however this practice is often neither practical nor desirable.

Certain herbicides have shown potential for partial or short term control of yellow nutsedge; however Wax (63) stated that complete control of yellow nutsedge is seldom achieved with any one treatment alone. Sequential and/or multiple herbicide treatments may effectively provide the necessary control of yellow nutsedge for optimum peanut production.

The objectives of this research were to (a) determine which herbicides, minimum herbicide rates, and herbicide combinations or sequences which would provide effective yellow nutsedge control and (b) determine the maximum safe rate of these treatments on both Spanish and Florunner variety peanuts.

CHAPTER II

LITERATURE REVIEW

Cyperus esculentus L. is a member of the family Cyperaceae and is one of the 25 species of this genus found in Oklahoma (62). It is considered native to North America (60) and to Eurasia (42), but grows well in both temperate and tropical areas of the world (60). Purple nutsedge (*C. rotundus* L.) is found only occasionally in Oklahoma. Purple nutsedge is distinguished from yellow nutsedge by tuber and floret characteristics (14), but more easily by leaf tip characteristics (51). The leaf tip of purple nutsedge has a gradual terminal tapering compared to that of yellow nutsedge which is more needle-like with a slight constriction about 1.5 to 2.0 cm back from the tip. This study will only be concerned with yellow nutsedge.

Yellow nutsedge grows best in warm moist conditions (6, 7, 42, 53, 60). Bendixen (8) reported that yellow nutsedge grows particularly well in low areas where water accumulates and is more tolerant of high moisture levels than most crops or weeds. Bell et al. (6) found no differences between plants growing in soils with pH values of 5, 6 and 7. Control of yellow nutsedge is difficult due to its physiology and growth characteristics. The nature of this subject should be reviewed before aspects of control are discussed.

Physiology and Growth Characteristics

Muenscher (42) describes yellow nutsedge as a perennial, reproducing by seeds and tubers. Stems are erect, simple triangular, yellow-green, and approximately 30 cm tall. The basal leaves which occur in 3 ranks are grasslike and are about as long as the stem. Fibrous roots bear tubers approximately 1 to 2 cm long.

While viable seeds are produced, they do not present a problem in agronomic systems and are easily destroyed by cultivation or by one of several dinitroaniline herbicides (6, 55). The vegetative tubers are the major means of propagation of yellow nutsedge (6). When a tuber germinates or sprouts it produces one or more rhizomes from its apical end (6, 7, 47, 58). Each of these terminates in a basal bulb near the soil surface when it becomes exposed to light (6, 47). The basal bulb produces the above ground plant parts (31). The basal bulb also produces new rhizomes which develop into new basal bulbs upon exposure to light (31).

Tubers normally begin forming in late summer with peak production beginning after about 10 weeks of growth (6). Tubers are formed at rhizome terminals (31), thus it appears that rhizomes act to form basal bulbs during the early part of the growing season, and tubers in the later portion of the growing season. Tuber production is a result of plant maturity and shortening of the photoperiod as summer days grow shorter (6, 7, 31). From laboratory studies, Bell et al. (6) and Jansen (31) reported that tuber production can be hastened by shortening the photoperiod from 16 hours to 8 or 12 hours. A large number of tubers were still produced **after** 10 weeks by plants in a constant 16-

hour photoperiod. Bell et al. (6) also reported finding tubers which germinated in the field in September that produced from 1 to 3 tubers after only 3 weeks of growth. These tubers, although small, still produced vigorous plants the following year. Kogan (40) reported initiation of tuber production in only 10 days after shoot emergence of January planted tubers in Chile.

After their formation, tubers remain dormant over winter in soil until spring when dormancy is evidently broken by warming soil temperatures or by the removal of tuber germination inhibitors through the leaching action of precipitation (46). Considerable attention has also been focused on the apparent cold requirement of tubers in order to germinate. Freshly dug tubers in late summer or fall have little or no germination as compared to near total germination of tubers dug in spring (6, 59). Tumbleson (59) found that washing of freshly dug tubers in cold water increased germination, but this could be partially attributed to the temperature of the water. An accepted laboratory procedure for breaking dormancy of freshly dug tubers is storage at approximately 3 C for periods of 2 weeks to 1 month (6, 59). This cold requirement is obtained naturally by overwintering of tubers. Stoller and Wax (48) determined in laboratory studies that 50% of the tubers were killed when exposed to a temperature of -7 C, but at -4 C all tubers survived. Although tubers in a laboratory study were killed after 3 days of exposure to temperatures of -6.7 C and -15 C, tubers placed on the soil surface over winter and exposed to temperatures lower than -15 C still had germination rates up to 32% (6). Stoller (48) reported that tubers beneath the soil surface survived winter temperature extremes in the field better than those near or on top of the soil surface. Tuber longevity has been reported to be longer than one year but rarely will a tuber survive two winters (6, 48, 54).

The potential for tuber production is tremendous. A plant originating from a single tuber reportedly produced 1900 plants and 6900 tubers in one year in a Minnesota silt loam soil (58). In Georgia, Hauser (22) reported that a single plant produced 622 tubers in 17 weeks. These reports are of extremes and typical production would be expected to be less. Tumbleson and Kommendahl (58) reported tuber and shoot production to be less in sand than in sandy silt loam or peat. Most tubers are found in the upper 15 cm of soil and rarely below 46 cm (6, 58). In depth of emergence studies, Stoller and Wax (48) reported shoot emergence from tubers was greatest from those planted at depths of 10.2 and 20.3 cm. They further reported that tubers planted as deep as 30.5 cm had greater shoot emergence than those planted at 7.6 cm or less as these were more prone to winter kill. A high percent emergence from depths of 10.2 cm and below may partially account for the difficulty to control this weed with herbicides, especially those that react with the tubers rather than the emerging shoots.

Sprouts arise from buds within the apical nodes of the tuber (7). Bendixen (7) reported 5 to 7 buds per tuber while Thullen and Keely (54) reported 2 to 7 buds per tuber. Bendixen (7) reported that buds are formed, one per node, at successive nodes of the tuber with the oldest bud being the largest and most basipetal. When tuber dormancy is broken, it is the oldest bud that sprouts first. Normally, one bud per tuber develops into a sprout (7, 54). If the primary sprout is removed, then the tuber can resprout as successive buds break dormancy in acropetal order (7). Thullen and Keeley (54) commonly found multiple sprouting tubers after removal of the first sprout. Bendixen (7) removed successive sprouts upon emergence until all seven buds had sprouted. This helps explain the difficulty of controlling this weed by chemical or cultural means.

Tubers do not all mature and break dormancy at the same time (46). Emergence from deeper tubers takes longer than those nearer to the soil surface (48); and, as reported earlier, rhizomes are continually differentiating into new basal bulbs. These facts would help explain why new yellow nutsedge plants emerge throughout the summer growing season.

Since vegetative reproduction by tubers is the major form of propagation, ecotypes have arisen which are adapted to local environments (46). Ecotypes may vary in response to certain herbicides meaning effectiveness of a particular herbicide may differ with location.

Environmental and Cultural Controls

Reduction in light intensity has been shown to reduce plant size, tuber production and number of vegetative shoots (6, 34, 38). However, tuber production, although curtailed, still occurs at reduced light. Keeley and Thullen (38) planted plots with 48 tubers each and imposed various levels of shading over the plots 2 weeks after plant emergence. After 3 months, plants under 80 and 94% shade produced an average of 381 and 55 new tubers respectively, compared to 1527 new tubers produced by plants grown in full sunlight. Jordan-Molero and Stoller (34) reported no difference in whole-plant growth between yellow nutsedge grown under 30% shade and no shade (sunlight). Keely and Thullen (38) suggested light interception by crops as a source of shade for growth reduction of yellow nutsedge may aid in controlling or suppressing yellow nutsedge, however, the short growth habit of peanuts coupled with the fact that they do not fill in between the rows until late summer would not provide shade levels required to reduce yellow nutsedge growth.

Leaving fields fallow and dry for 2 to 4 years and implementing a regular disking interval has been shown to reduce yellow nutsedge populations (6, 14, 58). The regular disking brings tubers to the soil surface which exposes them to the dessicating effects of wind, sun, and high temperatures (14, 53). Tumbleson and Kommendahl (58) collected tubers from the soil surface immediately after disking and found that over 90% of them germinated while those collected 2 days later germinated at less than 10%. Day and Russell (14) deep tilled thoroughly dry soil to a depth of 35 cm and reported that no sprouts emerged the following year.

The effects of soil compaction on tuber germination were studied by Bell et al. (6). Shoots from tubers planted 7.62 cm deep emerged after 10 days from loamy sand with bulk densities of 0.97, 1.17 and 1.36. No shoots emerged for 1 month from tubers planted in loamy sand with a bulk density of 1.68. After 4 months, the tuber germination was 96, 93, 67, and 47 percent respectively from soils with bulk densities of 0.97, 1.17, 1.36 and 1.68.

As reported earlier yellow nutsedge tubers have the capacity to resprout. For this reason a single cultivation and frequently multiple cultivations would provide inadequate weed control for optimum crop yields. Stoller et al. (47) reported that the first germination of a tuber consumes over 60% of its dry weight, carbohydrate, oil, starch, and protein contents while each successive germination utilizes almost

10% of these constituents. Several tillage operations can act to reduce the food reserves of the tubers (64). The shoots that emerge after previous shoots are killed should be easier to kill than the original shoots because of energy loss and reduced plant vigor (47). However, with increasing fuel prices and the desire to keep land in continuous production, the efficacy of chemical control of yellow nutsedge should be reviewed.

Chemical Control

The common, trade and chemical names of herbicides and surfactants used in this study are listed in Table I.

Thiocarbamate herbicides such as vernolate are effective for suppressing yellow nutsedge growth by delaying sprouting of tubers, but are ineffective for killing the tubers (6, 45, 64).

Vernolate is commonly used, in peanuts for the control of yellow nutsedge, but results are often erratic (21, 25). Andrews et al. (2) obtained excellent (99%) control of yellow nutsedge and no peanut injury 12 weeks after application of a 2.52 kg/ha rate of vernolate incorporated to a depth of 6.4 cm with a rotor tiller. Younce and Nolan (66) reported that vernolate applied at rates of 2.24 and 3.36 kg/ha gave season-long suppression of yellow nutsedge. Wax et al. (64) and Clark and Fawcett (13) obtained 90 to 95% control of yellow nutsedge from a 3.36 kg/ha rate of vernolate in soybeans. Boyles and Murray (11) did not adequately control nutsedge with several rates of vernolate. Grinchar et al. (21) reported erratic control of yellow nutsedge from a 2.28 kg/ha application as control ratings ranged from 43 to 73%. Hauser et al. (23, 25) attributes this variable reaction by yellow nutsedge to

TABLE I

COMMON AND CHEMICAL NAMES OF HERBICIDES AND SURFACTANTS

Common Name	Trade Name	Chemical Name
		Herbicides
Alachlor	Lasso	2-chloro-2',6'-diethyl-N-(methoxymethyl)acetanilide
Benefin	Balan	N-butyl-N-ethyl-α,α,α-trifluoro-2,6-dinitro-p-toluidine
Bentazon	Basagran	3-isopropyl-1H-2,1,3-benzothiadiazin-4(3H)-one 2,2-dioxide
Butam	--	2,2-dimethyl-N-(1-methylethyl)-N-(phenylmethyl) propanamide
Dinoseb	Premerge	2-sec-butyl-4,6-dinitrophenol
Glyphosate	Roundup	N-(phosphonomethyl)glycine
H-22234	Antor	N-chloroacetyl-N-(2,6-diethylphenyl)-glycine ethyl ether
M-4287	--	Chemical name not available
Metolachlor	Dual	2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide
MSMA	Daconate	monosodium methanearsonate
Naptalam	Alanap	N-1-napthylphthalamic acid
NC-20484	--	2,3-dihydro-3,3-dimethyl-5-benzofuranyl ethane-sulphonate
PPG-1023	--	Chemical name not available
R-33865	--	Non-herbicidal vernolate extender
Trifluralin	Treflan	α,α,α-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine
UBI-S-734	--	2- [1-(2,5-dimethylphenyl)ethylsulfonyl]pyridine-N-oxide
Vernolate	Vernam	S-propyl dipropylthiocarbamate
		Surfactants
AG-98	Triton	alkyl aryl polyoxyethylene glycol
CN-110242	--	Chemical name not available
Herbex	Herbex	polymeric polyhydroxy acids
SA-77	Cide-Kick	d-limonene
UBI-1262	--	Chemical name not available

vernolate to soil type, weather, and method of incorporation. In field studies, Hauser et al. (23) compared different methods of incorporating vernolate into the soil for yellow nutsedge control and peanut tolerance. In their studies, much higher yellow nutsedge control was obtained by applying vernolate at a 1.68 kg/ha rate to a depth of 3.8 cm with a subsurface sweep applicator than by disk incorporating an equal rate to a depth of 12.7 to 15.2 cm. Average yellow nutsedge control from 2 years for these two methods was 88% for the subsurface applied and 35% for the disk incorporated. However, subsurface applications of vernolate were much more injurious to the peanuts than was the disk incorporated vernolate. There was no difference in nutsedge control between subsurface placement depths of 3.8 cm and 8.9 cm but control decreased by over 20% when placed at a depth of 14.0 cm. Hauser et al. (23) attributed the poor control by disk incorporation of vernolate to lack of uniform distribution in the soil.

Vernolate must be placed in close proximity to the tuber to be effective. Hauser et al. (25) reported from laboratory studies that vernolate must be placed within 2.5 cm above or below the tuber to be effective. Wax et al. (64) reported greater growth inhibition occured when the vernolate layer was 1.2 to 3.7 cm below the tuber zone than when either above or around the tuber zone. One field study showed better yellow nutsedge control when vernolate was incorporated to a depth of 7.6 cm compared to a depth of 3.8 cm (64).

Alachlor will provide partial control of yellow nutsedge with excellent peanut tolerance when applied as either a preemergence or preplant incorporated treatment (1). Armstrong et al. (4, 5) reported that alachlor will suppress growth of yellow nutsedge, but will not kill the tubers. Keely and Thullen (37) reported alachlor at rates of 2.24 and 4.48 kg/ha only delayed shoot emergence until herbicide levels had dissipated. Alachlor is taken up in the apical portion of the tuber (5) and interferes with sprout growth in the meristematic region of buds and tubers (37). In the laboratory, Ingle and Worsham (30) studied placement of a 5.61 kg/ha rate of alachlor in relation to tubers in soil. Yellow nutsedge growth was reduced when the band of alachlor was placed above the tubers and growth was completely inhibited when placed in the tuber zone.

Yellow nutsedge control with alachlor is dependent on weather and method of application. Wax et al. (64) reported that preemergence applications of alachlor are dependent on rainfall soon after application in order to effectively control yellow nutsedge. Duncan et al. (17) obtained no yellow nutsedge control from a 3.36 kg/ha application of alachlor when no rain occurred within 10 days after application; however, a light incorporation of this rate improved control to 60%. Younce and Clark (66) reported a 3.36 kg/ha preemergence application of alachlor gave approximately 50% yellow nutsedge control 1 month after application and 40% control 4 months after application. Clark and Fawcett (13) reported control from 3.36 kg/ha rate of alachlor could be improved from 60% with a preemergence application to 92% with a preplant disk incorporated application. Wax et al. (64) obtained better yellow nutsedge control when alachlor was incorporated to a depth of 7.6 cm compared to 3.8 cm incorporation depth. Kurtz and Stroube (41) observed only fair control (50%) from a 3.36 kg/ha application of alachlor which was incorporated to a depth of 10.2 cm. Hunt et al. (29) reported a 2.24 kg/ha rate of alachlor to be satisfactory for yellow nutsedge control in soils with less than 3% organic matter. The rate must be increased as organic matter increased. Armstrong et al. (5) examined postemergence applications of alachlor in the laboratory. They showed that a foliar application of ^{14}C-alachlor resulted in acropetal translocation of alachlor and only limited basipetal translocation to the growing point which is necessary for control. After two days, 83% of the applied ^{14}C-alachlor was metabolized to a water-soluble product.

Boyles and Murray (11) reported that a treatment consisting of vernolate applied preplant incorporated plus alachlor applied preemergence was better than a single application of vernolate in controlling yellow nutsedge.

Metolachlor became registered for use in peanuts in 1980 and is similar in chemistry to alachlor (3). No significant peanut injury was observed from preemergence applications of metolachlor at rates up to 6.72 kg/ha (16). At equal rates, metolachlor has been shown to be more effective than alachlor in control of yellow nutsedge (13, 63). Dill and Dumford (16) obtained fair control of yellow nutsedge with a 1.68 kg/ha application. Obrigawitch et al. (43, 43) showed that metolachlor effectively controlled yellow nutsedge on fine sandy loam at rates of 2.24, 3.36 and 4.48 kg/ha when applied either as a preemergence or preplant incorporated treatment. Clark and Fawcett (13) improved control of a 3.36 kg/ha rate of metolachlor from 73% when applied preemergence to 95% when applied preplant incorporated. No difference in yellow nutsedge control was observed between shallow and deep incorporations of metolachlor (43). Boyles and Murray (11) reported that a treatment consisting of vernolate applied preplant incorporated plus metolachlor applied preemergence was better than a single application of vernolate in controlling yellow nutsedge. Translocation of foliarly applied ^{14}C-metolcahlor was primarily acropetal with some limited basipetal movement and therefore would not be effective when applied in this manner (44).

Bentazon was registered for use in peanuts in 1977 (18). Bentazon is used as a postemergence treatment for the control of yellow nutsedge in peanuts with no crop injury observed with rates up to 4.48 kg/ha (18). Bentazon will not control purple nutsedge (18, 51, 65). Growth stage of yellow nutsedge at time of treatment will affect the degree of control. Several researchers have shown that nutsedge plants 15 to 20 cm tall are the most susceptible to bentazon (20, 67). Others have shown that a plant height of 7.6 cm to be the most susceptible stage (50). Yellow nutsedge plants 15.2 cm tall were controlled with a 2.2 kg/ha rate of bentazon while those 30 cm or taller were not (50). Optimal leaf number at time of application has also been examined. Several researchers have shown that yellow nutsedge plants in the 4 to 6 leaf stage to be the most susceptible to bentazon (26, 49). Stoller et al. (49) reasoned that the leaf orientation at this stage would intercept a greater amount of the herbicide spray than would the orientation at other leaf stages. Good coverage of yellow nutsedge with bentazon is important because only the foliage is killed (19, 49). Foliar applications of ^{14}C-bentazon resulted in very slow acropetal translocation from the treated spot and almost no basipetal translocation (49). No ^{14}C from foliar applications of ^{14}C-bentazon was reported translocated to the tubers (49). However, Stoller et al. (49) reported that bentazon rates of 1.7 kg/ha typically caused over 80%

loss in parent tuber viability. Bentazon treatments caused the parent tubers to become soft and decayed (49). Suwanketnikom and Penner (50) also observed tuber mortality with bentazon treatments.

Cultivating 10 days after bentazon treatments usually significantly improved control when single applications were used (20). Repeat or split applications of bentazon are usually necessary to control yellow nutsedge. The second application is most effective when made 7 to 10 days after the first (20, 26, 67). Ellison et al. (19) obtained 90% control of yellow nutsedge with a split application of bentazon at 0.84 plus 0.84 kg/ha and 99% control with a split application rate 1.12 plus 1.12 kg/ha. Clark and Fawcett (13) observed 62% control of yellow nutsedge from a bentazon split application of 0.84 plus 0.84 kg/ha and 91% control from a split application of 1.12 plus 1.12 kg/ha. They improved yellow nutsedge control at these rates to 93 and 98% respectively with the addition of 9.35 l/ha of crop oil. Greulach et al. (20) reported the addition of wetting agents to bentazon applications showed little or no improvement over treatments receiving no wetting agents. Bentazon application rates higher than 1.12 kg/ha did not significantly improve control (20). Boswell et al. (9) obtained excellent full season control of yellow nutsedge from a combination treatment consisting of 2.80 kg/ha vernolate applied preplant incorporated and a postemergence application of bentazon at a rate of 2.24 kg/ha.

Yellow nutsedge is less effectively controlled with bentazon under drought conditions than under favorable growing conditions (19). Ellison et al. (19) noticed some transient peanut injury when treated with bentazon under extreme drought, particularly when spray additives were used. The injury symptoms ranged from mild chlorosis to bright yellowing of the leaves. In all cases, the terminal bud was not affected and complete recovery resulted.

The hooded sprayer, described by Jordan (32, 33) enables the use of non-selective herbicides in a manner that protects the crop while treating the weeds. The spray is contained within flexible hoods that run between the crop rows during application. This type of sprayer has effectively applied herbicides such as MSMA and glyphosate to yellow nutsedge in cotton and soybeans with no injury sustained by the crop (32, 33).

Tidwell et al. (56) obtained 80% control of yellow nutsedge from a 2.24 kg/ha postemergence application of MSMA. Tubers of treated plants will resprout following foliage kill by MSMA (35). Multiple shoots from treated tubers have also been observed. Tidwell and Harvey (57) observed no significant difference in yellow nutsedge control between a 2.24 kg/ha application of MSMA and a 4.48 kg/ha application rate. Keeley and Thullen (36) increased yellow nutsedge kill by increasing the rate from 1.68 to 3.36 kg/ha. Kogan and Gonzalez (40) reported that increasing the concentration of MSMA solutions applied to yellow nutsedge foliage resulted in decreased subterranean dry matter production. Though significantly lower than check plots, plots treated with MSMA at 4.48 kg/ha averaged 3,141,980 yellow nutsedge plants/ha. Keeley and Thullen (36) reported increased yellow nutsedge control could be obtained by increasing the exposure period of foliage to MSMA. The addition of a surfactant to MSMA has been shown to increase yellow nutsedge control (36). Foliage kill is much greater when MSMA is applied to the abaxial leaf surface (36).

Increasing the temperature from 13 to 29 C had no effect on yellow nutsedge control with MSMA (36). Little ^{14}C translocated to "daughter" plants (those developed from rhizomes) from the yellow nutsedge plants treated with ^{14}C-MSMA (35). Tubers from nutsedge plants treated with a foliar application of 3.36 kg/ha of MSMA contained much higher levels of arsenic than tubers from control plants (35). Smaller (those less than 4 mm long) tubers contained higher levels of arsenic than did larger tubers of treated plants (35). Tubers collected from MSMA treated plants and replanted, showed significantly reduced sprouting when compared to control tubers (36). Keeley and Thullen (35) treated tuber-bearing yellow nutsedge plants with MSMA. Vitality of shoots, as measured by shoot fresh weight per parent tuber, from large tubers that were produced by treated plants was not significantly different from vitality of shoots from tubers produced by non-treated plants. MSMA did reduce vitality of shoot from small tubers of treated plants, possibly because the smaller tubers were not yet mature at time of treatment and were therefore more sensitive to arsenic from MSMA (35).

Glyphosate is a non-selective postemergence herbicide that has been shown to be more effective in the control of yellow nutsedge than MSMA (40, 56). Tidwell et al. (56, 57) obtained up to 90% control of yellow nutsedge from applications of 3.36 kg/ha of glyphosate. Derting et al. (15) showed that a minimum rate of 3.36 kg/ha of glyphosate is necessary to control yellow nutsedge and repeat applications may be needed. Glyphosate solutions at concentrations of 0.5, 1 and 1.5% v/v of commercially formulated glyphosate greatly inhibited subterranean dry matter production of treated yellow nutsedge plants (40). A 2.24 kg/ha glyphosate application killed yellow nutsedge plants with shoots

7.6 and 15.2 cm tall, but not taller plants (50). Stoller et al (49) obtained 97 to 100% control of yellow nutsedge in the greenhouse 6 weeks after application of either 1.12 or 2.24 kg/ha of glyphosate to plants in either the 4 to 5, 5 to 7, or 7 to 9 leaf stage. However, in the field, glyphosate did not adequately control yellow nutsedge at rates less than 2.24 kg/ha. Yellow nutsedge plants in the 9 to 11 leaf stage (approximately 21 day after emergence) are more susceptible to glyphosate than plants in the pre-flower state (approximately 48 days after emergence) (40). Near total inhibition of tuber production was observed when glyphosate was applied to yellow nutsedge plants in the 9 to 11 stage (40). Stoller et al. (49) reported that glyphosate applications of 1.12 and 2.24 kg/ha had no effect on tuber viability of treated plants.

Researchers (9, 21) have applied glyphosate to yellow nutsedge plants 2 weeks prior to preparing the land for planting peanuts. At land preparation time, Boswell et al. (9) observed 65 to 95% control resulted from glyphosate treatments of 2.24 and 4.48 kg/ha, respectively. The degree of control obtained by this type of treatment is dependent upon the percentage of nutsedge tubers which had sprouted and emerged before treatments were applied. Glyphosate applied prior to land preparation and later followed by a preplant incorporated application of vernolate or a postemergence application of bentazon resulted in increased season-long yellow nutsedge control (1, 21).

CHAPTER III

METHODS AND MATERIALS

Broadcast and Granular Herbicide Treatments-1979

Field experiments were conducted at several locations in Oklahoma to evaluate herbicides for yellow nutsedge control and peanut tolerance. The experiments in this section were conducted during the summer of 1979. Extremely hot and dry conditions prevailed throughout the summer of 1980 and replication of the 1979 field studies were unsuccessful.

The experimental design used in all experiments was a randomized complete block design with four replications. Visual yellow nutsedge control and peanut injury ratings were taken periodically throughout the growing season. A 0 to 10 rating scale was used in the visual ratings where 0 denotes no nutsedge control or crop injury and 10 denotes complete nutsedge control or crop kill at the time of the particular rating. Ratings were then converted to percent for presentation in all tables contained in this thesis. Peanut stand counts were taken by counting plants on 2-1.52 m row lengths within each plot at each location several weeks after the initial treatments were applied. This data is expressed as plants per 3 m of row. Yellow nutsedge plant counts were also taken within each plot at each experimental location where applicable. This data was collected approximately 2 months after the initial treatments were applied. This data is expressed as plants per m^2 and was determined by counting yellow nutsedge shoots within a metal quadrangel which was randomly placed between the center 2 rows of each plot.

When the peanuts were mature, they were mechanically harvested and then threshed with a small-plot thresher for yield data. In-shell peanut samples from each treatment of each experiment were graded by the Oklahoma State University Peanut Laboratory. The Spanish peanuts were tested on a screen having 0.6 by 0.6 cm openings to determine the percent sound mature kernels, sound split kernels, total sound mature kernels, other kernels, the amount of damaged kernels and the weight percentages each of kernels and hulls. The Florunner peanuts were graded for the same criteria on a screen having 0.64 by 0.64 cm openings. Peanut grading data appear in Tables XXX through XXIV in the Appendix.

Five individual experiments were conducted in 1979 for yellow nutsedge control in peanuts. These experiments will be referred to as Location I through V.

Location I - Keeton Farm

The Location I experiment was established on the Keeton Farm near Willis, Oklahoma, in southern Marshall County. With the exception of alachlor 15% granules (alachlor 15G), all herbicides in this experiment are registered for use in peanuts, although not necessarily at the rates applied here. Sprinkler irrigation was used throughout the summer. Plot size was 1.8 m (2 row) by 6.1 m long. Naturally occurring yellow nutsedge stand at midseason was estimated to range from 1 to 10% ground cover in non-treated areas of the experiment. Although the nutsedge stand was not completely uniform in density, yellow nutsedge was present throughout the entire experimental area. Herbicides were applied either preplant incorporated (PPI), preemergence (PRE), postemergence over-the-top (POT), or late postemergence (LPOT). The sprayable liquid PPI and PRE treatments were applied with a compressed air tractor sprayer. Incorporation was done with a tandem disk incorporating approximately 5 to 7.5 cm deep diagonally across plots within 90 minutes after application. Sprayable liquid POT treatments were applied over-the-top of the peanuts and nutsedge with a compressed air bicycle type sprayer. Surfactant AG-98 was applied with all postemergence bentazon treatments at a rate of ½% v/v. Granular POT treatments were hoed clean where necessary prior to application of granules. The liquid LPOT treatments were applied over-the-top of the peanuts and nutsedge with a CO_2 pressurized hand sprayer. All pertinent application conditions and plot information are shown on Table XVII of the Appendix. The entire experimental area was treated with 1.13 kg/ha of benefin as a PPI treatment to control annual grasses and small-seeded broadleaf weeds. A complete treatment list is in Table XXVI of the Appendix.

Location II - Mangum, OK

The Location II experiment was established on the Sandyland Research station near Mangum, Oklahoma, in Greer County. Selected treatments from the Location I experiment were repeated at Location II. A complete treatment list is in Table XVII in the Appendix. No supplemental water was added during the growing season. Plot size was 4.1 m (4 rows) by 7.6 m long. Naturally occurring yellow nutsedge stand at midseason was estimated to range from 75 to 90% groundcover in non-treated areas and was fairly uniform throughout the experimental area. Herbicides were applied either PPI, PRE, or POT. The sprayable liquid PPI and PRE treatments were applied with a compressed air tractor sprayer. Incorporation was done with a tandem disk incorporating approximately 7.5 to 10 cm deep diagonally across plots within 45 minutes after application. The bentazon POT treatments were applied over-the-top of the peanuts and nutsedge with a compressed air bicycle sprayer and contained surfactant AG-98 ½% v/v. Granular POT treatments were uniformly hand applied using a perforated cup. Plots were hoed clean where necessary prior to application of granules. All pertinent application conditions and plot information are shown in Table XVIII of the Appendix. The entire experimental area was treated with 1.12 kg/ha of trifluarlin as a PPI treatment to control annual grasses and small-seeded broadleaf weeds.

Location III - Keeton Farm

The Location III experiment was established on the Keeton Farm in an area adjacent to the Location I experiment. The herbicides in this study were experimental materials and are not commercially available for use in peanuts. A complete treatment list is on Table IX. (Note: metolachlor has gained registration for use in peanuts since the completion of this experiment.) Sprinkler irrigation was used throughout the summer. Plot size was 1.8 m (2 row) by 6.1 m long. Naturally occurring yellow nutsedge stand at midseason was estimated to range from 80 to 90% groundcover in non-treated areas of the experiment. Although the nutsedge stand was not completely uniform in density, yellow nutsedge was present throughout the entire experimental area. All herbicides were applied PPI with a compressed air tractor sprayer. Incorporation was done with a tandem disk incorporating approximately 5 to 7.5 cm deep diagonally across plots within 90 minutes after application. All pertinent application conditions and plot information are shown in Table XIX of the Appendix. The entire experimental area was treated with 1.26 kg/ha of benefin as a PPI treatment to control annual grasses and small-seeded broadleaf weeds.

Location IV - Jarvis Farm

The Location IV experiment was established on the Jarvis Farm located south of Prague, Oklahoma, in Pottawatomie County. The experimental area was maintained in a weed-free state so as to determine the susceptibility of Florunner cultivar peanuts to several herbicides. No supplemental moisture was supplied. Plot size was 1.5 m (2 row) by 9.1 m long. A space of 1.5 m was left between outside rows of adjacent plots. The entire experimental area was treated with 2.24 kg/ha of vernolate plus 1.26 kg/ha of benefin as a PPI treatment. A postemergence application of bentazon at 1.12 kg/ha was on June 22 to control seedling jimsonweed (Datura Stramonium L.). The peanuts were 10 to 13 cm tall at the time of this treatment.

Herbicides in the Location IV experiment were applied as either PRE or POT treatments. All herbicides in this experiment were either emulsifiable concentrate or granular formulations of alachlor and metolachor. A complete treatment list is on Table XI. The sprayable liquid PRE treatments were uniformly hand applied using a perforated cup. All pertinent application conditions and plot information are shown in Table

XX of the Appendix.

Location V - Jarvis Farm

The Location V experiment was established on the Jarvis Farm located south of Prague, Oklahoma, in Pottawatomie County. The experimental area was maintained in a weed-free state so as to determine the susceptibility of Florunner cultivar peanuts to several herbicides. No supplemental moisture was supplied. Plot size was 1.5 m (2 row) by 9.1 m long. A space of 1.5 m was left between outside rows of adjacent plots. The entire experimental area was treated with 2.24 kg/ha of vernolate plus 1.26 kg/ha of benefin as a PPI treatment. A postemergence application of bentazon at 1.12 kg/ha was made on June 22 to control seedling jimsonweed (*Datura Stramonium* L.). The peanuts were 10 to 13 cm tall at the time of this treatment.

Six different herbicides were evaluated at Location V as PRE treatments. All treatments were applied with a compressed air tractor sprayer. A complete treatment list is on Table XII. All pertinent application conditions and plot information are shown in Table XXI of the Appendix.

Hooded Sprayer Treatments-1980

Field experiments were conducted at several locations in Oklahoma during the summer of 1980 to evaluate herbicide treatments applied through a hooded sprayer for yellow nutsedge control and peanut tolerance. A rearmounted tractor model hooded sprayer was used in all experiments. Air pressure was provided by a compressed CO_2 bottle mounted on the hooded sprayer frame. The hooded sprayer had four flexible teardrop-shaped hoods constructed from molded fiberglass and were 74 cm long by 18 cm tall by 36 cm wide at the rear. The nozzle tip was 46 cm from the rear of the hood and mounted under each hood. The two center hoods were set next to each other and ran between two peanut rows. Nozzle spacing was 30.5 cm and the two hoods effectively treated 71 cm of ground between the peanut rows. Each of the two outside hoods was set to run on the outside of the two peanut rows and sprayer approximately half the distance to the next row on either side. The fiberglass hood completely encloses the spray pattern and is designed to keep the peanut vines from getting underneath the hoods. Two small metal rods were mounted beneath each hood and set parallel to the ground. These rods act to bend the nutsedge over to facilitate thorough coverage of nutsedge by the herbicide solution.

All experimental areas were selected to utilize heavy established infestations of yellow nutsedge in peanuts. The experimental design was a randomized complete block with 3 replications. Visual yellow nutsedge control and peanut injury ratings were taken twice at each location following treatment applications. A 0 to 10 rating scale was used in the visual ratings where 0 denotes no nutsedge control or peanut injury and 10 denotes complete nutsedge control or peanut kill at the time of the particular rating. Ratings were then converted to percent for presentation in all tables contained in this thesis. Due mainly to lack of uniform peanut stand in all experiments, no stand count or yield data were taken.

Four experiments involving the hooded sprayer were conducted in 1980. These experiments will be referred to as Location VI through IX.

Location VI - Ft. Cobb, OK

The Location VI experiment was established on the Caddo Research Station near Ft. Cobb, Oklahoma, in Caddo County. The herbicides used at this location were the commercial formulation of glyphosate and MSMA applied both alone and in tank mix combinations with either alachlor or metolachlor. These tank mix combinations were selected to evaluate their potential for residual control of yellow nutsedge following the initial effects of the glypohsate of MSMA. Glyphosate rates were applied on an acid equivalent basis at this and all subsequent locations. A complete treatment list is on Table XIII. Sprinkler irrigation was used throughout the summer. Plot size was 3.7 m (4 row) by 12.2 m long. Treatments were applied to the center two rows of each plot with the outside two rows serving as check rows. Approximate yellow nutsedge stand at the time of application ranged from 5 to 10% groundcover and was uniformly distributed over the experimental area. All pertinent application conditions and plot information are shown on Table XXII in the Appendix. The entire experimental area was treated with trifluralin at 0.56 kg/ha as a preplant incorporated treatment to control annual grasses and small-seeded broadleaf weeds.

Location VII - Ft. Cobb, OK

The Location VII experiment was established on the Caddo Research Station. The herbicides used at this location were the commercial formulation of glyphosate and MSMA applied both alone and in tank mix combinations with either UBI-S-734 or NC-20484. As in Location VI, these two materials were added in tank mixes to evaluate their residual activity for yellow nutsedge control. Both of these herbicides are experimental (non-registered) materials which have been shown to be phytotoxic to yellow nutsedge in past research. A complete treatment list is on Table XIV. Sprinkler irrigation was used throughout the summer. Plot size was 3.7 m (4 row) by 12.2 m long. Treatments were applied to the center two rows of each plot with the outside two rows serving as check rows. Approximate yellow nutsedge stand at the time of application ranged from 20 to 40% groundcover and was uniformly distributed over the experimental area. All pertinent application conditions and plot information are shown on Table XXIII in the Appendix. The entire experimental area was treated with trifluralin at 0.56 kg/ha as a preplant incorporated treatment to control annual grasses and small-seeded broadleaf weeds.

Location VII - Ft. Cobb

The Location VII experiment was established on the Caddo Research Station. In this experiment, several surfactants were examined to determine their potential for increasing the efficiency of glyphosate for yellow nutsedge control. A complete treatment list is on Table XV. Sprinkler irrigation was used throughout the growing season. Plot size was 3.7 m (4 row) by 12.2 m long. Treatments were applied to the center two rows of each plot with the outside two rows serving as check rows. Approximate yellow nutsedge stand at the time of application ranged from 30 to 40% groundcover and was uniformly distributed over the experimental area. All pertinent application conditions and plot information are shown on Table XXIV in the Appendix. The entire experimental area was treated with trifluralin at 0.56 kg/ha as a preplant incorporated treatment to control annual grasses and small-seeded broadleaf weeds.

Location IX - Mangum, OK

The Location IX experiment was established on the Sandyland Research Station near Mangum, Oklahoma, in Greer County. Selected treatments from Locations VI and VII were evaluated under dryland conditions for yellow nutsedge control in peanuts. A complete treatment list appears on Table XVI. Plot size was 2.0 m (2 row) by 9.1 m long. Approximate yellow nutsedge stand at time of application was 30% groundcover and was uniformly distributed over the experimental area. Both peanuts and yellow nutsedge were under apparent drought conditions at time of application. All pertinent application conditions and plot information are shown on Table XXV in the Appendix. The entire experimental area was treated with trifluralin at 0.56 kg/ha as a preplant incorporated treatment to control annual grasses and broadleaf weeds.

Rainfall Data

Rainfall data for Locations I through IX is on Table XXVIII of the Appendix.

CHAPTER IV

RESULTS AND DISCUSSION

Location I - Keeton Farm

Several herbicide treatments in the Location I experiment resulted in minor crop stunting early, but visible injury symptoms did not persist and there were no significant differences between treatment means of peanut stand counts (Table XXVI of the Appendix). Due to an erratic yellow nutsedge stand between replications, statistical analysis of stand counts showed no significant differences between treatment means (Table XXVI of the Appendix). This lack of uniformity was taken into consideration when visual nutsedge control ratings were made. The results of all data collected for all treatments in Location I are in Table XXVI of the Appendix. For ease of explanation, this table has been broken into smaller tables in this chapter.

Heavy rain fell at Location I within hours following application of the PPI treatments, however high rates of vernolate (5.60 and 8.40 kg/ha) applied PPI provided excellent early yellow nutsedge suppression, but were ineffective for season-long control (Table II). The two higher rates of alachlor (4.48 and 5.60 kg/ha) applied PPI also provided excellent early yellow nutsedge suppression, and fair to good (78 to 80%) control was still evident by late season. In contrast, none of the rates of alachlor applied PRE were effective for season-

TABLE II

YELLOW NUTSEDGE CONTROL AND SPANISH PEANUT YIELDS WITH SINGLE APPLICATIONS OF VERNOLATE AND ALACHLOR (LOCATION I - KEETON FARM)

Treatment and Method of Application 1/	Rate (kg/ha)	Visual Nutsedge Control 6/28	Visual Nutsedge Control 8/17	In Shell Yield 10/13
---PPI---		---------%-------------		kg/ha
Vernolate	2.24	55	23	2241
"	3.36	85	63	2417
"	5.60	98	55	2417
"	8.40	100	60	2549
Alachlor	3.36	78	53	2154*
"	4.48	98	78	2505
"	5.60	100	80	2065*
---PRE---				
Alachlor	3.36	95	55	2330
"	4.48	83	60	2466
"	5.60	55	45	2636
"	8.40	58	48	2241
Weedy Check	--	0	0	2154*
Weed Free Check	--	100	100	2681**
LSD (0.05)				452
CV (%)				14

1/ - Method of application is: PPI= preplant surface applied and disk incorporated on May 29; and PRE= preemergence surface applied on June 8.

* Yield means are significantly less than the Weed Free Check.

** Yield means are significantly greater than the Weedy Check.

long nutsedge control. Alachlor applied PPI at 3.36 and 5.60 kg/ha and the weedy check treatments resulted in yield reductions when compared to the weed free check. All other single chemical treatments provided yield values equal or greater than the weedy check plots.

Primary treatments of vernolate followed by sequential treatments of alachlor EC (PRE), alachlor 15G (POT) and alachlor EC (PRE) plus bentazon (POT) substantially improved late-season yellow nutsedge control when compared to the vernolate alone treatment (Table III). Vernolate applied PPI at a rate of 3.36 kg/ha followed by a POT application of alachlor 15% granules at a rate of 4.48 kg/ha resulted in the highest late-season visual yellow nutsedge control of all treatments. A primary application of alachlor EC (PRE) followed by a sequential application of either alachlor EC (POT) or bentazon (POT) were ineffective and did not improve control over that obtained from the alachlor EC applied only as a PRE treatment. Bentazon was also ineffective as a sequential treatment when applied as a single treatment following vernolate.

Yields were reduced with sequential treatments of alachlor EC (PRE) at 3.36 kg/ha and alachlor EC (POT) at 2.24 kg/ha when compared to the weed free check (Table IV). Most treatments terminated with a bentazon POT application showed reduced yields when compared to the weed free check. This yield reduction could probably be attributed more to lack of yellow nutsedge control than to crop injury. The sequential treatments consisting of vernolate (PPI), alachlor EC (PRE) and bentazon (POT) also showed a yield reduction when compared to the weed free check despite good yellow nutsedge control and lack of any appreciable visual above-ground crop injury.

TABLE III

LATE-SEASON YELLOW NUTSEDGE CONTROL WITH SEQUENTIAL HERBICIDE TREATMENTS (LOCATION I - KEETON FARM)

Treatment and (Method of Application)[2/]	Rate (kg/ha)	None	Alachlor EC (PRE)		Alachlor EC (POT)		Alachlor 15G (POT)		Bentazon (POT)		Alachlor EC; Bentazon (PRE; POT)	
		--	3.36	4.48	2.24	3.36	3.36	4.48	1.12	1.68	3.36;1.12	4.48;1.68
Primary Treatment		% Visual Control 1/										
Vernolate (PPI)	2.24	23	70	-	-	-	80	-	45	-	85	-
"	3.36	63	-	60	-	-	-	90	-	43	-	65
Alachlor (PRE)	3.36	55	-	-	35	-	-	-	63	-	-	-
"	4.48	60	-	-	-	25	-	-	-	40	-	-

1/ Ratings taken on August 17.

2/ Method of application is: PPI= preplant surface applied and disk incorporated on May 29; PRE= preemergence surface applied on June 8; and POT= postemergence applied over-the-top on June 28.

TABLE IV

SPANISH PEANUT YIELDS FROM SEQUENTIAL HERBICIDE TREATMENTS (LOCATION I - KEETON FARM)

Treatment and (Method of Application)1/	Rate (kg/ha)	Sequential Treatment: None	Alachlor EC (PRE)		Alachlor EC (POT)		Alachlor 15G (POT)		Bentazon (POT)		Alachlor EC; Bentazon (PRE;POT)	
		--	3.36	4.48	2.24	3.36	3.36	4.48	1.12	1.68	3.36;1.12	4.48;1.68
Primary Treatment		In-Shell Yield (kg/ha)										
Vernolate (PPI)	2.24	2241	2373	-	-	-	2373	-	2110*	-	2110*	-
"	3.36	2417	-	2505	-	-	-	2461	-	1934*	-	2154*
Alachlor (PRE)	3.36	2330	-	-	2110*	-	-	-	2266	-	-	-
"	4.48	2461	-	-	-	2373	-	-	-	2110*	-	-
Weedy check	--	2154										
Weed free check	--	2681										

LSD (0.05) = 452

CV = (%) = 14

* Yield means are significantly less than the weed free check.

1/Method of application is: PPI= preplant surface applied and disk incorporated on May 59; PRE= preemergence surface applied on June 8; and POT= postemergence applied over-the-top on June 28.

A single POT application of bentazon did not sufficiently control yellow nutsedge as indicated by ratings taken on 8/17 (Table V). A sequential POT application of bentazon (POT) did improve control on 8/28; however, the resultant yellow nutsedge was still below acceptable levels. In spite of this, plots treated with a split POT application of bentazon at a rate of 0.84 plus 0.84 kg/ha were significantly higher in yield than the weedy check plots. Bentazon applied PRE;POT at rates of 1.68 and 2.24 kg/ha resulted in yield reductions below that obtained from the weed free check. This reduced yield can be attributed to lack of sufficient yellow nutsedge control.

Location II - Mangum, OK

A single application of alachlor provided good early yellow nutsedge control, but single applications of vernolate, alachlor or bentazon were ineffective for late-season yellow nutsedge control (Table VI).

Treatments involving vernolate PPI (3.36 kg/ha) as the primary treatment followed by sequential treatments of alachlor EC PRE (4.48 kg/ha), alachlor 15G POT (4.48 kg/ha), bentazon POT (1.68 kg/ha), and alachlor EC PRE (4.48 kg/ha) plus bentazon POT (1.68 kg/ha) provided substantially better visual yellow nutsedge control than vernolate alone (Table VII). Yellow nutsedge control was not improved with a sequential treatment of bentazon POT (1.68 kg/ha) following a primary treatment of alachlor EC PRE (4.48 kg/ha).

All primary and sequential herbicide treatments significantly reduced yellow nutsedge stand counts (Table VIII). Although not significantly so, the sequential herbicide treatments resulted in lower

TABLE V

LATE SEASON YELLOW NUTSEDGE CONTROL
AND PEANUT YIELDS WITH BENTAZON
(LOCATION I - KEETON FARM)

Method of Application 1/	Rate (kg/ha)	Visual Nutsedge Control 8/17	Visual Nutsedge Control 8/28	In Shell Yield 10/13
		---------%--------		kg/ha
PRE;POT	1.12;1.12	13	-	2154
"	1.68;1.68	50	-	1846*
"	2.24;2.24	43	-	2109*
POT;LPOT	0.84;0.84	25	63	2857**
"	1.12;1.12	53	58	2461
Weedy Check	---	0	0	2154*
Weed Free Check	---	100	100	2681**

1/ - Method of application is PRE= preemergence surface applied on June 8; POT= postemergence applied over-the-top on June 28; and LPOT= late postemergence applied over-the-top on August 17.

* Yield means are significantly less than the Weed Free Check

** Yield means are significantly

TABLE VI

YELLOW NUTSEDGE CONTROL WITH SINGLE APPLICATIONS OF VERNOLATE, ALACHLOR AND BENTAZON (LOCATION II - MANGUM, OK)

Treatment and Method of Application 1/	Rate	Visual Control 6/26	9/11
---PPI---	(kg/ha)	------%-------	
Vernolate	2.24	85	68
"	3.36	60	58
---PRE---			
Alachlor	3.36	95	75
"	4.48	80	60
---POT---			
Bentazon	1.12	-	33
"	1.68	-	38

1/ - Method of application is PPI= preplant surface applied and disk incorporated on June 6; PRE= preemergence surface applied on June 6; and POT= postemergence applied over-the-top on June 28.

TABLE VII

LATE SEASON YELLOW NUTSEDGE CONTROL WITH SEQUENTIAL HERBICIDE TREATMENTS (LOCATION II - MANGUM, OK)

Treatment and (Method of Application)2/	Rate (kg/ha)	Sequential Treatment: None -- --	Alachlor EC (PRE) 4.48	Alachlor 15G (POT) 4.48	Bentazon (POT) 1.12	Bentazon (POT) 1.68	Alachlor EC;Bentazon (PRE;POT) 4.48;1.68
Primary Treatment		% Visual Control 1/					
Vernolate (PPI)	3.36	58	90	93	-	88	88
Alachlor (PRE)	4.48	60	-	-	-	60	-
None	--	-	-	-	33	38	-

1/ - Ratings taken on September 11

2/ - Method of application is: PPI= preplant surface applied and disk incorporated on June 6; PRE = pre-emergence surface applied on June 6; and POT= postemergence applied over-the-top on June 28.

TABLE VIII

YELLOW NUTSEDGE STAND COUNTS
(LOCATION II - MANGUM, OK)

Treatment and (Method of Application)[2/]	Rate (kg/ha)	Sequential Treatment: None -- --	Alachlor EC (PRE) 4.48	Alachlor 15G (POT) 4.48	Bentazon (POT) 1.12	Bentazon (POT) 1.68	Alachlor EC;Bentazon (PRE;POT) 4.48;1.68
Primary Treatment		(plants/m^2) 1/					
Vernolate (PPI)	2.24	13.0*	-	-	-	-	-
"	3.36	20.8*	2.5*	2.7*	-	3.0*	4.3*
Alachlor (PRE)	3.36	12.8*	-	-	-	-	-
"	4.48	42.0*	-	-	-	18.8*	-
None	--	-	-	-	26.3*	33.8*	-
Weedy check		77.5					

LSD (0.05) = 31.9

CV (%) = 113.2

1/ - Data collected of August 2.

2/ - Method of application is PPI= preplant surface applied and disk incorporated on June 6; PRE= preemergence surface applied on June 6; and POT= postemergence applied over-the-top on June 28.

yellow nutsedge stand counts than the single herbicide treatments, with the lowest stand counts being obtained with sequential treatments having vernolate as the primary treatment.

Although some early crop stunting was observed, none of the treatments in the Location II experiment caused any lasting, serious, visible crop injury, stand count reduction, or yield reductions (Table XXVI of the Appendix). Herbicide treatments did not affect peanut grade (Table XXX of the Appendix). Adequate rainfall was available in June, July and August at this dryland location and most of the herbicide treatments provided good nutsedge control. However, only .01 cm of rain was recorded in September and less than half of the normal amount was recorded in October. This may account for the lack of differences in yields as this is a critical period for pod development.

Location III - Keeton Farm

Considerable variation in nutsedge distribution existed as indicated by the results of the nutsedge stand counts (Table IX). Several of the treated plots contained much higher plant populations than the untreated weedy check plots. The relatively low average yellow nutsedge population in the weedy check plots would probably explain the lack of difference in yield between the weedy and weed free check plots (Table X).

Metolachlor, UBI-S-734 and NC-20484 were the most successful treatments in the control of yellow nutsedge (Table IX). NC-20484 and UBI-S-734 appeared to be highly phytotoxic to nutsedge at the first two rating dates. However, as with other herbicides, these materials acted to suppress rather than kill yellow nutsedge. On the final rating date,

TABLE IX

YELLOW NUTSEDGE CONTROL WITH PREPLANT INCORPORATED HERBICIDE TREATMENTS (LOCATION III - KEETON FARM)

Treatment	Rate	Visual Nutsedge Control 6/28	7/13	8/14	Nutsedge Stand Counts 8/14
	(kg/ha)	------------%----------			(plants/m^2)
Vernolate	3.36	0	0	0	212.0
Alachlor	3.36	35	3	0	121.8
M-4287	2.24	70	50	48	65.0
"	2.80	67	67	58	33.8
"	3.36	37	0	15	82.8
M-4287 + Vernolate	2.80 + 2.24	65	33	43	34.5
M-4287 + Alachlor	2.80 + 3.36	65	73	68	25.0
Metolachlor	1.68	83	75	80	18.3
"	2.24	75	68	73	29.3
"	3.36	85	87	65	54.5
NC-20484	1.12	88	90	78	16.0
"	2.24	93	93	70	30.0
"	4.48	100	100	85	7.8
UBI-S-734	0.56	78	78	80	59.5
"	1.12	75	85	70	66.3
"	1.68	85	80	70	34.5
PPG-1023	3.36	30	0	13	106.8
Vernolate/R-33865	2.24/8:1E	20	0	13	140.8
Weedy check	--	0	0	0	30.8
Weed Free check	--	100	100	100	0
LSD (0.05)					60.0
CV (%)					143.6

Treatment applied on May 29

TABLE X

SPANISH PEANUT SUSCEPTIBILITY TO PREPLANT INCORPORATED HERBICIDE TREATMENTS (LOCATION III - KEETON FARM)

Treatment	Rate	Visual Crop Injury 6/28	Visual Crop Injury 7/13	Visual Crop Injury 8/14	Crop Stand Counts 6/28	In-Shell Yield 10/13
	(kg/ha)	----------	%	---------	(plants/3m of row)	(kg/ha)
Vernolate	3.36	0	0	10	20.3	703 *
Alachlor	3.36	0	0	3	19.8	2022
M-4287	2.24	5	3	8	18.5	1626
"	2.80	7	3	0	22.3	1626
"	3.36	0	0	0	18.0	1934
M-4287 + Vernolate	2.80 + 2.24	5	3	0	19.5	1407
M-4287 + Alachlor	2.80 + 3.36	3	3	0	17.8	1275
Metolachlor	1.68	0	0	0	23.8	1758
"	2.24	3	3	3	22.0	2241 **
"	3.36	0	10	0	21.3	1978
NC-20484	1.12	18	47	15	16.3	615 *
"	2.24	25	60	18	18.5	703 *
"	4.48	30	80	23	16.3	308 *
UBI-S-734	0.56	3	0	3	20.8	1450
"	1.12	10	0	8	18.3	791 *
"	1.68	8	35	8	19.0	747 *
PPG-1023	3.36	0	0	5	24.0	1538
Vernolate/R-33865	2.24/8:1E	0	0	5	22.8	967 *
Weedy check	--	0	0	0	18.8	1627
Weed free check	--	0	0	0	21.3	1538
LSD (0.05)					NSD	625
CV (%)					18.9	33

* Yield means are significantly less than the Weed free check.

** Yield means are significantly greater than the Weed free check.

Treatment applied on May 29.

numerous new nutsedge plants were emerging from these plots.

Metolachlor provided good, consistent nutsedge control (Table IX) with only minimal crop stunting (Table X). Plots treated with metolachlor at a rate of 2.24 kg/ha yielded significantly higher than the weed free check plots (Table X).

All rates of NC-20484 caused severe crop stunting and reduced peanut yields (Table X). The two highest rates of UBI-S-734 (1.12 and 1.68 kg/ha) caused slight crop stunting which resulted in reduced yields.

Vernolate did not provide any yellow nutsedge control at any time following application (Table IX). The heavy rainfall which fell within hours following treatment applications most likely affected the phytotoxicity of vernolate.

Peanut yields were reduced in plots treated with vernolate; however, extremely high yellow nutsedge stands (Table IX) were probably more responsible for these reduced yields than crop injury from the herbicide (Table X). This is evident since early crop injury from vernolate was not apparent, but stunting from competition was obvious at the August 14 rating date (Table X).

Alachlor, M-4287, M-4287 plus vernolate, M-4287 plus alachlor, metolachlor, PPG-1023, and vernolate/R-33865 treatments did not cause peanut injury severe enough to cause yield reductions. In some cases, peanut yields were reduced by apparent yellow nutsedge competition. This appears to be the reason for reduced peanut yields with both vernolate and vernolate/R-33865 (Table X). None of the treatments in this experiment affected peanut grade (Table XXXI of the Appendix).

Location IV - Jarvis Farm

All treatments in this experiment were applied as sequential treatments following a vernolate PPI treatment (2.24 kg/ha). Sequential treatments of alachlor and metolachlor applied PRE and POT at the two highest rate combinations (3.36 kg/ha PRE and POT and 5.60 kg/ha PRE and POT) caused increased peanut injury, but none of the treatments resulted in peanut stand reductions or yield reductions (Table XI). Peanut grade was not affected by these herbicides (Table XXXII of the Appendix), at equal rates, metolachlor was slightly more injurious to Florunner peanuts than alachlor.

Location V - Jarvis Farm

The experimental area in the Location V experiment received 2.24 kg/ha of vernolate as a preplant incorporated treatment. All treatments in Location V were applied in addition to this.

The 6.72 kg/ha rate of alachlor caused moderately high crop stunting which persisted throughout most of the summer (Table XII). The addition of naptalam plus dinoseb to alachlor increased stunting of the Florunner peanuts. Moderate crop stunting also resulted from the two higher rates of metolachlor; however, this visible crop stunting did not significantly affect stand counts or yields (Table XII). Peanut grade was not affected by any of the herbicide treatments (Table XXXIII of the Appendix). The Florunner peanuts of Location V were considerably more tolerant to UBI-S-734 applied preemergence than were the Spanish peanuts of Location III to this material applied preplant incorporated (Table X), however, heavy rainfall did occur at Location

TABLE XI

FLORUNNER PEANUT SUSCEPTIBILITY TO ALACHLOR AND METOLACHLOR FORMULATIONS (LOCATION IV - JARVIS FARM)

Treatment	Rate	Method of Application	Visual Crop Injury 6/22	Visual Crop Injury 6/29	Visual Crop Injury 7/9	Visual Crop Injury 9/4	Crop Stand Counts 6/23	In-Shell Yield 11/6
	(kg/ha)		%	%	%	%	(plants/3m of row)	(kg/ha)
Alachlor	2.24	PRE1/	0	0	3	0	28.5	2386
"	3.36	"	0	0	3	0	29.5	2342
Metolachlor	2.24	"	0	3	3	0	32.0	2125
"	3.36	"	8	8	13	3	25.8	2472
Alachlor;Alachlor 15G	2.24;2.24	PRE;POT	0	3	3	0	25.8	2407
"	3.36;3.36	"	3	5	5	3	27.0	2147
"	5.60;5.60	"	5	8	13	5	32.0	1995
Metolachlor;Metolachlor 15G	2.24;2.24	"	0	3	5	0	25.5	2342
"	3.36;3.36	"	3	8	10	3	25.5	1518
"	5.60;5.60	"	8	18	20	10	27.8	2017
Weed free check	-	-	0	0	0	0	29.0	2451
LSD (0.05)							NSD	NSD
CV (%)							18.9	15

1/ Method of application is PRE= preemergence surface applied on May 15; and POT= postemergence applied over-the-top on June 29.

TABLE XII

FLORUNNER PEANUT SUSCEPTIBILITY TO
PREEMERGENCE APPLIED HERBICIDES
(LOCATION IV - JARVIS FARM)

Treatment	Rate	Visual Crop Injury				Crop Stand Counts	In-Shell Yield
		6/22	6/29	7/9	9/4	6/13	11/6
	(kg/ha)	-----------%-----------				(plants/3m of row)	(kg/ha)
Alachlor	3.36	0	3	0	0	24.3	2342
"	4.48	10	8	5	0	27.5	2255
"	6.72	18	18	20	10	24.8	2125
Metolachlor	2.24	0	5	8	0	24.0	2212
"	3.36	0	13	10	5	24.8	2103
"	5.60	15	15	15	8	22.5	2103
UBI-S-734	0.84	0	0	0	0	25.3	2038
"	1.68	0	0	0	0	26.8	2255
"	3.36	5	5	5	0	25.3	2168
H-22234	2.80	3	5	0	0	26.8	2038
"	5.60	8	5	8	0	25.5	2060
Butam	2.80	3	0	0	0	27.3	2255
"	5.60	8	5	5	3	25.0	1712
Alachlor + Naptalam + Dinoseb	3.36 + 3.36 + 1.68	5	8	8	0	22.3	2516
"	4.48 + 2.24 + 1.12	13	15	13	5	25.8	1735
Weed free check	--	0	0	0	0	24.5	2125
LSD (0.05)						NSD	NSD
CV (%)						13.6	18

Treatments applied on May 15.

III soon after herbicide application.

Location VI - Ft. Cobb

With the use of a hooded sprayer, postemergence applied herbicide treatments did not cause noticeable crop injury (Table XIII). MSMA applied through the hooded sprayer resulted in rapid yellow nutsedge foliage necrosis; however, control was not lasting and regrowth occurred. The addition of alachlor and metolachlor to MSMA treatments resulted in substantially increased control by providing residual activity in the suppression of nutsedge regrowth. Yellow nutsedge control with glyphosate was increased with the addition of alachlor and metolachlor (Table XIII). Nutsedge control with a 1.68 kg/ha rate of glyphosate tank mixed with alachlor or metolachlor was higher than with a 3.36 kg/ha rate of glyphosate applied alone. A glyphosate plus metolachlor treatment resulted in somewhat higher visual yellow nutsedge control than did a glyphosate plus alachlor treatment. Soon after the final rating, peanut vines lapped the row middles.

Location VII - 1980

Control of yellow nutsedge with a hooded sprayer by MSMA was substantially improved by adding of UBI-S-734 and NC-20484 (Table XIV). Particularly good control (90%) was obtained from the MSMA plus NC-20484 combination. The MSMA provided rapid foliage necrosis and the NC-20484 provided effective residual control. Application of glyphosate at 4.48 kg/ha provided 93% and 80% visual yellow nutsedge control at the two successive rating dates (Table XIV). Overall control with tank mixtures of glyphosate with UBI-S-734 and NC-20484 did not

TABLE XIII

YELLOW NUTSEDGE CONTROL IN IRRIGATED SPANISH PEANUTS WITH HERBICIDES APPLIED THROUGH A HOODED SPRAYER (LOCATION VI - FT. COBB, OK)

		Visual Ratings			
		Peanut Injury		Nutsedge Control	
Treatment	Rate	7/14	8/11	7/14	8/11
	(kg/ha)	-------%	--------	--------	--------
Glyphosate	0.84	3	0	27	43
"	1.68	0	0	40	67
"	3.36	0	0	83	53
Glyphosate + Alachlor	1.68 + 4.48	0	0	33	73
Glyphosate + Metolachlor	1.68 + 3.36	0	0	37	90
MSMA*	3.36	0	0	83	46
MSMA* + Alachlor	3.36 + 4.48	0	0	80	86
MSMA* + Metolachlor	3.36 + 3.36	0	0	80	86

* Plus surfactant AG-98, ½% v/v.

Treatments applied on July 3.

TABLE XIV

YELLOW NUTSEDGE CONTROL IN IRRIGATED SPANISH PEANUTS WITH HERBICIDES APPLIED THROUGH A HOODED SPRAYER (LOCATION VII - FT. COBB)

		Visual Ratings			
		Peanut Injury		Nutsedge Control	
Treatment	Rate	8/6	9/6	8/6	9/6
	(kg/ha)	---------------	%	----------------	
Glyphosate	4.48	3	0	93	80
MSMA*	3.36	0	0	53	40
Glyphosate + UBI-S-734	4.48 + 1.68	7	0	76	83
Glyphosate + NC-20484	4.48 + 1.68	7	0	80	87
MSMA* + UBI-S-734	3.36 + 1.68	0	0	73	77
MSMA* + NC-20484	3.36 + 1.68	0	0	90	90

* Plus surfactant AG-98, ½% v/v.

appreciably improve control from glypohsate alone. Later ratings did show some improvement of control over time whereas the glyphosate alone showed decreases in visual control. With both MSMA and glyphosate, the addition of UBI-S-734 and NC-20484 increased yellow nutsedge control presumably by imposing residual herbicide activity without affecting the peanuts in the nearby rows.

Location VIII - 1980

All herbicide applications in this particular experiment resulted in appreciable crop injury (Table XV). Due to the late treatment date and growth habit of the Florunner cultivar, some of the peanuts had begun to fill in the row middles and consequently were treated whereas they normally would not have been. The glyphosate used in this experiment was formulated by the manufacturer with surfactant and the addition of other surfactants did not improve yellow nutsedge control. When glyphosate rates were increased from 4.48 kg/ha to 5.60 kg/ha and 6.72 kg/ha, yellow nutsedge control was improved, especially so at the second rating. The entire experimental area contained a depression which accumulated irrigation water. It was observed that these excessively wet areas enhanced yellow nutsedge growth and thus control was not as effective as would be otherwise expected.

Location IX - 1980

Glyphosate commercially formulated with surfactant and applied through a hooded sprayer alone at 3.36 and 4.48 kg/ha provided good early season yellow nutsedge control with very little peanut injury (Table XVI). The addition of other surfactants did not improve control.

TABLE XV

YELLOW NUTSEDGE CONTROL IN SPANISH PEANUTS WITH GLYPHOSATE PLUS SEVERAL SURFACTANTS APPLIED THROUGH A HOODED SPRAYER (LOCATION VIII - FT. COBB, OK)

		Visual Ratings			
		Peanut Injury		Nutsedge Control	
Treatment	Rate	8/6	9/6	8/6	9/6
	(kg/ha)	-------------%-------------			
Glyphosate	4.48	20	17	53	37
"	5.60	17	10	53	67
"	6.72	20	17	70	70
Glyphosate + AG-98	4.48 + ½%	7	13	53	47
Glyphosate + SA-77	4.48 + ½%	10	7	56	50
Glyphosate + UBI-1262	4.48 + ½%	3	10	53	40
Glyphosate + Herbex	4.48 + ½%	7	7	53	57
Glyphosate + CN-110242	4.48 + ¼%	17	10	60	57

TABLE XVI

YELLOW NUTSEDGE CONTROL IN DRYLAND SPANISH PEANUTS WITH HERBICIDES APPLIED THROUGH A HOODED SPRAYER (LOCATION IX - MANGUM, OK)

		Visual Ratings			
		Peanut Injury		Nutsedge Control	
Treatment		8/11	9/6	8/11	9/6
Glyphosate	3.36	3	0	86	63
"	4.48	3	0	93	63
Glyphosate + AG-98	3.36 + ½%	0	0	73	57
Glyphosate + SA-77	3.36 + ½%	0	0	63	63
Glyphosate + Metolachlor	3.36 + 1.68	0	0	83	83
MSMA + AG-98	3.36 + ½%	0	0	86	57
MSMA + SA-77	3.36 + ½%	7	0	76	50
MSMA + Metolachlor + AG-98	3.36 + 3.36 + ½%	7	0	80	57

Treatments applied on July 23.

The addition of metolachlor did not improve the early-season control but did provide approximately 20% higher control late in the season than glyphosate treatments applied without metolachlor. Yellow nutsedge control with MSMA was not improved by the addition of surfactants or metolachlor. The tank mixture of MSMA with metolachlor did provide good nutsedge control at another loaction, but it was under irrigation (Table XII). None of the treatments caused any notable peanut injury (Table XVI).

CHAPTER V

SUMMARY AND CONCLUSIONS

Experiments evaluating chemical control of yellow nutsedge in peanuts were conducted in 1979 and 1980 on both Spanish and Florunner varieties under dryland and irrigated conditions. It is regrettable that adverse weather conditions in 1980 prevented repetition of the more promising 1979 results. However, it is hoped that the findings in this thesis will aid in continued research in the area of yellow nutsedge control.

Although season-long control or suppression of yellow nutsedge may not be necessary to obtain increased peanut yields, it is important to prevent new tuber formation to keep nutsedge populations from increasing in both area and density. It is also important to keep peanuts which are grown for seed, free of tubers. From this standpoint, more than a single herbicide treatment is necessary. A primary application of vernolate followed by one of several sequential treatments provided good, season-long suppression of yellow nutsedge. The more successful sequential treatments following vernolate PPI were: alachlor EC applied preemergence, alachlor 15% granules applied postemergence and alachlor applied preemergence plus bentazon applied postemergence. Two postemergence applications of bentazon as split applications were better than a single application for nutsedge control.

In some cases, in spite of no apparent crop injury, sequential applications resulted in reduced crop yields. Vernolate plus alachlor plus bentazon reduced yields at Location I but did not at Locations II, IV and V. This may be dependent upon environmental conditions and/or crop variety. From these data it appears that yellow nutsedge is more easily controlled by surface applied herbicides under dryland conditions (Location II) than under irrigated conditions (Location I). Better yellow nutsedge control was obtained from alachlor applied preplant incorporated than preemergence. Vernolate will not control yellow nutsedge when heavy rainfall occurs within hours following application. Preplant incorporated applications of metolachlor, UBI-S-734, and NC-20484 all showed good to excellent yellow nutsedge control in Spanish peanuts although the latter two herbicides caused crop injury. However, a preemergence application of UBI-S-734 did not cause injury to Florunner peanuts. Again, this may be a variety and/or environmental response. In several cases, peanuts appeared to be detrimentally affected (stunted) by high rates of certain herbicides such as metolachlor and alachlor, but yields were not reduced.

The hooded sprayer can be successfully used to control yellow nutsedge with excellent safety to peanuts. Control with glyphosate and MSMA is greatly enhanced by the addition of herbicides which provide residual activity following the initial phytotoxic effects of these two foliar active herbicides. Alachlor, metolachlor, UBI-S-734, and NC-20484 all provided excellent residual suppression of yellow nutsedge by preventing tuber resprouting. The addition of surfactant to formulated glyphosate is not significantly beneficial in the control of yellow nutsedge. Extremely dry or wet conditions adversely affect the control of yellow nutsedge with these materials when applied through the hooded sprayer.

It may be impractical to rely solely upon the hooded sprayer for yellow nutsedge control due to, among other reasons, treatment costs, lack of control in the rows, and weather conditions preventing entry into a field. It can be a useful tool for controlling patches of yellow nutsedge which have escaped conventional controls. By making a late application with the hooded sprayer, it is hoped that residual herbicide activity suppresses nutsedge growth until the peanuts fill in the row middles thereby shading out a regrowing plant and preventing or reducing tuber formation.

LITERATURE CITED

1. Andrews, O.N., C.W. Derting, C.T. Dickerson, R.G. Duncan, D.F. Jones and G.W. Selleck. 1970. Lasso, a new herbicide for peanuts. Proc. S. Weed Sci. Soc. 23:89-94.

2. Andrews, O.N., F.D. Timmons, W.L. Currey and G.A. Buchanan. 1973. An evaluation of alachlor plus dinoseb applied postemergence in peanuts. Proc. S. Weed Sci. Soc. 26:106-118.

3. Anonymous. 1979. Herbicide Handbook of the Weed Science Society of America. Fourth ed. 479 pp.

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

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

6. Bell, R.S., W.H. Lachman, E.M. Rahn and R.D. Sweet. 1962. Life history studies as related to weed control in the Northeast. I. Nutgrass. Rhode Island Agr. Exp. Sta. Bull. 364. 33pp.

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

8. Bendixen, L.E. and E.W. Stroube. 1977. Two weed species of world-wide significance. Weeds Today. 9(1):9,15.

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

10. Boyle, L.W. and R.O. Hammons. 1956. Cultural practices with respect to peanut yield and control of Southern blight and root rot. Georgia Ag. Exp. Sta. Mimeogr. Series N.S. 31.

11. Boyles, M.C. and D.S. Murray. 1979. Control and competition of yellow nutsedge. Proc. S. Weed Sci. Soc. 32:58.

12. Buchanan, G.A., C.S. Hoveland, V.L. Brown and R.H. Wade. 1975. Weed population shifts influenced by crop rotations and weed control programs. Proc. S. Weed Sci. Soc. 28:60-71.

13. Clark, D.E. and R.S. Fawcett. 1977. Yellow nutsedge control in soybeans. Proc. North Central Weed Control Conf. 32:117.

14. Day, B.E. and R.C. Russell. 1955. The effect of drying on survival of nutgrass tubers. Calif. Ag. Exp. Sta. Bull. 751.

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. Sco. 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. 24:110-117.

18. Ellison, E., C. Cole, J. Thompson and J. Daniel. 1977. Bentazon for weed control in corn and peanuts. Proc. S. Weed Sci. Soc. 30:121.

19. Ellison, E., C. Cole, and J. Harden. 1978. Control of yellow nutsedge in peanuts with bentazon. Proc. S. Weed. Sci. Soc. 31:121.

20. Greulach, L.K., R.E. Ascheman, J.H. Kinsella and P.R. Harder. 1975. Bentazon for yellow nutsedge control in soybeans and corn. Proc. North Central Weed Control Conf. 30:83.

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. 1968. Yellow nutsedge-problems, research trends and outlook. Proc. N.E. Weed Control Conf. 23:37-48.

23. Hauser, E.W., J.L. Butler, J.L. Shepherd and S.A. Parham. 1966. response of yellow nutsedge, Florida pusley and peanuts to thiocarbamate herbicides as effected by method of placement in soil. Weed Res. 6:338-345.

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. 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.

26. Hayes, R.M. and C.H. Slack. 1978. Yellow nutsedge control in soybeans. Proc. S. Weed Sci. Soc. 31:93.

27. Holm, L., J.V. Pancho, J.P. Herberger and D.L. Plucknett. 1979. A Geographical Atlas of World Weeds. John Wiley and Sons. New York. 391 pp.

28. Holm, L.G., D.L. Plucknett, J.V. Pancho and J.P. Herberger. 1977. The World's Worst Weeds, Distribution and Biology. Univ. Press. Hawaii. 609 pp.

29. Hunt, C.R., R.G. Brenchly, R.L. Benson, K.R. Frost, Jr. and G.T. Reynolds, 1969. An evaluation of alachlor (Lasso) alone and in combination with certain herbicides for the control of weeds in soybeans. Proc. North Central Weed Control Conf. 24:26-27.

30. Ingle, E.L. and A.D. Worsham. 1971. Effect of soil placement of several herbicides on yellow nutsedge (Cyperus esculentus) tubers. Proc. S. Weed. Sci. Soc. 24:188-192.

31. Jansen, L.L. 1971. Morphology and photoperiodic responses of yellow nutsedge. Weed Sci. 19:210-219

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

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

34. Jordan-Molero, J.E. and E.W. Stoller. 1978. Seasonal developemnt of yellow and purple nutsedges (Cyperus esculentus and C. rotundus) in Illinois. Weed Sci. 26:614-618.

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

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

37. Keeley, P.E. and R.J. Thullen. 1974. Yellow nutsedge control with soil-incorporated herbicides. Weed Sci. 22:378-383.

38. 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.

39. Keeley, P.E., R.J. Thullen and J. Miller. 1970. Biological control studies of yellow nutsedge with Bactra vernutana Zeller. Weed Sci. 18:393-395.

40. Kogan, M. and M.I. Gonzalez. 1979. Yellow and purple nutsedge vegetative propagule production and the effect of MSMA and glyphosate. Proc. W. Soc. Weed Sci. 32:87-92.

41. Kurtz, W.L. and E.W. Stroube. 1975. Control of yellow nutsedge by various herbicides. Proc. North Central Weed Control Conf. 30:59

42. Muenscher, W.C. 1955. Weeds. 2nd ed. Macmillan Co. New York. 560 pp.

43. Obrigawitch. T., J.R. Gibson 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. Gibson and J.R. Abernathy. 1980. Activity of metolachlor on nutsedge. Proc. S. Weed Sci. Soc. 33:225.

45. Ray, B. and M. Wilcox. 1969. Chemical fallow control of nutsedge. Weed Res. 9:86-94.

46. Stoller, E.W. 1975. Growth, development and physiology of yellow nutsedge. Proc. North Central Control Conf. 30:124-125.

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

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

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

50. Suwanketnikom, R. and D. Penner. 1975. Yellow nutsedge control with bentazon and glyphosate. Proc. North Central Weed Control Conf. 30:115.

51. Swann, C.W. and C.M. French. 1979. Differentation of yellow and purple nutsedge. Proc. Am. Peanut Res. and Ed. Soc. 11(1):60.

52. Taylorson, R.B. 1967. Seasonal variation in sprouting and available carbohydrate in yellow nutsedge tubers. Weed Sci. 15:22-24.

53. Thomas, R.E.L. 1969. Effects of dessication and temperature on survival of <u>Cyperus esculentus</u> tubers and <u>Cynadon dactylon</u> rhizomes. Weed Res. 9:1-8.

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

55. Thullen, R.J. and P.E. Keeley. 1978. Purple and yellow nutsedge seed production, germination and control. Proc. W. Soc. Weed Sci. 31:142-145.

56. Tidwell, J., G. W. Dickerson and C. Harvey. 1975. Control of nutsedge in West Texas. Proc. S. Weed Sci. Soc. 28:203.

57. Tidwell, J. and C. Harvey. 1976. The use of pre- and postemergence herbicides for nutsedge control. Proc. S. Weed Sci. Soc. 29: 168-170.

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

59. Tumbleson, M.E. and T. Kommendahl. 1962. Factors affecting dormancy in tubers of *Cyperus esculentus*. Bot. Gaz. 123:186-189.

60. U.S. Dep. of Agric., Agric. Res. Serv. 1970. Selected Weeds of the United States. Agric. Handb. 366. 436 pp.

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

62. Waterfall, U.T. 1972. Keys to the Flora of Oklahoma. 5th ed. Okla. State Univ. 246 pp.

63. Wax, L.M. 1975. Control of yellow nutsedge in field crops. Proc. North Central Weed Control Conf. 30:125-128.

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

65. Wilfret, G.J. and D.S. Burgis. 1976. Nutsedge (*Cyperus rotundus* L.) control using herbicides under fallow conditions. Proc. S. Weed Sci. Soc. 29:237-243.

66. Younce, H.D. and C.N. Nolan. 1975. Response of peanuts to preemergence and cracking stage treatments. Proc. S. Weed Sci. Soc. 28:40.

67. Zarecor, D., E. Ellison, C. Cole and J. Lunsford. 1976. Bentazon for yellow nutsedge control in soybeans and corn. Proc. S. Weed Sci. Soc. 29:157.

APPENDIX

TABLE XVII

APPLICATION CONDITIONS AND PLOT INFORMATION
(LOCATION I - KEETON FARM)

Method of Application	PPI	PRE	POT*	LPOT
Treatment Date	May 29	June 8	June 28	August 17
Row Spacing (cm)	91	91	91	91
Spray Volume (l/ha)	140.3	140.3	280.5	280.5
Pressure (g/cm^2)	1547	1547	1477	2109
Ground Speed (km/hr)	4.8	4.8	4.8	4.8
Tip Size	9502	9502	8003	8003
Number of Tips	3	3	3	3
Tip Spacing (cm)	51	51	51	51
Air Temperature (C)	26.7	28.3	32.2	33.3
Soil Temperature (C)	26.7	27.8	34.4	30.0
Soil Moisture	good	good	fair to good	good
Sky Conditions	ptly. cloudy	cloudy	clear	clear
Wind (km/hr)	6.4 to 9.7	8 to 11.3	0 to 8	0 to 3.2
Crop Growth Stage (cm)	PPI	PRE	7.6 to 12.7	25.4 to 30.5
Nutsedge Growth Stage (cm)	PPI	PRE	5.1 to 20.3	20.3 to 30.5
Soil Type	Doughtery Loamy find sand; 0 to 3% slope Arenic Haplustalf			
% Sand	79			
% Silt	14			
% Clay	8			
% OM	0.3			
pH	6.2			
CEC	2.75			
Crop Variety	Spanish 'Tamnut'			
Date of Planting	June 8			
Depth of Planting (cm)	6.4			

*includes granular treatments

TABLE XVIII

APPLICATION CONDITIONS AND PLOT INFORMATION
(LOCATION II - MANGUM, OK)

Method of Application	PPI	PRE	POT*
Treatment Date	June 6	June 6	June 28
Row Spacing (cm)	102	102	102
Spray Volume (l/ha)	140.3	140.3	280.6
Pressure (g/cm)	4078	3516	2391
Ground Speed (km/hr)	4.8	4.8	4.8
Tip Size	9501	9501	8003
Number of Tips	6	6	12
Tip Spacing (cm)	51	51	25.4
Air Temperature (C)	27.8	32.8	37.8
Soil Temperature (C)	25.6	31.1	40.0
Soil Moisture	Good	Good	Dry
Sky Conditions	Clear	Ptly. Cloudy	Clear
Wind (km/hr)	0	4.8 to 8.1	0 to 3.2
Crop Growth Stage (cm)	PPI	PRE	15.2
Nutsedge Growth Stage (cm)	PPI	PRE	10.2 to 17.8
Soil Type	Meno and Altus loamy find sand: 0 to 1% slope Arenic Haplustalf		
% Sand	84		
% Silt	7		
% Clay	9		
% OM	0.4		
pH	5.6		
CEC	1.60		
Crop Variety	Spanish 'Tamnut'		
Date of Planting	June 6		
Depth of Planting (cm)	6.4		

*includes granular treatments

TABLE XIX

APPLICATION CONDITIONS AND PLOT INFORMATION
(LOCATION III - KEETON FARM)

Method of Application	PPI
Treatment Date	May 29
Row Spacing (cm)	91
Spray Volume (l/ha)	140.3
Pressure (g/cm^2)	1617
Ground Speed (km/hr)	4.8
Tip Size	9502
Number of Tips	3
Tip Spacing (cm)	51
Air Temperature (C)	27.2
Soil Temperature (C)	28.3
Soil Moisture	Good
Sky Conditions	Partly Cloudy
Wind (km/hr)	6.4 to 9.7
Soil Type	Doughtery loamy fine sand; 0 to 3% slope Arenic Haplustalf
% Sand	73
% Silt	18
% Clay	9
% OM	0.4
pH	7.8
CEC	3.21
Crop Variety	Spanish 'Tamnut'
Date of Planting	June 8
Depth of Planting	6.4

TABLE XX

APPLICATION CONDITIONS AND PLOT INFORMATION
(LOCATION IV - JARVIS FARM)

Method of Application	PRE	POT
Treatment Date	May 15	June 29
Row Spacing (cm)	76	--
Spray Volume (l/ha)	140.3	--
Pressure (g/cm)	1617	--
Ground Speed (km/hr)	4.8	--
Tip Size	9502	--
Number of Tips	3	--
Tip Spacing (cm)	51	--
Air Temperature (C)	28.9	36.7
Soil Temperature (C)	31.1	39.4
Soil Moisture	Fair	Dry
Sky Conditions	Clear	Clear
Wind (km/hr)	3.2 to 4.8	0 to 6.4
Crop Growth Stage (cm)	PRE	15.2 to 17.8
Soil Type	Konawa fine sandy loam; 3 to 5% slope Ultic Haplustalf	
% Sand	65	
% Silt	22	
% Clay	13	
% OM	0.5	
pH	5.6	
CEC	2.76	
Crop Variety	Runner 'Florunner'	
Date of Planting	May 14	
Depth of Planting (cm)	7.6	

TABLE XXI

APPLICATION CONDITIONS AND PLOT INFORMATION
(LOCATION V - JARVIS FARM)

Method of Application	PRE
Treatment Date	May 15
Row Spacing (cm)	76
Spray Volume	140.3
Pressure (g/cm^2)	1617
Ground Speed (km/hr)	4.8
Tip Size	9502
Number of Tips	3
Tip Spacing (cm)	51
Air Temperature (C)	28.9
Soil Temperature (C)	31.1
Soil Moisture	Fair
Sky Conditions	Clear
Wind (km/hr)	3.2 to 4.8
Soil Type	Konawa fine sandy loam; 3 to 5% slope Ultic Haplustalf
% Sand	64
% Silt	23
% Clay	13
% OM	0.6
pH	5.3
CEC	2.76
Crop Variety	Runner 'Florunner'
Date of Planting	May 14
Depth of Planting (cm)	7.6

TABLE XXII

APPLICATION CONDITIONS AND PLOT INFORMATION
(LOCATION VI - FT. COBB, OK)

Method of Application	Post-Hooded Sprayer
Treatment Date	July 3
Row Spacing (cm)	91
Spray Volume (l/ha)	280.6
Pressure (g/cm^2)	1898
Ground Speed (km/hr)	4.8
Tip Size	8004E
Air Temperature (C)	41.7
Soil Temperature (C)	44.4
Soil Moisture	Dry
Sky Conditions	Clear
Wind (km/hr)	0 to 6.4
Crop Growth Stage (cm)	12.7 to 17.8
Nutsedge Growth Stage (cm)	7.6 to 17.8 (4 to 6 leaves)
Soil Type	Cobb fine sandy loam; 1 to 3% slope Udic Haplustalf
% Sand	66
% Silt	19
% Clay	15
% OM	0.7
pH	7.4
CEC	3.8
Crop Variety	Spanish 'Pronto'
Date of Planting	June 2
Depth of Planting (cm)	5

TABLE XXIII

APPLICATION CONDITIONS AND PLOT INFORMATION
(LOCATION VII - FT. COBB, OK)

Method of Application	POST-Hooded Sprayer
Treatment Date	July 14
Row Spacing (cm)	91
Spray Volume (l/ha)	280.6
Pressure (g/cm^2)	1898
Ground Speed (km/hr)	4.81
Tip Size	8004E
Air Temperature (C)	38.3
Soil Temperature (C)	42.2
Soil Moisture	Dry
Sky Conditions	Clear
Wind (km/hr)	0 to 8.1
Crop Growth Stage (cm)	15.2 to 25.4 (flowering)
Nutsedge Growth Stage (cm)	10.2 to 25.4 (5 to 10 leaves)
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
Crop Variety	Runner 'Florunner'
Date of Planting	June 3
Depth of Planting (cm)	5

TABLE XXIV

APPLICATION CONDITIONS AND PLOT INFORMATION
(LOCATION VIII - FT. COBB, OK)

Method of Application	Post-Hooded Sprayer
Treatment Date	July 14
Row Spacing (cm)	91
Spray Volume (l/ha)	280.6
Pressure (g/cm^2)	1898
Ground Speed (km/hr)	4.8
Tip Size	8004E
Air Temperature (C)	38.3
Soil Temperature (C)	42.2
Soil Moisture	Dry
Sky Conditions	Clear
Wind (km/hr)	0 to 8.1
Crop Growth Stage (cm)	15.2 to 25.4 (flowering)
Nutsedge Growth Stage (cm)	10.2 to 25.4 (5 to 12 leaves)
Soil Type	Cobb fine sandy loam; 1 to 3% slope Udic Haplustalf
% Sand	58
% Silt	19
% Clay	23
% OM	0.7
pH	7.6
CEC	3.8
Crop Variety	Runner 'Florunner'
Date of Planting	June 3
Depth of Planting (cm)	5

TABLE XXV

APPLICATION CONDITIONS AND PLOT INFORMATION
(LOCATION IX - MANGUM, OK)

Method of Application	POST-Hooded Sprayer
Treatment Date	July 23
Row Spacing (cm)	102
Spray Volume (l/ha)	280.6
Pressure (g/cm^2)	1898
Ground Speed	4.81
Tip Size	8004E
Air Temperature (C)	26.7
Soil Temperature (C)	28.9
Soil Moisture	Dry
Sky Conditions	Clear
Wind (km/hr)	0
Crop Growth Stage (cm)	15.2 (flowering)
Nutsedge Growth Stage (cm)	7.6 to 17.8 (5 to 12 leaves)
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
Crop Variety	Spanish 'Tamnut'
Date of Planting	June 12
Depth of Planting	5

TABLE XXVI

YELLOW NUTSEDGE CONTROL IN IRRIGATED SPANISH PEANUTS (LOCATION I - KEETON FARM)

Treatment	Rate	Method of Application	Visual Ratings: Peanut Injury 6/18	7/13	8/17	8/28	Nutsedge Control 6/18	7/13	8/17	8/18	Stand Counts: Peanuts 6/28	Nutsedge 8/18	In Shell Yield 10/13
	(kg/ha)		%								(plants/3m of row)	(plants/m^2)	(kg/ha)
Vernolate	2.24	PPI[1/]	0	0	0	--	55	38	23	--	20.3	26.5	2241
Vernolate	3.36	PPI	0	5	3	--	85	90	63	--	20.5	5.3	2417
Vernolate	5.60	PPI	13	3	0	--	98	75	55	--	18.3	3.8	2417
Vernolate	8.40	PPI	5	0	0	--	100	70	60	--	23.8	1.3	2549
Alachlor	3 36	PPI	0	0	0	--	78	55	53	--	21.0	24.8	2154
Alachlor	4.48	PPI	5	3	3	--	98	75	78	--	21.3	8.5	2505
Alachlor	5.60	PPI	8	10	0	--	100	98	80	--	20.0	3.5	2065
Vernolate; Alachlor	2.24; 3.36	PPI; PRE	3	0	0	--	83	80	70	--	22.0	23.3	2373
Vernolate; Alachlor	3.36; 4.48	PPI; PRE	0	0	3	--	75	80	60	--	21.0	25.3	2505
Vernolate; Alachlor; Bentazon	2.24; 3.36; 1.12	PPI; PRE; POT	0	3	0	--	98	85	85	--	17.8	2.8	2110
Vernolate; Alachlor; Bentazon	3.36; 4.48; 1.68	PPI; PRE; POT	8	10	0	--	88	93	65	--	18.5	9.5	2154
Vernolate; Alachlor 15G	2.24; 3.36	PPI; POT	0	3	0	--	70	63	80	--	19.5	16.8	2373
Vernolate; Alachlor 15G	3.36; 4.48	PPI; POT	0	3	0	--	78	50	90	--	21.0	11.8	2461
Vernolate; Bentazon	2.24; 1.12	PPI; POT	3	0	0	--	78	53	45	--	19.3	4.0	2110
Vernolate; Bentazon	3.36; 1.68	PPI; POT	8	8	0	--	75	55	43	--	18.5	18.8	1934
Alachlor; Alachlor	2.24; 2.24	PPI; POT	5	10	0	--	95	78	35	--	19.3	14.0	2110
Alachlor; Alachlor	3.36; 3.36	PPI; POT	0	0	0	--	60	23	25	--	21.8	23.5	2373
Alachlor	3.36	PRE	3	5	0	--	95	55	55	--	19.3	26.8	2330
Alachlor	4.48	PRE	3	5	3	--	83	73	60	--	15.0	6.8	2461
Alachlor	5.60	PRE	5	8	0	--	55	50	45	--	19.3	36.5	2636
Alachlor	8.40	PRE	3	5	0	--	58	88	48	--	18.8	2.5	2241
Bentazon; Bentazon	1.12; 1.12	PRE; POT	0	0	0	--	0	33	13	--	21.0	20.8	2154
Bentazon; Bentazon	1.68; 1.68	PRE; POT	0	0	0	--	43	80	50	--	16.5	33.3	1846
Bentazon; Bentazon	2.24; 2.24	PRE; POT	0	5	0	--	25	50	43	--	17.0	10.3	2109
Alachlor; Bentazon	3.36; 1.12	PRE; POT	0	3	0	--	48	68	63	--	20.0	32.3	2286
Alachlor; Bentazon	4.48; 1.68	PRE; POT	3	5	0	--	25	60	40	--	17.3	24.3	2110
Bentazon ; Bentazon	0.68; 0.68	POT; LPOT	--	0	0	0	--	53	25	63	22.0	14.5	2857
Bentazon ; Bentazon	1.12; 1.12	POT; LPOT	--	3	3	0	--	43	53	58	20.3	6.3	2461
Weedy check	--	--	0	0	0	0	0	0	0	0	17.3	16.3	2154
Weed free check	--	--	0	0	0	0	10	10	10	10	19.5	--	2681
LSD (0.05)											NSD	NSD	452
CV (%)											15.2	143.6	14

1/ Method of application is PPI= preplant surface applied and disk incorporated on May 29; PRE= preemergence surface applied on June 8; POT= postemergence applied over-the-top on June 28; and LPOT= late postemergence applied over-the-top on August 17.

TABLE XVII

YELLOW NUTSEDGE CONTROL IN
DRYLAND SPANISH PEANUTS
(LOCATION II - MANGUM, OK)

Treatment	Rate	Method of Application	Visual Ratings: Peanut Injury 6/26	Visual Ratings: Peanut Injury 7/23	Visual Ratings: Peanut Injury 9/11	Visual Ratings: Nutsedge Control 6/26	Visual Ratings: Nutsedge Control 7/23	Visual Ratings: Nutsedge Control 9/11	Stand Counts: Peanuts 6/28	Stand Counts: Nutsedge 8/2	In Shell Yield 11/15
	(kg/ha)		%						(plants/3m of row)	(plants/m^2)	(kg/ha)
Vernolate	2.24	PPI[1/]	0	3	3	85	73	68	23.0	13.0	1537
Vernolate	3.36	PPI	0	0	0	60	58	58	23.8	20.8	1976
Vernolate; Alachlor	3.36; 4.48	PPI; PRE	10	5	4	98	93	90	21.5	2.5	1220
Vernolate; Alachlor; Bentazon	3.36; 4.48; 1.68	PPI; PRE; POT	15	3	5	100	95	88	23.8	4.3	1317
Vernolate; Alachlor 15G	3.36; 4.48	PPI; POT	7	0	5	97	98	93	23.8	2.7	1537
Vernolate; Bentazon	3.36; 1.68	PRE	3	0	3	98	90	88	25.3	3.0	1415
Alachlor	3.36	PRE	8	0	0	95	70	75	23.5	12.8	1878
Alachlor	4.48	PRE	10	8	0	80	68	60	26.3	42.0	1439
Alachlor; Bentazon	4.48; 1.68	PRE; POT	13	8	3	93	83	60	28.3	18.8	1585
Bentazon	1.12	POT	0	0	0	--	20	33	25.5	26.3	1366
Bentazon	1.68	POT	0	0	3	--	18	38	23.5	33.8	1390
Weedy check	--	--	0	0	0	0	0	0	24.5	77.5	1707
Weed free check	--	--	0	0	0	100	100	100	22.7	0	1683
LSD (0.05)									NSD	31.9	NSD
CV (%)									12.1	113.2	38

1/ Method of application is PPI = preplant surface applied and disk incorporated on June 6; PRE = preemergence surface applied on June 6; and POT = postemergence over-the-top on June 28.

TABLE XXVIII

RAINFALL DATA

Keeton Farm (1979)1/		Mangum (1979)		Jarvis Farm (1979)2/		Ft. Cobb (1980)3/		Mangum (1980)3/	
Date	cm	Date	cm	Date	cm	Date	cm	Date	cm
5/29	7.6	6/6	0.1	5/20	6.4				
5/31	3.2	6/9	1.5	5/21	2.8				
6/2	0.5	6/10	0.7	5/26	Tr				
6/3	Tr	6/23	0.1	5/27	0.3				
6/4	0.1	6/26	0.1	6/2	0.6				
6/5	0.1	7/1	0.7	6/8	5.8				
6/6	4.0	7/6	9.1	7/9	7.6				
6/9	Tr	7/10	0.4	7/20	2.5				
6/26	0.8	7/16	0.9	7/22	2.1				
7/6	0.3	7/17	2.6	7/23	0.3				
7/7	2.8	7/25	0.1	7/24	0.5				
7/8	Tr	7/31	2.1	7/25	1.3				
7/10	0.6			7/4	1.8				
7/17	Tr								
7/18	0.6								
7/27	0.7								
8/3	0.7								
8/10	Tr								
8/11	0.2								
8/16	0.8								

Rainfall data is given for the period over which herbicide applications were made.

1/ - The rainfall datum for 5/29 was recorded at the experimental area. All other amounts were recorded approximately 14.5 km NE of the experimental area.

2/ - Rainfall data was recorded approximately 11.3 km NNW of the experimental area.

3/ - No rainfall fell within 4 weeks of treatment applications.

TABLE XXIX

PEANUT GRADES (LOCATION I - KEETON FARM)

Treatment	Rate	Method of Application	Sound Mature Kernels	Sound Splits	Total Sound Mature Kernels	Other Kernels	Damage	Kernels	Hulls
	(kg/ha)		-----------------------------			%			-----------------------------
Vernolate	2.24	PPI	64.5	5.0	69.5	3.5	1.5	74.5	25.5
Vernolate	3.36	PPI	63.0	5.0	68.0	3.0	3.5	74.5	25.5
Vernolate	5.61	PPI	68.0	3.5	71.5	2.5	1.5	75.5	24.5
Vernolate	8.41	PPI	66.5	4.0	70.5	2.5	2.5	75.5	24.5
Alachlor	3.36	PPI	63.0	5.5	68.5	3.5	2.5	74.5	25.5
Alachlor	4.48	PPI	64.5	4.5	69.0	5.0	0.5	74.5	25.5
Alachlor	5.61	PPI	65.5	5.0	70.5	3.0	1.5	75.0	25.0
Vernolate; Alachlor	3.36; 4.48	PPI; PRE	66.5	4.0	70.5	4.0	0.5	75.0	25.0
Vernolate; Alachlor; Bentazon	2.24; 3.36; 1.12	PPI; PRE; POT	65.0	6.0	71.0	1.5	2.0	74.5	25.5
Vernolate; Alachlor; Bentazon	3.36; 4.48; 1.68	PPI; PRE; POT	65.5	3.5	69.0	3.0	2.0	74.0	26.0
Vernolate; Alachlor 15G	2.24; 3.36	PPI; POT	63.5	5.5	69.0	3.0	2.0	74.0	26.0
Vernolate; Alachlor 15G	3.36; 4.48	PPI; POT	68.0	4.5	72.5	2.0	1.5	76.0	24.0
Vernolate; Bentazon	2.24; 1.12	PPI; POT	64.0	6.0	70.0	3.0	2.0	75.0	25.0
Vernolate; Bentazon	3.36; 1.68	PPI; POT	66.0	5.0	71.0	2.0	1.5	74.5	25.5
Alachlor; Alachlor	2.24; 2.24	PPI; POT	67.0	2.5	69.5	4.0	1.0	74.5	25.5
Alachlor; Alachlor	3.36; 3.36	PPI; POT	63.0	4.5	67.5	4.5	2.0	74.0	26.0
Alachlor	3.36	PRE	65.5	3.0	68.5	3.5	1.5	73.5	26.5
Alachlor	4.48	PRE	64.0	3.0	67.0	5.0	1.0	73.0	27.0
Alachlor	5.61	PRE	66.0	5.0	71.0	2.0	2.0	75.0	25.0
Alachlor	8.41	PRE	68.5	3.0	71.5	2.5	0.5	74.5	25.5
Bentazon; Bentazon	1.12; 1.12	PRE; POT	66.5	2.5	69.0	2.5	1.5	73.0	27.0
Bentazon; Bentazon	1.68	PRE; POT	67.5	3.5	71.0	2.0	2.0	75.0	25.0
Bentazon; Bentazon	2.24	PRE; POT	65.0	5.0	70.0	2.5	2.0	74.5	25.5
Alachlor; Bentazon	3.36; 1.12	PRE; POT	67.0	3.5	70.5	3.5	1.0	75.0	25.0
Alachlor; Bentazon	4.48; 1.68	PRE; POT	63.5	6.5	70.0	2.5	2.5	75.0	25.0
Bentazon ; Bentazon	0.84; 0.84	POT; LPOT	64.5	5.5	70.0	3.5	2.5	76.0	24.0
Bentazon ; Bentazon	1.12; 1.12	POT; LPOT	64.0	4.5	68.5	4.5	1.5	74.5	25.5
Weedy check	--	--	65.5	4.5	70.0	2.5	2.0	74.5	25.5
Weed free check	--	--	64.0	5.5	69.5	3.5	2.5	75.5	24.5
LSD (0.05)			2.9	2.2	2.2	NSD	NSD	1.3	1.3
CV (%)			2.2	23.9	1.5	37.0	53.5	0.8	2.5

1/ Method of application is PPI = preplant surface applied and disk incorporated; PRE = preemergence surface applied; POT = postemergence over-the-top; and LPOT = late postemergence over-the-top.

TABLE XXX

PEANUT GRADES (LOCATION II - MANGUM, OK)

Treatment	Rate	Method of Application	Sound Mature Kernels	Sound Splits	Total Sound Mature Kernels	Other Kernels	Damage	Kernels	Hulls
	(kg/ha)		%						
Vernolate	2.24	PPI	54.5	2.0	56.5	9.5	17.0	73.5	26.5
Vernolate	3.36	PPI	63.5	3.0	66.5	5.0	2.5	74.0	26.0
Vernolate; Alachlor	3.36; 4.48	PPI; PRE	62.0	5.0	67.0	6.0	3.0	76.0	24.0
Vernolate; Alachlor; Bentazon	3.36; 4.48; 1.68	PPI; PRE; POT	61.0	3.5	64.5	6.5	5.0	76.0	24.0
Vernolate; Alachlor 15G	3.36; 4.48	PPI; POT	58.0	1.5	59.5	8.5	6.5	74.5	25.5
Vernolate; Bentazon	3.36; 1.68	PPI; POT	59.0	1.0	60.0	5.5	7.5	73.0	27.0
Alachlor	3.36	PRE	62.5	3.0	65.5	3.5	5.5	74.5	25.5
Alachlor	4.48	PRE	64.5	3.0	67.5	3.0	4.0	74.5	25.5
Alachlor; Bentazon	4.48; 1.68	PRE; POT	63.0	3.5	66.5	3.5	5.0	75.0	25.0
Bentazon	1.12	POT	65.0	3.0	68.0	3.0	4.0	75.0	25.0
Bentazon	1.68	POT	61.0	2.5	63.5	5.0	4.5	73.0	27.0
Weedy check	--	--	58.5	6.0	64.5	5.0	4.5	74.0	26.0
Weed free check	--	--	57.5	2.0	59.5	8.0	5.5	73.0	27.0
LSD (0.05)			NSD	NSD	NSD	NSD	NSD	NSD	NSD
CV (%)			8.5	7.7	66.6	65.8	76.6	1.3	3.6

1/ Method of application is: PPI = preplant surface applied and disk incorporated; PRE = preemergence surface applied; and POT = postemergence over-the- top.

TABLE XXXI

PEANUT GRADES (LOCATION III - KEETON FARM)

Treatment	Rate	Method of Application	Sound Mature Kernels	Sound Splits	Total Sound Mature Kernels	Other Kernels	Damage	Kernels	Hulls
	(kg/ha)		%						
Vernolate	3.36	PPI[1/]	62.0	4.0	66.0	4.5	1.5	72.0	28.0
Alachlor	3.36	PPI	66.0	3.5	69.5	4.0	1.5	75.0	25.0
M-4287	2.24	PPI	64.5	3.0	67.5	5.5	1.5	74.5	25.5
M-4287	2.80	PPI	63.0	3.0	66.0	7.5	1.0	74.5	25.5
M-4287	3.36	PPI	64.0	4.0	68.0	6.0	0.5	74.5	25.5
M-4287 + Vernolate	2.80 + 2.24	PPI	63.0	3.0	66.0	7.0	1.0	74.0	26.0
M-4287 + Alachlor	2.80 + 3.36	PPI	63.0	3.5	66.5	7.5	0.5	74.5	25.5
Metolachlor	1.68	PPI	64.0	2.5	66.5	6.0	1.0	73.5	26.5
Metolachlor	2.24	PPI	67.0	1.5	68.5	5.0	0.5	74.0	26.0
Metolachlor	3.36	PPI	66.5	3.0	69.5	4.5	1.0	75.0	25.0
NC 20484	1.12	PPI	65.5	3.5	69.0	5.5	1.0	75.5	24.5
NC 20484	2.24	PPI	62.5	2.5	65.0	6.5	1.0	72.5	27.5
NC 20484	4.48	PPI	59.5	3.0	62.5	9.0	2.0	73.5	26.5
UBI-S-734	0.56	PPI	65.0	2.0	67.0	6.5	1.5	75.0	25.0
UBI-S-734	1.12	PPI	65.0	1.5	66.5	6.0	1.0	73.5	26.5
UBI-S-734	1.68	PPI	65.0	2.5	67.5	6.0	0.5	74.0	26.0
PPG 1023	3.36	PPI	66.5	3.0	69.5	3.5	1.0	74.0	26.0
Vernolate/R-33865	2(8:1E)	PPI	67.5	2.5	70.0	4.0	0.5	74.5	25.5
Weed free check	--	--	67.0	2.0	69.0	5.5	0.0	74.5	25.5
Weedy check	--	--	65.5	2.0	67.5	5.5	0.5	73.5	26.5
LSD (0.05)			3.3	NSD	NSD	NSD	NSD	NSD	NSD
CV (%)			2.5	33.5	2.3	26.1	72.4	1.7	6.5

[1/] Method of application is: PPI = preplant surface applied and disk incorporated.

TABLE XXXII

PEANUT GRADES (LOCATION IV - JARVIS FARM)

Treatment	Rate	Method of Application	Sound Mature Kernels	Sound Splits	Total Sound Mature Kernels	Other Kernels	Damage	Kernels	Hulls
	(kg/ha)		%						
Alachlor; Alachlor 15G	2.24; 2.24	PRE; POT[1/]	56.0	1.5	57.5	14.0	8.0	79.5	20.5
Alachlor; Alachlor 15G	3.36; 3.36	PRE; POT	54.0	1.5	55.5	13.0	11.5	80.0	20.0
Alachlor; Alachlor 15G	5.60; 5.60	PRE; POT	56.5	1.5	58.0	17.5	4.5	80.0	20.0
Metolachlor; Metolachlor 15G	2.24; 2.24	PRE; POT	61.5	6.5	68.0	7.0	5.0	80.0	20.0
Metolachlor; Metolachlor 15G	3.36; 3.36	PRE; POT	56.5	1.5	58.0	14.0	7.0	79.0	21.0
Metolachlor; Metolachlor 15G	5.60; 5.60	PRE; POT	60.0	2.0	62.0	8.5	10.0	80.5	19.5
Alachlor	2.24	PRE	65.0	2.0	67.0	8.0	4.0	80.0	20.0
Alachlor	3.36	PRE	56.5	3.0	59.5	9.5	11.5	80.5	19.5
Metolachlor	2.24	PRE	67.0	1.0	68.0	8.5	2.5	79.0	21.0
Metolachlor	3.36	PRE	66.0	4.5	70.5	4.5	6.0	81.0	19.0
Check	--	--	61.0	3.0	64.0	11.0	5.5	80.5	19.5
LSD (0.05)			NSD	NSD	NSD	NSD	NSD	NSD	NSD
CV (%)			7.8	87.7	7.1	30.0	67.8	1.7	6.8

[1/] Method of application is: PRE = preemergence surface applied and POT = postemergence over-the-top. Entire experimental area treated with 2.24 kg/ha vernolate as a preplant incorporated treatment.

TABLE XXXIII

PEANUT GRADES (LOCATION V - JARVIS FARM)

Treatment	Rate	Method of Application	Sound Mature Kernels	Sound Splits	Total Sound Mature Kernels	Other Kernels	Damage	Kernels	Hulls
	(kg/ha)		%						
Alachlor	3.36	PRE[1/]	62.0	0.5	62.5	8.5	9.0	80.0	20.0
Alachlor	4.48	PRE	60.5	3.0	63.5	14.0	3.5	81.0	19.0
Alachlor	6.72	PRE	62.5	1.5	64.0	13.5	3.5	81.0	19.0
Metolachlor	2.24	PRE	62.0	1.5	63.5	11.0	6.5	81.0	19.0
Metolachlor	3.36	PRE	64.0	2.0	66.0	9.0	5.5	80.5	19.5
Metolachlor	5.60	PRE	65.5	1.0	66.5	8.5	5.5	80.5	19.5
UBI-S-734	0.84	PRE	62.5	1.5	64.0	11.5	5.5	81.0	19.0
UBI-S-734	1.68	PRE	63.5	3.5	67.0	9.5	5.0	81.5	18.5
UBI-S-734	3.36	PRE	64.0	2.0	66.0	10.5	3.5	80.0	20.0
H-22234	2.80	PRE	68.0	0.5	68.5	9.5	2.5	80.5	19.5
H-22234	5.60	PRE	67.5	2.0	69.5	9.0	2.0	80.5	19.5
Butam	2.80	PRE	65.0	2.0	67.0	11.5	3.0	81.5	18.5
Butam	5.60	PRE	64.5	4.0	66.5	12.5	3.5	82.5	17.5
Alachlor + naptalam/dinoseb	3.36 + 14.0 1	PRE	64.5	2.0	66.5	12.5	2.5	81.5	18.5
Alachlor + naptalam/dinoseb	4.48 + 9.4 1	PRE	62.0	1.5	63.5	12.5	4.0	80.0	20.0
Weed free check	--	--	66.5	1.5	68.0	7.0	7.0	82.0	18.0
LSD (0.05)			NSD	NSD	NSD	NSD	NSD	NSD	NSD
CV (%)			7.9	49.2	7.7	32.2	65.5	1.2	5.2

[1/] Method of application is: PRE = preemergence surface applied. Entire experimental area treated with 2.24 kg/ha vernolate as a preplant incorporated treatment.

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VITA

Jerry L. Wilhm, III

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Master of Science

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