Comparison Between Diclosulam- and Imazapic-Based Weed Control Systems in Peanut[1]

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ABSTRACT

Field studies were conducted in Florida and Alabama in 1998 and 1999 to evaluate imazapic [70 g ai/ha preemergence (PRE) or early postemergence (EPOST)], diclosulam (18 or 26 g ai/ha PRE or 18 g/ha EPOST) or imazapic + diclosulam (35 + 13 g/ha PRE or 35 + 9 g/ha EPOST). These treatments were applied alone or supplemented with either a paraquat + bentazon tank mixture or 2,4-DB. The intent was to determine if diclosulam, which has a mode of action similar to imazapic and is less persistent and less costly, could be incorporated into systems with other herbicides and thereby offer an alternative to imazapic. Maximum yield and economic return were consistently associated with only two treatments, imazapic at 70 g/ha EPOST and imazapic + diclosulam at 35 + 9 g/ha EPOST. However, none of the diclosulam-based systems provided a more favorable economic return than imazapic applied alone due to poor sicklepod control with diclosulam. Sicklepod control with diclosulam was improved with the addition of either paraquat + bentazon or 2,4-DB, but control was less than that obtained with imazapic. Diclosulam-based systems could be identified that were as effective as imazapic alone in controlling Florida beggarweed (diclosulam 26 g/ha EPOST or imazapic + diclosulam PRE or EPOST), bristly starbur (diclosulam 18 g/ha PRE or imazapic + diclosulam PRE or EPOST) and yellow nutsedge (imazapic + diclosulam EPOST). Thus, diclosulam-based systems may offer an economic advantage over imazapic in areas void of sicklepod. Neither diclosulam nor imazapic adversely affected any of five runner-type peanut cultivars (Georgia Green, Southern Runner, ViruGuard, Florida MDR 98, or Florida C-99R) when applied at twice labeled rates.

Key Words: Bristly starbur, Florida beggarweed, sicklepod, weed control economics, yellow nutsedge.

Imazapic{(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid} has become established as an excellent weed control option for peanut (*Arachis hypogaea* L.) production. Imazapic is applied early postemergence (EPOST) even though it has soil as well as foliar activity (Richburg *et al.*, 1994). It provides control of many problem weeds in peanut including sicklepod [*Senna obtusifolia* (L.) Irwin and Barneby], purple nutsedge (*Cyperus rotundus* L.), yellow nutsedge (*Cyperus esculentus* L.), pitted morningglory (*Ipomoea lacunosa* L.), smallflower morningglory [*Jacquemontia tamnifolia* (L.) Griseb], and Florida beggarweed [*Desmodium tortuosum* (Sw.) DC] (Richburg *et al.*, 1995, 1996; Grichar, 1997; Grichar and Nester, 1997). However, Florida beggarweed control can be variable (Richburg *et al.*, 1995).

Wehtje *et al.* (2000) reported that imazapic applied EPOST alone at 71 g/ha was consistently associated with comprehensive weed control, maximum yield, and economic returns. Frequently, systems that included variations of this treatment, such as reduced imazapic rates applied either alone or in paraquat (1,1'-dimethyl-4,4'-bipyridinium ion)-containing tank mixtures and supplemented with other postemergence-applied (POST) herbicides, had equivalent control of Florida beggarweed, sicklepod, and bristly starbur, and no effect on peanut yield. However, these variations offered no improvement with respect to economic return.

The recently-registered herbicide diclosulam (*N*-(2,6-dichlorophenyl)-5-ethoxy-7-fluoro[1,2,4]triazolo[1,5-c]pyrimidine-2-sulfonamide) may offer an alternative to imazapic. Diclosulam is a triazolopyrimidine sulfonanilide. Even though imazapic and diclosulam are of different chemical families, they share a common mode of action. Both inhibit aceto-hydroxyl acid synthase (AHAS), the enzyme that catalyzes the first committed step in the synthesis of the branched chain amino acids (Hatzios, 1991).

Preliminary studies have revealed that diclosulam can control effectively many weed species that are problematic in peanut. Wilcut *et al.* (1997) reported that diclosulam applied preemergence (PRE) or preplant incorporate (PPI) at 26 g/ha controlled Florida beggarweed, ecilpta (*Eclipta prostrata* L.), common ragweed (*Ambrosia artemisiifolia* L.), prickly sida (*Sida spinosa* L.), velvetleaf (*Abutilon theophrasti* Medikus), and Pennsylvania smartweed (*Polygonum pensylvanicum* L.) at least 95%, morningglories (*Ipomoea* spp.) at least 85%, and nutsedges (*Cyperus* spp.) approximately 80%. Peanut injury was less than 5% and dissipated completely within 2 wk of treatment. Sicklepod, a serious problem in southeastern peanut, was not controlled with any of the diclosulam treatments.

In Texas, Dotray *et al.* (1999) reported that diclosulam applied either PPI or PRE at 26 g/ha controlled Palmer amaranth (*Amaranthus palmeri* S. Wats.) and devil's claw (*Proboscidea louisianica* (Mill.) Thellung] at least

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83%. Grichar *et al.* (1998) applied diclosulam at rates ranging from 9 to 52 g/ha at three application timings and found that diclosulam at 9 g/ha controlled purple nutsedge ≥ 90% when applied either PPI or POST and ≥ 80% when applied PRE. Yellow nutsedge was controlled ≥ 80% with 18 g/ha applied either PPI or PRE. POST applications were less effective. Peanut injury, expressed as stunting, was evident only at the 52 g/ha rate (Grichar *et al.*, 1998).

No reports of significant long-term peanut damage resulting from application of either imazapic or diclosulam were found in the literature. Richburg *et al.* (1995), Wilcut *et al.* (1996), and Dotray *et al.* (2001) evaluated imazapic tolerance in a total of 10 peanut cultivars (three virginia market types, one spanish market type, and six runner market types). They reported some initial peanut injury from imazapic at 71 g/ha but no effect on yield. Bailey *et al.* (2000) evaluated the tolerance of eight virginia market-type cultivars to diclosulam at 36 g/ha and observed ≤ 3% visual injury and no effect on peanut yield. Previous research with other herbicides has in some instances indicated differential cultivar response (Johnson *et al.*, 1992), while tolerance to other herbicides was independent of cultivar (Grichar and Colburn, 1993; Johnson *et al.*, 1993).

Diclosulam may have potential as either an alternative or as a supplement to imazapic since both herbicides have the same mode of action. In addition, diclosulam is less restrictive with respect to cotton rotational limitations. For example, the imazapic label restricts planting of cotton for 18 mo after application. In contrast, the rotation interval for cotton following diclosulam is only 10 mo (Anon., 2000, 2001). These restrictions eliminate the possibility of rotating cotton the year following imazapic application to peanut, while cotton could be planted the year following diclosulam application.

The first objective of this study was to evaluate imazapic and diclosulam alone and in various combinations that are deemed to capitalize on the merits, or compensate for the weakness, of each of these two herbicides. The second objective was to determine whether selected peanut cultivars differ in their tolerance to imazapic and diclosulam.

Materials and Methods

General Information. Field experiments were conducted in 1998 and 1999 at the Wiregrass Substation of Auburn Univ., located at Headland, AL and at the Univ. of Florida, West Florida Res. and Educ. Ctr. located at Jay, FL. Soil at Headland was a Dothan loamy sand (fine-loamy, siliceous, thermic plinthic paleudults) with 1.3% organic matter and a pH of 6.5. Soil at Jay was a Red Bay sandy loam (fine-loamy, siliceous, thermic rhodic kandiudults) with 2.1% organic matter and pH of 5.8. Separate areas were used each year of the experiment. Both locations were infested heavily with sicklepod (5/m^2) and Florida beggarweed (2 to 5/m^2). In addition, Headland was infested with bristly starbur (*Acanthospermum hispidum* DC.) (5/m^2), and Jay with yellow nutsedge (20/m^2) such that control ratings of these species also could be taken.

Experimental areas were moldboard plowed in the spring, and a seed bed was prepared by disking. Annual grasses and small-seeded broadleaf weeds were controlled with a broadcast, PPI application of ethalfluralin [*N*-ethyl-*N*-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl) benzenamine] at 0.6 kg ai/ha. Peanut cv. Florunner was planted at 123 kg/ha during either the 4th wk of April or the 1st wk of May. Rows were spaced 91 cm apart and individual plots were four rows wide and 6.1 m long. All other pest management decisions and other cultural practices were in accordance with recommendations of the Alabama and Florida Coop. Ext. Serv. for the Headland, AL and Jay, FL locations, respectively. All herbicide treatments were applied with a tractor-mounted, compressed air sprayer, equipped with flat fan nozzles and discharging 140 L/ha. A nonionic surfactant was included at 0.25% v/v [X-77 (a mixture of alkylary-polyoxyethylene glycols, free fatty acids and isopropanol)] (Loveland Industries, Greeley, CO) in all postemergence treatments.

Comparison of Herbicide Systems. Eight basic treatments with either imazapic, diclosulam or both herbicides were evaluated and included (a) nontreated control, (b) imazapic applied PRE at 70 g/ha, (c) imazapic EPOST at 70 g/ha, (d) diclosulam PRE at 18 g/ha, (e) diclosulam PRE at 26 g/ha, (f) diclosulam EPOST at 18 g/ha, 7) imazapic + diclosulam PRE at 35 and 13 g/ha, respectively, and (g) imazapic + diclosulam EPOST at 35 and 9 g/ha, respectively (Table 1). These eight 'AHAS-inhibiting herbicide' treatments were applied alone or supplemented with three additional treatments which, including (a) no supplemental herbicide, (b) paraquat + bentazon [3-(1-methylethyl)- (1*H*)-2,1,3-benzothiadiazin-4(3*H*)-one 2,2-dioxide] at 140 + 560 g/ha, respectively, applied at cracking (AC), or (c) 2,4-DB [4-(2,4-dichlorophenoxy)butanoic acid] at 220 g ae/ha applied POST (Table 1). Both supplemental herbicide treatments are effective for sicklepod control (Wilcut *et al.*, 1994).

Individual treatments were arranged as a factorial and consisted of all possible combinations of the eight AHAS-inhibiting herbicide treatments and three supplemental treatments for a total of 24 treatments. Experimental design was a randomized complete block with four replications. Percent peanut injury was visually estimated 4 wk after herbicide application. Visual estimates of percent weed control by species, as compared to the nontreated check, were recorded within 2 wk of harvest. A scale was used where 0 and 100% represented no control and complete control, respectively.

The center two rows of each plot were harvested in September using conventional harvesting equipment. Recorded peanut weights were adjusted to 11% moisture. For the weed control studies, individual plot input and yield data were evaluated at the farm production scale level using the current enterprise budget developed by the Alabama Coop. Ext. Serv. for nonirrigated peanut production (budgets for major row crops in Alabama 1994, Alabama Coop. Ext. Serv., Dep. Econ. Rural Sociol., Auburn Univ., AL) to determine the income above variable costs (IAVC) for each treatment. Machinery and labor inputs for a typical peanut farm were determined for each operation. Herbicide costs were representative and excluded the application cost (Table 1).

Peanut crop income was based upon the assumption that the crop would be marketed at a 3:1 ratio of quota to additional peanuts. Values for quota and additional peanut were $610 and $300/mt, respectively. These values assumed the following average quality grade: 71% sound mature and/or sound split kernels, 2% other kernels, 3% loose shelled kernels, and 22% hulls.

Table 1. Application rate and timing, and herbicide cost of imazapic, diclosulam and supplemental herbicides that were evaluated in peanut production.

Treatments	Application rate	Application timing[a]	Cost
	g/ha		$/ha
AHAS-inhibiting herbicides			
None	----	----	0
Imazapic	70	PRE	66.00
Imazapic	70	EPOST	66.00
Diclosulam	18	PRE	41.50
Diclosulam	26	PRE	60.00
Diclosulam	18	EPOST	41.50
Imazapic + diclosulam	35 + 13	PRE	63.00
Imazapic + diclosulam	35 + 9	EPOST	53.80
Supplemental herbicides			
None	----	----	0
Paraquat + bentazon	130 + 560	AC	25.60
2,4-DB	220	POST	6.40

[a]PRE = preemergence, EPOST = early postemergence, AC = at ground cracking, POST = postemergence.

Data were subjected to analysis of variance, tested for interactions, and were pooled where appropriate. Means were compared by the appropriate LSD values at the 0.05 level.

Cultivar Tolerance to Imazapic and Diclosulam. Trials were conducted in 1998, 1999, and 2000 at Jay. Five runner-type peanut cultivars (Georgia Green, Southern Runner, ViruGuard, Florida MDR 98, and Florida C-99R) were treated with either imazapic at 140 g/ha EPOST or diclosulam at 54 g/ha PRE. These cultivars were selected on the basis of area presently sown to a cultivar or potential for increased utilization due to enhanced disease resistance characteristics. The application rates were twice the maximum rate listed on the respective labels and were selected to insure that any variation in tolerance among cultivars would be detected. A nontreated check was included for comparison. A split-plot design with four replications was utilized with peanut cultivar as main plots and herbicide treatments as split-plots. All plots were kept weed free with cultivation and hand removal. Peanut injury was visually evaluated and yield was determined as described above. Data were subjected to analysis of variance and were pooled across years since there were no treatment by year interactions.

Results and Discussion

Sicklepod Control. There were no treatment by location by year interactions; therefore, data were pooled over years and locations (Table 2). Sicklepod control was influenced by the AHAS-inhibiting herbicides, the supplemental herbicides, and their interaction. Among the AHAS-inhibiting herbicide treatments applied with no supplemental herbicide, imazapic EPOST at 70 g/ha was the most effective (93% control) while imazapic applied PRE provided much less control (72%) (Table 2). The imazapic + diclosulam combination also was more effective when applied EPOST than PRE even though the rate of diclosulam was higher in the PRE than EPOST treatment. Other than imazapic EPOST, supplementing the AHAS-inhibiting herbicide treatments that included imazapic with paraquat + bentazon improved sicklepod control to ≥ 81%. Imazapic applied PRE followed by (fb) 2,4-DB controlled sicklepod 83%.

Diclosulam did not control sicklepod greater than 36% (Table 2). Diclosulam control generally was improved with the addition of either paraquat + bentazon or 2,4-DB. However, control did not exceed 74% even with these supplemental applications. Sicklepod control may have been improved if a sequential application of paraquat + bentazon AC fb 2,4-DB POST or 2,4-DB AC fb 2,4-DB POST had been included in the study because these sequential treatments provide control of sicklepod (Wilcut, 1994).

These results suggest that imazapic applied alone EPOST controls sicklepod while diclosulam requires supplemental treatment to be effective. Other researchers have observed similar levels of sicklepod control with imazapic and diclosulam. Johnson and Vencil (2000) reported that diclosulam did not control sicklepod. Imazapic, however, is generally effective against sicklepod providing > 90% control (Richburg *et al.*, 1995, 1996; Wilcut *et al.*, 1996).

Florida Beggarweed Control. Analysis indicated that data for Jay 1998 and Headland 1999, and for Headland 1998 and Jay 1999 could be pooled. For both data sets, control was influenced by the AHAS-inhibiting herbicides, the supplemental herbicide, and by their interaction. For Jay 1998 and Headland 1999, all AHAS-inhibiting herbicides applied without supplemental herbicides, except imazapic PRE at 70 g/ha and diclosulam at 18 g/ha either PRE or EPOST, provided > 90% Florida beggarweed control (Table 2). Supplemental herbicide application did not improve control obtained with either imazapic or diclosulam (Table 2).

For the Headland 1998 and Jay 1999 data, all AHAS-inhibiting treatments without supplemental herbicides provided ≥ 87% Florida beggarweed control. Supplementing these treatments with either paraquat + bentazon or 2,4-DB was of no benefit (Table 2). Imazapic provided equivalent control (90%) for both the PRE and EPOST applications.

The differences between the two data sets for Florida beggarweed may be due to differences in level of Florida beggarweed infestation. The overall density of Florida beggarweed was somewhat less at Jay 1999 and Headland 1998 than at Jay 1998 and Headland 1999. Thus, several of the herbicide treatments appeared to be less effective at the latter two sites.

Florida beggarweed control with diclosulam at 18 g/ha applied PRE was equivalent to imazapic at 70 g/ha applied EPOST for both data sets (Table 2). Similarly, the one-half rate of imazapic (35 g/ha) combined with either diclosulam at 13 g/ha applied PRE or diclosulam at 9 g/ha applied EPOST was as effective for Florida beggarweed control as the full rate of imazapic (70 g/ha) applied EPOST. This suggests that, when tank mixed, the use rate of both imazapic and diclosulam can be reduced

Table 2. Weed control with imazapic, diclosulam, and supplemental treatments.

AHAS-inhibiting herbicide	Rate	Application timing[a]	Supplemental treatment[b]	Weed control				
				Sicklepod[c]	Florida beggarweed[d]	Florida beggarweed[e]	Bristly starbur[f]	Yellow nutsedge[g]
	g/ha			%				
None			None	0	0	0	0	0
			Para. + bent.	62	56	78	66	65
			2,4-DB	51	10	63	36	30
Imazapic	70	PRE	None	72	70	90	51	93
			Para. + bent.	86	75	93	70	95
			2,4-DB	83	75	90	86	86
Imazapic	70	EPOST	None	93	94	92	96	96
			Para. + bent.	96	78	92	99	99
			2,4-DB	92	89	87	93	96
Diclosulam	18	PRE	None	30	84	89	93	50
			Para. + bent.	70	81	90	96	90
			2,4-DB	62	89	93	97	70
Diclosulam	26	PRE	None	36	95	99	97	56
			Para. + bent.	73	86	96	93	86
			2,4-DB	66	84	99	96	75
Diclosulam	18	EPOST	None	32	76	89	75	75
			Para. + bent.	74	69	86	96	90
			2,4-DB	58	79	90	99	80
Imaz. + diclo.	35+13	PRE	None	66	92	98	94	74
			Para. + bent.	82	87	94	94	88
			2,4-DB	72	93	94	97	83
Imaz. + diclo.	35+9	EPOST	None	80	92	91	98	96
			Para. + bent.	81	73	84	96	99
			2,4-DB	73	89	89	98	95
LSD (0.05)				13	15	13	13	11

[a]PRE = preemergence; EPOST = early postemergence.

[b]Para. + bent. = paraquat + bentazon applied at ground cracking as a tank mixture at 140 + 560 g/ha, respectively; 2,4-DB was applied POST at 220 g/ha.

[c]Data pooled over years (1998 and 1999) and locations (Headland, AL and Jay, FL).

[d]Data pooled over Jay, FL 1998 and Headland, AL 1999.

[e]Data pooled over Jay, FL 1999 and Headland, AL 1998.

[f]Data pooled over Headland, AL 1998 and 1999.

[g]Data pooled over Jay, FL 1998 and 1999.

while maintaining an acceptable level of Florida beggarweed control.

Previous research indicated that both imazapic and diclosulam provide 85 to 90% control of Florida beggarweed (Richburg *et al.*, 1995, 1996; Wilcut *et al.*, 1996; Johnson and Vencil, 2000; Main *et al.*, 2000). Florida beggarweed control with imazapic, however, can be inconsistent and sometimes less than 50% (Richburg *et al.*, 1995, 1996; Wilcut *et al.*, 1996).

Bristly Starbur Control. This species was present only at Headland. There was no treatment by year interaction; therefore, data were pooled over years (Table 2). Control was influenced by the main effects of AHAS-inhibiting herbicides, supplemental herbicides, and their interaction. All the AHAS-inhibiting treatments applied alone, except imazapic PRE at 70 g/ha and diclosulam EPOST at 18 g/ha, provided ≥ 93% control (Table 2). Similar results have been reported by researchers in North Carolina (Richburg *et al.*, 1995; Wilcut *et al.*, 1996).

Control with diclosulam EPOST was improved to ≥ 96% when supplemented with either paraquat + bentazon or 2,4-DB (Table 2). As with Florida beggarweed, diclosulam PRE at 18 g/ha and imazapic EPOST at 70 g/ha provided equivalent bristly starbur control. The one-half rate of imazapic (35 g/ha) combined with either diclosulam at 13 g/ha and applied PRE, or diclosulam at 9 g/ha applied EPOST were as effective in controlling bristly starbur as the full rate of imazapic (70 g/ha) applied EPOST.

Yellow Nutsedge Control. This species was present only at Jay. There was no treatment by year interaction; therefore, data were pooled over years. Control was influenced by the main effects of AHAS-inhibiting herbicides, supplemental herbicides, and their interaction. Among the AHAS-inhibiting herbicides applied alone, > 90% yellow nutsedge control was obtained with imazapic at 70 g/ha applied either PRE or EPOST and with imazapic + diclosulam (35 + 9 g/ha) applied EPOST (Table 2). The other diclosulam treatments were ineffective for yellow nutsedge control and benefited from the addition of paraquat + bentazon. These results indicate that imazapic is much more effective for yellow nutsedge control than diclosulam, and that diclosulam will need to be supplemented with other herbicides to obtain acceptable control.

Results from previous research indicate that yellow nutsedge control with diclosulam is inconsistent. Some have reported > 90% yellow nutsedge control with diclosulam (Grichar *et al.*, 1998) while others have observed less than 75% control (Baughman *et al.*, 2000; Dotray *et al.*, 2000). Imazapic appears to provide more consistent yellow nutsedge control than diclosulam with most previous research indicating > 90% control with imazapic (Richburg *et al.*, 1995, 1996; Wilcut *et al.*, 1996; Swann, 2000).

Peanut Yield and Economic Return. Treatment performance varied across both location and years. Consequently, data could not be pooled. Yield was influenced by the main effects of the AHAS-inhibiting herbicides at Jay in 1998 and 1999 and Headland in 1999. Similarly, yield was influenced by main effects of the supplemental herbicides at the same location-year combinations. There were no significant differences in yield for Headland in 1998 (data not shown). There were no interactions between the AHAS-inhibiting herbicides and the supplemental treatments. Consequently, only the main effects of the AHAS-inhibiting herbicides and the supplemental herbicides are presented (Table 3).

Across all location and years, maximum yield was consistently associated with only two of the eight AHAS-inhibiting herbicide treatments (Table 3). These two treatments were EPOST applications of imazapic at 70 g/ha and imazapic + diclosulam at 35 + 9 g/ha, respectively. For the Jay 1998 and Jay 1999 data, the supplemental herbicides of either paraquat + bentazon or 2,4-DB resulted in higher yields compared with no supplemental herbicides. However, in no case was one supplemental treatment more effective than the other. Supplemental herbicides had no effect on yield at Headland in 1999 (Table 3).

In general, IAVC paralleled peanut yield both in terms of treatment performance and statistical analysis (Table 4). Therefore, as expected from the yield results, imazapic at 70 g/ha and imazapic + diclosulam at 35 + 9 g/ha were the only two AHAS-inhibiting herbicide treatments that consistently resulted in maximum IAVC. Since none of the diclosulam-based systems were more effective than imazapic applied alone with respect to IAVC, our original hypothesis that diclosulam may have potential as either an alternative to, or as a supplement for, imazapic is largely proven false for areas infested with sicklepod.

Table 3. Main effects of imazapic, diclosulam, and supplemental herbicides on peanut yield[a].

Treatment	Rate	Appl. timing[b]	Yield Jay, FL 1998	Yield Jay, FL 1999	Yield Headland, AL 1999
	g/ha		kg/ha		
AHAS-herbicide					
None	---	---	2990 d	2200 ab	2710 c
Imazapic	70	PRE	4460 bc	2260 ab	3970 b
Imazapic	70	EPOST	5530 a	2490 ab	4640 ab
Diclosulam	18	PRE	3770 cd	1950 b	4340 ab
Diclosulam	26	PRE	3980 c	2180 ab	4840 a
Diclosulam	18	EPOST	3520 cd	2200 ab	4360 ab
Imaz. + dicl.	35+13	PRE	4090 c	2810 a	4330 ab
Imaz. + dicl.	35+9	EPOST	5270 ab	2630 ab	4700 ab
Supplemental herbicide					
None	----	----	3300 b	1880 b	3960 a
Para. + bent.	130+560	AC	4920 a	2720 a	4330 a
2,4-DB	220	POST	4390 a	2420 a	4420 a

[a]Means within a column followed by the same letter are not significantly different as determined by the appropriate LSD value at the 5% level.

[b]PRE = preemergence, EPOST = early postemergence, AC = at cracking, POST = postemergence.

Table 4. Main effects of imazapic, diclosulam, and supplemental economic returns[a].

Treatment	Rate	Appl. timing[b]	Income above variable costs Jay, FL 1998	Income above variable costs Jay, FL 1999	Income above variable costs Headland, AL 1999
	g/ha		$/ha		
AHAS-herbicide					
None	----	----	245 d	15 ab	350 b
Imazapic	70	PRE	685 bc	95 ab	845 a
Imazapic	70	EPOST	1010 a	10 ab	1075 a
Diclosulam	18	PRE	510 cd	205 b	985 a
Diclosulam	26	PRE	570 c	130 ab	1150 a
Diclosulam	18	EPOST	410 cd	95 ab	1005 a
Imaz. + dicl.	35+13	PRE	590 c	175 a	960 a
Imaz. + dicl.	35+9	EPOST	950 ab	120 ab	1085 a
Supplemental herbicide					
None	----	----	320 b	260 b	820 b
Para. + bent.	130+560	AC	140 a	130 a	980 ab
2,4-DB	220	POST	115 a	35 a	1005 a

[a]Means within a column followed by the same letter are not significantly different as determined by the appropriate LSD value at the 5% level.

[b]PRE = preemergence, EPOST = early postemergence, AC = at cracking, POST = postemergence.

We speculate that the inability of the diclosulam-based treatments to control sicklepod was their primary limitation and this limitation could not be overcome with additional herbicide applications. However, diclosulam-based systems could be identified that were equally effective as imazapic alone in controlling the other weed species evaluated. Thus, we conclude that in areas not infested with sicklepod, these treatments very likely may offer an economic advantage over imazapic with less risk of injury to rotational cotton crops, particularly cotton.

Cultivar Tolerance to Imazapic and Diclosulam. None of the cultivars evaluated were negatively impacted (< 5% visual injury and no yield reduction) by either imazapic or diclosulam applied at twice the labeled rate in any of the 3 yr of the study (data not shown). Previous research has indicated similar results (no effect on peanut yield) with diclosulam applied to virginia-type cultivars (Wilcut *et al.*, 1997; Bailey *et al.*, 1999, 2000). Others have evaluated imazapic on viginia-, spanish-, and runner-type cultivars (Richburg *et al.*,1995; Wilcut *et al.*, 1996; Dotray *et al.*, 2001). Together they evaluated a total of 10 cultivars and reported some initial peanut injury from imazapic at 71 g/ha but no effect on yield. Our results indicate that both diclosulam and imazapic can be applied at labeled rates to a wide range of runner-type cultivars without concern for injury.

These field trials indicate that imazapic and diclosulam applied alone at full rate or in combination at one-half rate of each provide control of Florida beggarweed and bristly starbur. Imazapic alone or a combination of imazapic + diclosulam EPOST controlled yellow nutsedge while diclosulam alone did not control this weed species. Sicklepod was not controlled effectively with diclosulam alone at full rate or in combination with imazapic at reduced rates. Supplementing diclosulam with paraquat + bentazon improved activity against sicklepod, but control was still less than with the full rate of imazapic alone EPOST. Two treatments (imazapic 70 g/ha EPOST and imazapic + diclosulam 35 + 9 g/ha) provided consistently better economic returns than the other treatments. None of the diclosulam-based systems provided more favorable returns than imazapic applied alone due to poor sicklepod control with diclosulam. However, it may be possible to control weeds economically and reduce the potential for herbicide carryover to succeeding crops in areas without sicklepod with combination of imazapic and diclosulam, each applied at less than full labeled rates.

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