# Herbicide Efficacy in Peanuts Grown Under Reduced Tillage Systems

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## ABSTRACT

**The use of reduced tillage systems in peanuts (*Arachis hypogaea* L.) from 1987 to 1989 resulted in weed problems, which in many instances required the use of a postemergence herbicide. When herbicides were applied prior to tillage, Pursuit (imazethapyr) tank-mixed with Roundup (glyphosate) or Gramoxone (paraquat) provided excellent control of southern crabgrass (*Digitaria ciliaris* Koel.) and Palmer amaranth (*Amaranthus palmeri* S. Wats.), while Texas panicum (*Panicum texanum* Buckl.) control was erratic. Under irrigated and rainfed conditions, a postemergence treatment of Poast, (sethoxydim) and Blazer (acifluorfen) provided the most consistent control of annual grasses and broadleaf weeds at six locations in South Texas. Prowl (pendimethalin) + Dual (metolachlor) provided the most consistent control (>85%) of annual grasses and yellow nutsedge (*Cyperus esculentus* L.) when applied immediately before irrigation. When Prowl + Dual was applied 7 days prior to irrigation, annual grass control was reduced by 14 to 16%.**

KEYWORDS: strip-tillage, irrigation, rainfed

Peanuts have traditionally been grown in a well-prepared seedbed. Relatively little research has been conducted in peanuts using minimum-tillage production practices compared with other agronomic crops. Part of this lack of interest was due to a perceived need to moldboard-plow to bury crop residues to reduce the possibility of disease problems (Buchanan et al., 1982; Grichar and Boswell, 1986).

The use of minimum- and strip-tillage production practices in corn, grain sorghum, and soybeans has greatly reduced production costs (Adams et al., 1973; Fink and Wesley, 1974; Melville and Rabb, 1976; and Nelson, et al., 1977). These tillage production practices in peanut could result in considerable savings in

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energy, machinery, and labor requirements. Unger et al. (1977) reported that a crop residue on the soil surface could nearly eliminate erosion problems. Musick et al. (1975) reported that a heavy mulch comprised of irrigated wheat could increase soil water storage by 2.5 inches in an 11-month fallow period. The extra soil water could increase subsequent grain sorghum yield by approximately 1000 lb $acre^{-1}$.

Peanut yields under minimum- and no-tillage management have varied. Wright and Porter (1985) reported that no-tillage peanuts matured later than conventional-tilled peanuts and produced lower pod yields and grade than peanuts produced with conventional-tillage. Colvin et al. (1985) found that peanut yields were higher in several minimum-tillage systems compared with those produced by conventional-tillage methods. He found that peanut grade was not influenced by a minimum-tillage system. Hartzog and Adams (1985) reported that the elimination of deep tillage affected neither yield nor grade.

Varnell et al. (1976) stated that no-till peanuts reduced pod yield and quality. In comparison with conventional cultural practices, no-tillage reduced foliage, pod, and kernel yields by 58, 64, and 62%, respectively. In Texas, researchers (Boswell and Grichar, 1981a; Boswell and Grichar, 1981b; Grichar and Boswell, 1987; and Grichar and Smith, 1989) have reported yield reductions of 400 to 1500 lb $acre^{-1}$ with the no-tillage system as compared with full-tillage, while minimum-tillage has been intermediate in yield.

The strip-tillage peanut production system is a conservation tillage system which offers potential for use by Texas peanut producers. This system offers an opportunity for peanut production on highly erodible soils by reducing wind and water erosion. It also offers the opportunity to cut the number of tillage trips across a field, thus reducing energy and labor inputs to the crop.

Acceptance of conservation tillage in most areas of the US has been hampered by less-than-adequate weed control (Hoefer et al., 1981; Kapusta, 1979; Richey et al., 1977). The introduction of new pre- and postemergence herbicides is beginning to ease weed control problems in soybeans (Elmore, 1987). However, problems with weed control still exist in reduced-tillage peanuts and need to be resolved.

The objectives of this research were to evaluate broadleaf signalgrass, southern crabgrass, Texas panicum, Palmer amaranth, wooly croton (*Croton capitatus* Michx.), and yellow nutsedge control and peanut yields in reduced tillage systems under irrigated and rainfed conditions. Additional studies were set up to evaluate various preemergence herbicides in combination with Roundup or Gramoxone to determine i) herbicide compatibility, ii) the possibility of obtaining burndown of existing vegetation and, iii) residual herbicide activity with preemergence herbicides. The effectiveness of using irrigation to incorporate dinitroaniline herbicides was also investigated.

## MATERIALS AND METHODS

These studies were conducted throughout South and Central Texas, in areas where peanuts are normally grown. Oats (*Avena sativa* L.), ryegrass (*Lolium multiflorium* L.), or wheat (*Triticum aestivum* L.) was planted in the fall and allowed to grow to harvest time in the late spring, or shredded to a height of 10 to 12 inches prior to planting of peanuts.

Seedbeds were prepared with a Bush-hog Ro-till (Bush-Hog, Inc., Selma, AL) unit

which tilled a 14 to 18 inch wide strip on 36 inch centers. The Ro-Till unit consisted of a subsoil shank which penetrated the soil to a depth of approximately 14 inches. Twin sets of fluted coulters were mounted on either side of these shanks. The subsoiler shank was used to open the soil and destroy any plowpan beneath the row. The fluted coulters were used to smooth the soil and break any large clods. Rolling crumblers mounted immediately behind the fluted coulters further smoothed and shaped the seedbed. The previous crop residue was left intact on the soil surface. Prowl at 1.5 pt $acre^{-1}$ or Treflan (trifluralin) at 1.0 pt $acre^{-1}$ was incorporated into the strip-tilled area during the tillage operation. Peanuts (var. Florunner) were planted at all locations in the prepared strip immediately after tillage at the rate of 90 to 95 lb $acre^{-1}$.

Existing vegetation in all tests, except for the herbicide combination studies, was killed with Roundup at 3 qt or Gramoxone at 1 to 2 qt $acre^{-1}$. These were applied either prior to, or immediately after the ro-till operation. Peanuts were then planted into the tillage strip with conventional planters.

Experimental design was a randomized complete block design with a plot length of 25 to 30 feet by two rows wide. Each test was replicated four or five times. All herbicide trials, except for the herbicide combination study, included an untreated check. All field plots had naturally moderate to high weed populations (3 to 8 plants $ft^{-2}$). Herbicide treatments were applied broadcast with a compressed-air, bicycle sprayer using Teejet (Spraying Systems Co., Wheaton, IL) 11002 flat fan nozzles which delivered a spray volume of 20 gal $acre^{-1}$.

Visual ratings of weed control were recorded at various intervals throughout the growing season. Ratings were based on a scale of 0 (no control) to 100 (complete weed control), relative to the untreated check. Peanut yields were determined by digging the pods when plants were 140 to 150 days old, air-drying in the field for 4 to 6 days, and harvesting individual plots with a combine. Weights were recorded after soil and trash were removed from samples. Ratings and peanut yields were subjected to an analyses of variance with Duncan's Multiple Range Test at the 5% level of significance.

All tests were irrigated regularly during the growing season except for the dryland trials located in Lee County. Leafspot and insect sprays were applied as recommended by the Extension Service.

### Tank Mixes of Preemergence Herbicides with Roundup or Gramoxone

This study involved the use of various preemergence herbicides (Table 1) in tank mixes with Roundup or Gramoxone to determine i) herbicide compatibility, ii) the possibility of obtaining burndown of existing vegetation and, iii) residual herbicide activity with the preemergence herbicide (conducted in Lavaca and Frio Counties). The soil type at the Lavaca County location was a Tremona loamy fine sand (thermic Aquic Arenic Paleustalfs) with less than 1% organic matter. Soil on the producer's farm near Pearsall in Frio County was a Duval fine sandy loam (fine-loamy, mixed, hyperthermic Aridic Haplustalfs) with 1% organic matter. Herbicide treatments included Roundup alone at 1.0 lb ai $acre^{-1}$ or in combination with Lasso (alachlor) at 3.0 lb ai $acre^{-1}$, Dual at 2.0 lb ai $acre^{-1}$, Pursuit at 0.094 lb ai $acre^{-1}$, or Alanap (Naptalam) at 2.0 lb ai $acre^{-1}$. Gramoxone at 0.75 lb ai $acre^{-1}$ was applied alone or with the above mentioned herbicides.

Table 1. Herbicides evaluated in strip-tillage experiments.

| Trade Name | Common Name | Chemical composition |
|---|---|---|
| Alanap | Naptalam | 2-[(1-naphtalenylamino)carbonyl]benzoic acid |
| Basagran | bentazon | 3-(1-methylethyl)-(1H)-2,1,3-benzothiadiazin-4(3H)-one, 2,2-dioxide |
| Blazer | acifluorfen | 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoic acid |
| Butyrac | 2,4-DB | 4-(2,4-dichlorophenoxy)butanoic acid |
| Cobra | lactofen | (±)-2-ethoxy-1-methyl-2-oxoethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoate |
| Dual | metolachlor | 2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide |
| Gramoxone | paraquat | 1,1'-dimethyl-4,4'-bipyridinium ion |
| Lasso | alachlor | 2-chloro-N-(2,6-diethylphenyl-N-(methoxymethyl)acetamide |
| Poast | sethoxydim | 2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one |
| Prowl | pendimethalin | N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine |
| Pursuit | imazethapyr | (±)2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-ethyl-3-pyridinecarboxylic acid |
| Rescue | naptalam+2,4-DB | see above |
| Roundup | glyphosate | N-(phosphonomethyl)glycine |
| Tough | pyridate | 0-(6-chloro-3-phenyl-4-pyridazinyl S-octyl carbonothioate |
| Treflan | trifluralin | 2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)benzenamine |

### Weed Control Under Irrigation

This study evaluated peanut weed control with various herbicides alone and in combination under irrigated conditions (conducted in Atascosa, Frio, and Lavaca counties). Soil in Atascosa County near Pleasanton was a Webb fine sandy loam (fine, mixed, hyperthermic Aridic Paleustalfs) with less than 1% organic matter. The soil type at the Lavaca County location was a Tremona loamy fine sand (thermic Aquic Arenic Paleustalfs) with less than 1% organic matter. Soil at the Frio County location was a Duval fine sandy loam (fine-loamy, mixed, hyperthermic Aridic Haplustalfs) with 1% organic matter. Herbicide treatments included Alanap at 2.0 lb ai $acre^{-1}$ + Dual at 2.0 lb ai $acre^{-1}$, Alanap at 2.0 lb ai $acre^{-1}$ + Lasso at 3.0 lb ai $acre^{-1}$, Dual at 1.5 and 3.0 lb ai $acre^{-1}$, Lasso at 3.0 lb ai $acre^{-1}$, Prowl alone at 0.75 lb ai $acre^{-1}$ or in combination with Lasso at 3.0 lb ai $acre^{-1}$ or Dual at 1.5 lb ai $acre^{-1}$, Poast at 0.3 lb ai $acre^{-1}$ plus Blazer at 0.5 lb ai $acre^{-1}$, Dual at 1.5 lb ai $acre^{-1}$ plus Cobra (lactofen) at 0.2 lb ai $acre^{-1}$, and Gramoxone at 0.125 lb ai $acre^{-1}$ plus Basagran (bentazon) at 0.5 lb ai $acre^{-1}$.

### Weed Control Under Dryland Conditions

This study evaluated peanut weed control with various herbicides alone and in combination under dryland conditions (conducted in Lee County). The soil in Lee County near Dime Box was a Demona loamy sand (clayey, mixed, thermic Aquic Arenic Paleustalfs) with 1% organic matter. This study included the same herbicide treatments as the weed control under irrigation study with the addition of Prowl at 0.75 lb ai $acre^{-1}$ plus Poast at 0.3 lb ai $acre^{-1}$.

### Weed Control with Incorporation by Irrigation

This study evaluated peanut weed control with Prowl, Treflan, or Prowl + Dual when incorporated with irrigation. Herbicide treatments included Prowl alone at 0.75 lb ai $acre^{-1}$ and 1.0 lb ai $acre^{-1}$, Prowl at 0.75 lb ai $acre^{-1}$ plus Dual at 2.0 lb ai $acre^{-1}$, and Treflan at 0.75 and 1.0 lb ai $acre^{-1}$.

## RESULTS AND DISCUSSION

In general, weed control was difficult to obtain with soil applied herbicides in many of the strip-tillage plots, and required use of a postemergence herbicide in order to obtain satisfactory control.

### Tank Mixes of Preemergence Herbicides with Roundup or Gramoxone

Roundup and Gramoxone alone provided good initial kill of the small grain cover crop (data not shown). However, the addition of Alanap to Gramoxone resulted in slower activity on existing vegetation. Activity time was doubled when Alanap was added to Gramoxone over that of Gramoxone alone for burndown effects to be seen on small grains (data not shown).

When Roundup or Gramoxone was mixed with a preemergence herbicide, subsequent growth of annual grasses was adequately controlled (>80%) with only

a few herbicide treatments as shown by later season ratings (Table 2 and 3). At the Lavaca County location, Roundup or Gramoxone plus Pursuit provided the best overall control of southern crabgrass in 1987 and 1988 (Table 2). Pursuit is the first herbicide to provide residual control of purple (*Cyperus rotundus*) and yellow nutsedge and numerous broadleaf weed species (Grichar et al., 1992; Wilcut et al., 1994). However, many peanut producers are unaccustomed to rotational crop restrictions after Pursuit application (Anonymous, 1992; Wilcut et al., 1991a).

All herbicide combinations provided fair late-season control (66-78%) of broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash] without any significant differences between herbicide combinations in 1987 (Table 2). In 1988, all herbicide treatments provided less than 70% late season control of broadleaf signalgrass. Work in the Virginia-North Carolina area showed that broadleaf signalgrass control was unacceptable with preplant incorporated (PPI) applications of Balan (benefin), Lasso, or Dual (Chamblee et al., 1982). Full season broadleaf signalgrass control required a PPI application of Balan followed by Dual applied at ground-cracking (Chamblee et al., 1982).

At the Frio County location, in 1987, under light weed pressure, Roundup and Gramoxone alone provided better than 80% control of Texas panicum and Palmer amaranth (Table 3). Addition of Pursuit to Roundup significantly improved Texas panicum control 14% over that of Roundup alone. In 1988, with heavy Texas panicum pressure, Gramoxone plus Lasso provided excellent late-season annual grass control (>90%). In 1988, when Roundup was added to Lasso, Texas panicum control was reduced (21%) from the Gramoxone plus Lasso treatment. Pigweed (*Palmer amaranth*) control in 1987 was greater than 85% with all herbicides (Table 3). In 1988, Roundup plus Pursuit provided up to 27% better pigweed control than other herbicide combinations. Pursuit has been found to be a cost-effective soil-applied herbicide that may reduce reliance on postemergence herbicides for annual broadleaf weed control (Wilcut et al., 1991b).

Peanut yields in 1987 were greater than 3500 lb acre$^{-1}$ with all herbicide treatments. The Roundup + Dual treatment outyielded the Roundup alone treatment by 20% (Table 3). Yields reflect excellent weed control throughout the growing season and lack of problems at digging. Although weeds seriously reduce the yield of peanuts through competition, major losses also occur by weeds interfering with efficient harvesting (Buchanan et al., 1982). A heavy stand of weeds, especially grasses, made this operation almost impossible. The tight fibrous root system of the weeds become entwined with the peanut plant, and when this occurred many peanuts are stripped from the vine during digging operations. Peanuts that become detached from the plant remained unharvested in or on the soil. This harvesting loss was estimated to range from \$6 acre$^{-1}$ in Alabama to \$15 acre$^{-1}$ in Oklahoma and South Carolina (Wilcut et al., 1994).

## Weed Control Under Irrigation

Various herbicides alone and in combination were evaluated for weed control in Frio, Atascosa, and Lavaca counties in 1988 and 1989 (Table 4). At all locations, the most consistent control was obtained with a postemergence application of Poast plus Blazer. Control was greater than 90% for Texas panicum, broadleaf signalgrass, Wooly croton and pigweed species when Poast and Blazer were applied

Table 2. Percent annual grass weed control[†] with a strip-tillage system in Lavaca County using various herbicide combinations applied prior to planting of peanuts.

| Treatment | Rate | 1987 (11 WAT)[‡] | | 1988 (15 WAT) | |
|---|---|---|---|---|---|
| | | Southern crabgrass | Broadleaf signalgrass | Southern crabgrass | Broadleaf signalgrass |
| | lb ai acre$^{-1}$ | | | | |
| Roundup | 1.0 | 0 d[§] | 0 b | 0 e | 0 c |
| Gramoxone[¶] | 0.75 | 0 d | 0 b | 0 e | 0 c |
| Roundup + Lasso 4E | 1.0 3.0 | 58 c | 72 a | 63 bc | 52 ab |
| Roundup + Dual 8E | 1.0 2.0 | 60 bc | 70 a | 67 bc | 45 ab |
| Roundup + Pursuit 2AS | 1.0 0.094 | 81 a | 66 a | 95 a | 65 a |
| Roundup + Alanap L | 1.0 2.0 | 63 bc | 78 a | 53 cd | 47 ab |
| Gramoxone + Lasso 4E | 0.75 3.0 | 54 c | 70 a | 55 cd | 42 ab |
| Gramoxone + Dual 8E | 0.75 2.0 | 60 bc | 72 a | 75 abc | 37 b |
| Gramoxone + Pursuit 2AS | 0.75 0.094 | 72 ab | 74 a | 89 b | 66 a |
| Gramoxone + Alanap L | 0.75 2.0 | 61 bc | 74 a | 32 d | 31 b |

†Control index: 0=no control; 100=complete control.
‡WAT=weeks after preemergence treatment.
§Means followed by the same letter are not significantly different at the 5% level of significance (Duncan's Multiple Range Test).
¶All Gramoxone treatments included a non-ionic surfactant (X-77) added at the rate of 4 oz acre$^{-1}$.

Table 3. Percent weed control† and 1987 peanut yield with a strip-tillage system in Frio County using various herbicide combinations applied prior to planting of peanuts.

| Treatment | Rate | 1987 (15 WAT)‡ Texas panicum | 1987 (15 WAT)‡ Palmer amaranth | 1988 (11 WAT) Texas panicum | 1988 (11 WAT) Palmer amaranth | yield |
|---|---|---|---|---|---|---|
| | lb ai acre$^{-1}$ | | | | | lb acre$^{-1}$ |
| Roundup | 1.0 | 83 b§ | 87 a | 0 e | 0 d | 3728 bc |
| Gramoxone¶ | 0.75 | 90 ab | 96 a | 0 e | 0 d | 3978 abc |
| Roundup + Lasso 4E | 1.0 3.0 | 95 ab | 92 a | 70 b | 67 abc | 3882 abc |
| Roundup + Dual 8E | 1.0 2.0 | 91 ab | 100 a | 65 bc | 62 bc | 4463 a |
| Roundup + Pursuit 2AS | 1.0 0.094 | 97 a | 97 a | 65 bc | 87 a | 4273 ab |
| Roundup + Alanap L | 1.0 2.0 | 95 ab | 96 a | 50 cd | 70 abc | 4377 ab |
| Gramoxone + Lasso 4E | 0.75 3.0 | 95 ab | 100 a | 91 a | 76 abc | 3936 abc |
| Gramoxone + Dual 8E | 0.75 2.0 | 93 ab | 97 a | 45 d | 70 abc | 3541 c |
| Gramoxone + Pursuit 2AS | 0.75 0.094 | 88 ab | 98 a | 62 bc | 85 ab | 3945 abc |
| Gramoxone + Alanap L | 0.75 2.0 | 90 ab | 95 a | 57 bcd | 60 c | 4247 ab |

†Control index: 0=no control; 100=complete control.
‡WAT=Weeks after preemergence treatment.
§Means followed by the same letter are not significantly different at the 5% level of significance Duncan's Multiple Range Test).
¶All Gramoxone treatments included a non-ionic surfactant (X-77) added at the rate of 4 oz acre$^{-1}$.

Table 4. Percent weed control† under a strip-tillage system with irrigation.

| Treatment | Rate | Appl. Time | 1988 Frio Co. (16 WAT)‡ Texas panicum | 1988 Frio Co. (16 WAT)‡ Wooly croton | 1988 Atascosa Co. (11 WAT) Texas panicum | 1989 Frio Co. (13 WAT) Texas panicum | 1989 Frio Co. (13 WAT) Pigweed Spp. | 1989 Lavaca Co. (13 WAT) Broadleaf Signalgrass |
|---|---|---|---|---|---|---|---|---|
| | lb ai acre$^{-1}$ | | | | | | | |
| Check | - | - | 0 d§ | 0 e | 0 f | 0 c | 0 b | 0 f |
| Alanap L+Dual 8E | 2.0+2.0 | Pre | 76 bc | 86 abc | 30 cde | 99 a | 97 a | 70 bc |
| Alanap L+Lasso 4E | 2.0+3.0 | Pre | 76 bc | 77 bcd | 32 cde | 99 a | 98 a | 30 ef |
| Dual 8E | 1.5 | Pre | 70 c | 8 abcd | 15 ef | 95 ab | 100 a | 36 e |
| Dual 8E | 3.0 | Pre | 76 bc | 6 bcd | 37 bcde | 98 a | 99 a | 66 bcd |
| Lasso 4E | 3.0 | Pre | 70 c | 72 cd | 43 bcd | 98 a | 100 a | 42 de |
| Prowl 4E | 0.75 | Pre | 73 bc | 65 d | 52 bc | 98 a | 96 a | 10 fg |
| Prowl 4E+Lasso 4E | 0.75+3.0 | Pre | 80 bc | 85 abc | 58 b | 99 a | 100 a | 45 cde |
| Prowl 4E+Dual 8E | 0.75+1.5 | Pre | 88 ab | 78 abcd | 42 bcd | 98 a | 100 a | 38 e |
| Poast 1.5E/ Blazer 2L¶ | 0.3/ 0.5 | Post | 93 a | 97 a | 97 a | 98 a | 100 a | 97 a |
| Dual 8E+Cobra 2EC | 1.5+0.2 | Pre | 83 abc | 93 ab | 27 de | 92 b | 97 a | 51 bcde |
| Gramoxone+ Basagran 4E# | 0.125+ 0.5 | Post | 72 bc | 75 bcd | 41 bcd | 99 a | 100 a | 74 b |

†Control index: 0=no control; 100=complete control.
‡WAT=weeks after preemergence treatment.
§Means followed by the same letter are not significantly different at the 5% level of significance (Duncan's Multiple Range Test).
¶Crop oil (Agridex) added at the rate of 1 qt acre$^{-1}$.
#Non-ionic surfactant (X-77) added at the rate of 4 oz acre$^{-1}$.

early in the growing season (weeds were less than 4 inches tall). Poast controls annual and perennial grasses but lacks residual control (Grichar and Boswell, 1986; Grichar and Boswell, 1989; Wilcut et al., 1994). Poast is most active if the grass weeds are not moisture stressed when treated (Wilcut et al., 1994). Blazer is widely used in the Virginia-North Carolina and the southwestern peanut regions of the US (Wilcut et al., 1994). Blazer controls many broadleaf weeds found in peanuts (Buchanan et al., 1982; Wilcut et al., 1994). Common lambsquarters (*Chenopodium album*), common ragweed (*Ambrosia artemisiifolia*), eclipta (*Eclipta prostrata*), pigweed species (*Amaranthus* spp.), and tropic croton (*Croton glandulosus*) are controlled with Blazer (Buchanan et al., 1982; Wilcut, 1991; Wilcut et al., 1994). Timeliness of application is critical for maximum efficacy, yields, and net returns (Buchanan et al., 1982; Wilcut and Swann, 1990).

### Weed Control Under Dryland Conditions

Texas panicum control in 1988 was greater than 70% with all herbicide combinations (Table 5). Moisture conditions were excellent at planting and early in the growing season, but very little rain fell later in the season (less than 14 inches of rainfall from planting until peanut harvest).

In 1989, Prowl applied PPI followed by Poast applied postemergence (POST) and the POST treatment of Poast and Blazer provided excellent control of broadleafs and annual grasses (>85%). Prowl controlled Texas panicum 47%, while Prowl followed by Poast resulted in a 46% increase in grass control. Prowl alone did not effectively control wooly croton (*Croton capitatus*) or silverleaf nightshade (*Solanum elaeagnifolium*).

Peanut yields reflect the importance of reducing weed populations when moisture conditions are less than ideal. In both years, the POST treatment of Poast and Blazer produced the significantly highest yields (Table 5). Peanut yields with Poast and Blazer were increased by 38% and 163% in 1988 and 1989, respectively, over the untreated check. Poor overall yields in 1989 were the result of virtually no rainfall after peanuts were planted (less than 8 inches of rain during the growing season).

### Weed Control with Incorporation by Irrigation

The need to incorporate dinitroaniline herbicides used in peanuts was the objective for this study conducted in 1989. The Prowl label states that it must be incorporated within 7 days of application (Anonymous, 1992). However, since hot and windy weather conditions are usually prevalent in South Texas during peanut planting, it was felt that this interval would not be acceptable to provide adequate weed control (authors personal observations). Herbicides were applied up to 7 days prior to irrigation to determine residual activity of Prowl, Treflan, or Prowl in combination with Dual.

Southern crabgrass control was better with Prowl and Treflan when applied immediately ahead of irrigation (0 day). As the time interval between herbicide application and irrigation increased, southern crabgrass control decreased (Table 6). With broadleaf signalgrass, the control was less than 60% with Prowl or Treflan. The interval between herbicide application and irrigation had no effect on signalgrass control. When Prowl and Dual were tank-mixed, control of broadleaf signalgrass

Table 5. Percent weed control[†] and peanut yield with a strip-tillage system in Lee County under dryland conditions.

| Treatment | Rate | Appl Time | 1988 (17 WAT)[‡] Texas panicum | 1989 (12 WAT) Texas panicum | 1989 (12 WAT) Broadleafs[§] | Yield 1988 | Yield 1989 |
|---|---|---|---|---|---|---|---|
| | lb ai acre$^{-1}$ | | | | | lb acre$^{-1}$ | |
| Check | - | - | 0 d[¶] | 0 e | 0 c | 761 ab | 176 ab |
| Alanap L+Dual 8E | 2.0+2.0 | Pre | 85 abc | 45 bcd | 91 a | 747 ab | 268 ab |
| Alanap L+Lasso 4E | 2.0+3.0 | Pre | 95 ab | 57 b | 86 a | 626 b | 205 ab |
| Dual 8E | 1.5 | Pre | 81 abc | 48 bcd | 90 a | 910 ab | 183 ab |
| Dual 8E | 3.0 | Pre | 86 abc | 40 bcd | 90 a | 816 ab | 108 b |
| Lasso 4E | 3.0 | Pre | 76 bc | 42 bcd | 93 a | 736 ab | 150 b |
| Prowl 4E | 0.75 | Pre | 92 abc | 47 bcd | 66 b | 684 ab | 183 ab |
| Prowl 4E+Lasso 4E | 0.75+3.0 | Pre | 90 abc | 50 bcd | 85 a | 689 ab | 225 ab |
| Prowl 4E+Dual 8E | 0.75+1.5 | Pre | 73 c | 52 bc | 92 a | 776 ab | 271 ab |
| Poast/Blazer[#] | 0.3/0.5 | Post | 98 a | 88 a | 98 a | 1043 a | 463 a |
| Gramoxone + Basagran[††] | 0.125+0.5 | Post | 94 ab | 20 de | 96 a | 706 ab | 102 b |
| Dual 8E+Cobra 2EC | 3.0+0.2 | Pre | 77 bc | 25 cde | 95 a | 584 b | 160 b |
| Prowl 4E/Poast | 0.75/0.3 | Pre/Post | - | 93 a | 87 a | - | 331 ab |

[†]Control index: 0=no control; 100=complete control.
[‡]WAT=weeks after preemergence treatment.
[§]Broadleafs=Mixed stand of wooly croton and silverleaf nightshade.
[¶]Means followed by the same letter are not significantly different at the 5% level of significance (Duncan's Multiple Range Test).
[#]Crop oil (Agridex) added at the rate of 1 qt acre$^{-1}$.
[††]Non-ionic surfactant (X-77) added at the rate of 4 oz acre$^{-1}$.

Table 6. Weed control† with Herbicide incorporation of Prowl, Treflan, and Dual with irrigation in Lavaca County in 1989.

| Treatment | Rate | Appl time§ | % Control (6 WAT)‡ Broadleaf signalgrass | Southern crabgrass | Yellow nutsedge | Peanut yield |
|---|---|---|---|---|---|---|
| | lb ai acre$^{-1}$ | | | | | lb acre$^{-1}$ |
| Check | - | - | 0 e¶ | 0 e | 0 c | 912 cd |
| Prowl 4E | 0.75 | 0 day | 25 de | 67 abc | 0 c | 1075 bcd |
| Prowl 4E | 1.00 | 0 day | 45 bcd | 67 abc | 0 c | 1147 bcd |
| Prowl 4E | 0.75 | 2 day | 32 cde | 53 bcd | 0 c | 944 bcd |
| Prowl 4E | 1.00 | 2 day | 37 cde | 61 bcd | 0 c | 1145 bcd |
| Prowl 4E | 0.75 | 4 day | 32 cde | 58 bcd | 0 c | 1090 bcd |
| Prowl 4E | 1.00 | 4 day | 45 bcd | 47 bcd | 0 c | 1068 bcd |
| Prowl 4E | 0.75 | 7 day | 35 cde | 37 cd | 0 c | 996 bcd |
| Prowl 4E | 1.00 | 7 day | 41 bcd | 32 d | 0 c | 852 d |
| Treflan 4E | 0.75 | 0 day | 35 cde | 52 bcd | 0 c | 1260 abcd |
| Treflan 4E | 1.00 | 0 day | 57 abcd | 81 ab | 0 c | 1505 abcd |
| Treflan 4E | 0.75 | 2 day | 32 cde | 57 bcd | 0 c | 1095 bcd |
| Treflan 4E | 1.00 | 2 day | 30 de | 60 bcd | 0 c | 1052 bcd |
| Treflan 4E | 0.75 | 4 day | 37 cde | 37 cd | 0 c | 1088 bcd |
| Treflan 4E | 1.00 | 4 day | 30 de | 52 bcd | 0 c | 1218 abcd |
| Treflan 4E | 0.75 | 7 day | 30 de | 40 cd | 0 c | 846 d |
| Treflan 4E | 1.00 | 7 day | 50 abcd | 57 bcd | 0 c | 1001 bcd |
| Prowl 4E+ Dual 8E | 0.75 + 2.0 | 0 day | 85 a | 95 a | 88 a | 1708 ab |
| Prowl 4E+ Dual 8E | 0.75 + 2.0 | 2 day | 86 a | 95 a | 80 ab | 1917 a |
| Prowl 4E+ Dual 8E | 0.75 + 2.0 | 4 day | 77 ab | 79 ab | 71 b | 1658 abc |
| Prowl 4E+ Dual 8E | 0.75 + 2.0 | 7 day | 71 abc | 79 ab | 77 ab | 1622 abcd |

†Control index: 0=no control; 100=complete control.
‡WAT=weeks after preemergence treatment.
§Application time denotes interval between herbicide application and irrigation.
¶Means followed by the same letter are not significantly different at the 5% level of significance (Duncan's Multiple Range Test).

and southern crabgrass improved considerably. Also, this combination provided greater than 70% yellow nutsedge control. Yields reflected the competitive nature of the annual grasses. The Prowl plus Dual treatments provided a 78 to 110% yield increase over the untreated check.

These studies indicated that excellent weed control is possible in a reduced tillage system. However, a greater herbicide input is required. This included the use of

postemergence herbicides to provide season long weed control. Presently cleared preemergence herbicides, which were effective in reduced tillage systems, did not provide full season control when used alone.

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