RESIDUAL CONTROL OF RED MORNINGGLORY WITH HERBICIDES APPLIED PREEMERGENCE

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Experiments to evaluate residual control of red morningglory with herbicides applied preemergence (PRE) were conducted near Port Allen, LA, in West Baton Rouge Parish in a fallowed sugarcane field. The soil type was a Commerce silt loam with 1.8% organic matter and a pH of 6.5. Each experiment was conducted as a randomized complete block with 4 replications. Plot size was 3.1 by 4.6 m.

PRE Residual Study. Experiments were conducted to evaluate residual control of red morningglory with herbicides typically used after the layby cultivation in sugarcane. Treatments included atrazine at 1.0, 2.0, 3.0 and 4.0 lb/A (1, 2, 3, and 4 qt/A of Atrazine 4L); a premix of diuron plus hexazinone at 0.94 + 0.27, 1.4 + 0.39, and 1.88 + 0.53 lb/A (2, 3, and 4 lb/A of DuPont K4 60DF); flumioxazin at 0.06, 0.12, 0.19, and 0.26 lb/A (2, 4, 6, and 8 oz/A Valor 51DG); sulfentrazone at 0.14, 0.19, 0.23, 0.29, 0.33, and 0.38 lb/A (3, 4, 5, 6, 7, and 8 oz/A Spartan 75DF); and metribuzin at 1.5 and 2.25 lb/A (2 and 3 lb/A Sencor 75DF). Visual control of red morningglory was determined 35, 49, 63, and 77 days after treatment (DAT) based on a scale of 0 to 100% with 0 = no control and 100 = no plants emerged. At each rating date, glufosinate was applied to the entire experimental area. Glufosinate provided complete control of all weeds thereby allowing for residual effects of the herbicides to be determined out to 77 DAT. Herbicide treatments were applied June 10, 2004 and May 25, 2005. Soil was tilled 1 to 2 days prior to application to represent a layby cultivation in sugarcane. At application soil was moist and rainfall to activate the PRE herbicides was received within 7 days after application both years.

Red morningglory control 35 DAT was at least 90% with atrazine at 3.0 and 4.0 lb/A; diuron plus hexazinone at 1.4 + 0.39 and 1.88 + 0.53 lb/A; flumioxazin at 0.12, 0.19, and 0.26 lb/A; sulfentrazone at 0.19, 0.23, 0.29, 0.33, and 0.38 lb/A; and metribuzin at 2.25 lb/A (Table 1). Red morningglory control 35 DAT increased when atrazine rate increased from 1.0 to 2.0 lb/A (78 to 88%), when diuron plus hexazinone rate increased from 0.94 + 0.27 to 1.40 + 0.39 lb/A (84 to 94%), and when flumioxazin rate increased from 0.06 to 0.12 lb/A (63 to 92%). Increasing sulfentrazone rate from 0.14 to 0.19 lb/A increased red morningglory control from 87 to 96%.

By 49 DAT red morningglory control with atrazine at 2.0 lb/A and higher was around 70% and control for all atrazine rates was less than that observed 35 DAT (Table 1). Diuron plus hexazinone at the two lowest rates and flumioxazin at the two highest rates controlled red morningglory equivalent to atrazine at 2.0 lb/A, but control with metribuzin was less than that for atrazine at 2.0 lb/A. In contrast, sulfentrazone at 0.19 to 0.38 lb/A controlled red morningglory at least 93% 49 DAT and control was unchanged from the earlier rating. None of the other herbicide treatments controlled red morningglory equal to that of sulfentrazone at 0.19 lb/A and only diuron plus hexazinone at 1.40 + 0.39 and 1.88 + 0.53 lb/A controlled red morningglory equivalent to that of sulfentrazone at 0.14 lb/A (80%).

By 63 DAT red morningglory was controlled no more than 53% with atrazine and for the highest rate of atrazine, control was less than that observed 49 DAT (Table 1). Diuron plus hexazinone at all rates and flumioxazin at the three highest rates controlled red morningglory equivalent to that of atrazine at 3.0 lb/A (53%). Red morningglory control was no more than 41% with metribuzin. For all rates of diuron plus hexazinone and metribuzin, control 63 DAT was less than that observed 49 DAT. For sulfentrazone at 0.19 lb/A and higher, red morningglory was controlled at least 83% 63 DAT, and for the low rate of sulfentrazone (0.14 lb/A) red morningglory control was 69% and greater than for all other treatments except the highest rates of diuron plus hexazinone and flumioxazin. Even though red morningglory control decreased at 63 DAT for all rates of sulfentrazone compared with 49 DAT, control was still around 85% 63 DAT for the higher rates. Residual control of red morningglory with sulfentrazone was impressive considering that none of the other treatments 63 DAT provided more than 61% control and that atrazine controlled morningglory no more than 53%.

At 77 DAT red morningglory control was 78 to 82% when sulfentrazone was applied at 0.19 lb/A and higher. The lowest rate of sulfentrazone controlled red morningglory 64% and no other treatment provided more than 46% control. For most rates of sulfentrazone, red morningglory control 77 DAT was unchanged compared with 63 DAT. However, when compared with 49 DAT, red morningglory control decreased 12 to 16 percentage points for sulfentrazone. For the highest rate of atrazine, diuron plus hexazinone, flumioxazin, and metribuzin, red morningglory control 77 DAT ranged from 27 to 46%.

The ability to evaluate long term residual control (greater than 28 days) with soil applied herbicides is often difficult because weeds not initially controlled can affect emergence and growth of new weeds. This factor was eliminated in this research through use of glufosinate which provided complete POST control of red morningglory without the soil activity to interfere with evaluation of herbicide treatments. Our research shows that in areas with moderate to heavy red morningglory infestation, application of at least 0.19 lb/A sulfentrazone (4 oz/A Spartan 75DF) can provide control of around 80% for as long as 77 days. Sulfentrazone rate higher than 0.19 lb/A, however, may be needed on soils with high clay content and organic matter. Atrazine has been widely used as a soil applied treatment for morningglory control in sugarcane. In this study atrazine at 4.0 lb/A (a rate around four times higher than that used in corn) controlled red morningglory 90% 35 DAT but only 70% 49 DAT, clearly showing that long term residual control should not be expected. Unlike corn, a single application of atrazine in sugarcane in Louisiana can be as high as 4.0 lb/A. An alternative method to best utilize atrazine for red morningglory control in sugarcane would be to delay application until later in the growing season to take advantage of the 35 days effective control period. The postemergence (POST) activity of atrazine on red morningglory would be advantageous in situations when application is delayed.

Another advantage of atrazine is that it can be applied over the top of sugarcane. Based on current labels, diuron plus hexazinone, flumioxazin, and sulfentrazone would have to be applied as a directed treatment preferably after sugarcane is jointing to avoid crop injury. Later applications of these herbicides, like atrazine, would also extend red morningglory control later into the growing season, which would be advantageous. Previous research has shown that red morningglory seeds can germinate and emerge from May through September and plants can thrive under a 90% shade environment, which can be expected in a sugarcane crop in Louisiana into July.

Trifluralin/Sulfentrazone PPI/PRE Residual Study. Experiments were conducted to evaluate residual control of red morningglory with sulfentrazone both soil incorporated and applied to soil surface. Treatments included trifluralin at 2.0 lb/A (2 qt/A Treflan 4EC) preplant incorporated (PPI) once using a field cultivatior; trifluralin at 2.0 lb/A plus sulfentrazone at 0.19, 0.25, 0.31, and 0.38 lb/A (4.0, 5.3, 6.6, and 8 oz/A Spartan 75DF) PPI; trifluralin at 2.0 lb/A PPI followed by sulfentrazone at 0.19, 0.25, 0.31, and 0.38 lb/A PRE applied to the soil surface; and sulfentrazone at 0.19, 0.25, 0.31, and 0.38 lb/A PRE applied to a tilled seedbed. Treatments were selected because trifluralin is widely used for grass control at the layby cultivation in sugarcane. Application of sulfentrazone with trifluralin would save an extra trip across the field. Herbicide treatments were applied June 10, 2004 and May 25, 2005. Visual control of red morningglory was determined 35, 49, 63, and 77 DAT based on a scale of 0 to 100% with 0% = no control and 100% = no plants emerged. As also indicated for the PRE study, after each rating date, glufosinate was applied to the entire experimental area to allow for determination of residual control. At application, soil was moist and rainfall to activate the PRE herbicides was received within 7 days after application both years.

Red morningglory control was no more than 29% when trifluralin was applied alone PPI (Table 2). At 35 DAT, red morningglory control was at least 95% when sulfentrazone (0.19 to 0.38 lb/A) was applied PRE either alone or following trifluralin. When sulfentrazone at 0.19 lb/A was incorporated with trifluralin, however, red morningglory control 35 DAT was decreased to 89%. At 49 DAT, red morningglory control when sulfentrazone at 0.19 lb/A was applied PRE alone or following trifluralin was 90 and 93%, respectively, but when sulfentrazone at 0.19 lb/A was incorporated control decreased to 84%. When sulfentrazone at higher rates was incorporated red morningglory control 49 DAT in most cases was equivalent to PRE applications. For the individual sulfentrazone treatments red morningglory control did not change from 35 to 49 DAT. This same response was also observed with sulfentrazone in the PRE residual study (Table 1).

At 63 DAT red morningglory control with sulfentrazone applied PRE was 83 to 90% (Table 2). For the lowest rate of sulfentrazone incorporated with trifluralin weed control was less than the same rate applied PRE (73 vs. around 84%). In most cases red morningglory control with sulfentrazone applied PRE was not increased as rate increased from 0.19 to 0.38 lb/A. A decrease in weed control with sulfentrazone at 0.19 lb/A incorporated with trifluralin compared with a PRE application of sulfentrazone was also observed 77 DAT (68 vs. around 78%), but differences in weed control related to method of application were not noted for other rates of sulfentrazone. In most cases, weed control with individual sulfentrazone treatments did not change from 63 to 77 DAT, but for all treatments control 63 and 77 DAT was less than what was observed 35 DAT.

Trifluralin is commonly used in sugarcane to control grass weeds. It would be desirable when morningglory also is a problem to apply sulfentrazone with trifluralin to save a trip over the field. This study shows that if sulfentrazone at 0.19 lb/A (4.0 oz/A Spartan 75DF) is to be incorporated with trifluralin, red morningglory control would be sacrificed if compared with the same rate of sulfentrazone applied to the soil surface. A sulfentrazone rate of at least 0.25 lb/A (5.3 oz/A Spartan 75DF) would be needed to maximize red morningglory control when herbicide is incorporated.

In sugarcane, control of red morningglory is critical to prevent climbing and wrapping of sugarcane plants and subsequent decrease in yield and harvest efficiency. Ideally, herbicides used to control morningglory should have PRE and POST activity and should have excellent crop safety. The capability to apply herbicides over the top of sugarcane would increase versatility and weed control options. Atrazine offers all these benefits, but length of residual control of red morningglory under Louisiana conditions is limited to around 35 days and is rate dependent. For atrazine to be most effective, application should be delayed until later in the growing season (4 to 6 weeks after the layby cultivation in May) when both foliar and soil residual activity could be appreciated. Current label restrictions would limit the use of diuron plus hexazinone, flumioxazin, sulfentrazone, and trifloxysulfuron-sodium to POST directed application. Sulfentrazone provided longer residual red morningglory control than atrazine and the other alternative herbicides and sulfentrazone would have a fit when either incorporated at the layby cultivation with trifluralin or when applied to the soil surface after cultivation.

Table 1. Red morningglory residual control with preemergence herbicides 35, 49, 63, and 77 days after treatment (DAT).[a]

Herbicide	Rate	35 DAT	49 DAT	63 DAT	77 DAT
	lb ai/A		%		
Atrazine	1.0	78 f A [b]	49 ef B	46 ef BC	27 fg C
Atrazine	2.0	88 cde A	69 d B	50 de C	30 efg D
Atrazine	3.0	92 abcd A	69 d B	53 cde BC	44 cd C
Atrazine	4.0	90 abcde A	70 d B	53 cde C	39 cde C
Diuron plus hexazinone	0.94 + 0.27	84 ef A	70 d A	54 cd B	39 cde C
Diuron plus hexazinone	1.40 + 0.39	94 abcd A	76 bcd B	59 c C	43 cd D
Diuron plus hexazinone	1.88 + 0.53	96 abc A	79 bc B	61 bc C	46 c D
Flumioxazin	0.06	63 g A	44 f AB	39 fg B	26 fg B
Flumioxazin	0.12	92 abcde A	55 e B	45 efg BC	36 def C
Flumioxazin	0.19	93 abcd A	68 d B	56 cd BC	43 cd C
Flumioxazin	0.26	96 ab A	71 cd B	61 bc B	46 c C
Sulfentrazone	0.14	87 de A	80 b A	69 b B	64 b B
Sulfentrazone	0.19	96 abc A	94 a A	83 a B	78 a B
Sulfentrazone	0.23	97 a A	94 a A	84 a B	78 a C
Sulfentrazone	0.29	97 a A	94 a A	84 a B	78 a B
Sulfentrazone	0.33	98 a A	93 a A	84 a B	80 a B
Sulfentrazone	0.38	98 a A	94 a A	88 a B	82 a C
Metribuzin	1.5	89 bcde A	55 e B	37 g C	26 g D
Metribuzin	2.25	94 abcd A	54 e B	41 fg C	27 fg D

[a] Herbicide treatments were applied June 10, 2004 and May 25, 2005, to soil that had been tilled 1 to 2 days earlier to represent a layby cultivation in sugarcane. Rainfall for activation of herbicides was received within 7 days after application both years. After each rating, glufosinate at 0.37 kg ai/ha was applied to kill emerged red morningglory and to allow for residual effects of the herbicide treatments to be determined.

[b] Means within a column followed by the same lowercase letter are not significantly different using Fisher's protected LSD ($P \leq 0.05$). Means within a row followed by the same uppercase letter are not significantly different using Fisher's protected LSD ($P \leq 0.05$).

Table 2. Red morningglory control with trifluralin and sulfentrazone applied as preemergence treatments alone, in combination, and sequentially at 35, 49, 63, and 77 days after treatment (DAT).[a]

Treatment	Rate	Timing[b]	35 DAT	49 DAT	63 DAT	77 DAT
	lb ai/A		%			
Trifluralin	2.0	PPI	29 d A[c]	28 f AB	27 f AB	19 d B
Trifluralin + sulfentrazone	2.0 + 0.19	PPI	89 c A	84 e A	73 e B	68 c B
Trifluralin + sulfentrazone	2.0 + 0.25	PPI	92 bc A	87 de A	80 cd B	79 ab B
Trifluralin + sulfentrazone	2.0 + 0.31	PPI	94 ab A	88 cde A	78 de B	78 ab B
Trifluralin + sulfentrazone	2.0 + 0.38	PPI	95 ab A	92 abc A	84 bc B	84 ab B
Trifluralin fb sulfentrazone	2.0 fb 0.19	PPI fb PRE	97 ab A	93 ab A	83 bcd B	77 b B
Trifluralin fb sulfentrazone	2.0 fb 0.25	PPI fb PRE	97 ab A	92 abc AB	83 bc BC	77 b C
Trifluralin fb sulfentrazone	2.0 fb 0.31	PPI fb PRE	97 a A	92 abc AB	87 ab B	79 ab C
Trifluralin fb sulfentrazone	2.0 fb 0.38	PPI fb PRE	97 a A	94 a AB	90 a B	84 ab C
Sulfentrazone	0.19	PRE	97 ab A	90 abcd AB	84 bc BC	79 ab C
Sulfentrazone	0.25	PRE	95 ab A	89 bcd AB	83 bc BC	82 ab C
Sulfentrazone	0.31	PRE	96 ab A	92 abc A	86 ab B	79 ab C
Sulfentrazone	0.38	PRE	96 ab A	92 abc AB	88 ab BC	86 a C

[a] Herbicide treatments were applied on June 10, 2004 and May 25, 2005. Rainfall for activation of herbicides was received within 7 days after application both years. After each rating, glufosinate at 0.37 kg ai/ha was applied to kill emerged red morningglory and to allow for residual effects of the herbicide treatments to be determined.

[b] Timing treatments consisted of trifluralin alone or with sulfentrazone applied preplant incorporated (PPI), trifluralin PPI followed by (fb) sulfentrazone preemergence (PRE), and sulfentrazone applied PRE. PPI treatments were incorporated using a field cultivator. PRE treatments were applied to the soil surface of a tilled seedbed on the same day as the PPI treatments.

[c] Means within a column followed by the same lowercase letter are not significantly different using Fisher's protected LSD ($P \leq 0.05$). Means within a row followed by the same uppercase letter are not significantly different using Fisher's protected LSD ($P \leq 0.05$).

CROP RESIDUE MANAGEMENT AND TILLAGE EFFECTS ON WEED CONTROL AND SUGARCANE PRODUCTION

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Residue Management/Tillage Study. Research was conducted to evaluate the residual effect of burning and mechanical removal of sugarcane crop residue on weed control and sugarcane growth and yield. Crop residue was removed in December or January within three weeks after sugarcane harvest. Mechanical removal of residue from the row top and placement in the row middle using a Sunco Trash Tiger®, was compared with burning and a no removal control. Superimposed on each residue removal treatment was tillage of row sides and middles in March and in May and a no-tillage program. Tillage efficiency in March when sugarcane was emerging from the winter dormant period was not negatively affected when residue was removed mechanically. Crop residue at the locations when the study was initiated ranged from 10,310 to 19,420 kg/ha (4.6 to 8.7 tons/A) dry weight (Table 1). Even though variation in initial crop residue dry weight occurred among locations there was not a significant interaction between residue management and tillage program for any of the parameters. There was, however, a significant effect for some of the variables attributed to crop residue management.

Sugarcane residue remaining in March was consistent with residue management practices imposed after harvest in December or January. When sugarcane residue was removed by burning or mechanically using a Trash Tiger® ground cover of crop residue on the row top in March averaged across locations and tillage programs was no more than 14%, whereas ground cover was 90% when residue was not removed (Table 2). An attempt was not made to quantify biomass of residue on the soil surface or thickness of the crop residue mat. Ground cover ratings are simply reflective of the soil surface area covered by crop residue. There was no difference in sugarcane residue ground cover or weed ground cover between the burning and mechanical removal treatments. Winter weed ground cover on the row top in March averaged 14% for the burn treatment and 17% for the mechanical removal treatment compared with 7% where crop residue was not removed (Table 2). Even with 90% sugarcane residue on the soil surface, winter weeds would need to be controlled with a late winter/early spring herbicide treatment.

Crop residue on the soil surface did not negatively affect activity of residual herbicides applied in March (data not shown). Sugarcane height in April averaged across locations and tillage programs was equal for the burn and no residue removal treatments and averaged 9.2% greater than for mechanical removal (Table 2). A difference in sugarcane height in April when crop residue was removed mechanically compared with burning, however, was not detected in June or August. In June, sugarcane height for the burn and mechanical removal treatments averaged 10.3 cm taller than for the no removal treatment. By August, however, there were no differences in sugarcane stalk height among the residue management treatments.

Differences among the residue management treatments in sugarcane shoot population in April were not observed (Table 3). Additionally, sugarcane stalk population in August was equivalent regardless of residue management treatment (Table 3). When differences in sugarcane stalk population and height among residue management treatments are not observed in August it would be expected that sugarcane yield also would not be affected, which was the case in this study (Table 3). Sugar yield averaged across locations and tillage programs was equal for the burn and mechanical residue removal treatments and averaged 8.6% greater than when residue was not removed.

Economic analysis for the crop residue management programs was not conducted for this study. However, mechanical removal of residue would cost considerably more than burning, although there would be some cost associated with burning. In this study, burning or mechanical removal of sugarcane crop residue [at least 10,300 kg/ha (4.6 tons/A) dry matter] within three weeks following combine harvest in December or January increased sugar yield an average of 670 kg/ha (598 lb/A) compared with no residue removal. Elimination of spring tillage and layby tillage did not hinder sugarcane growth or yield when compared with a full season tillage program. These findings are supported by previous research. Of interest in the present study is that neither tillage nor fertilizer application was negatively affected when the Trash Tiger® was used and sugarcane residue from the row top was placed into the row middles. When using the Trash Tiger® some soil from the row top would be moved along with the crop residue. Although not measured in this study it was felt that mixing of soil with residue may have enhanced decomposition.

Residue Removal Timing Study. Crop residue of sugarcane harvested in early December was burned or removed mechanically from the row top four days after harvest and also mechanically in January, February, or March. The winter weed and sugarcane crop residue ground cover data were collected before the March removal timing and before plots were tilled. Therefore, the mechanical March removal treatment would represent a no removal control. Results showed that sugarcane residue can suppress weed emergence and growth. Winter weed ground cover in mid-March on the row top was 5% when crop residue had not been removed, but was 10 and 18% when crop residue was burned or removed mechanically, respectively, in December (Table 4). The greater winter weed ground cover when sugarcane residue was removed mechanically compared with burning could be due to the slight stirring of the soil with the Trash Tiger® which may have stimulated weed seed germination. Results clearly show that even though the crop residue provided some suppression of weeds, weeds were still present and would need to be controlled to eliminate early season competition with sugarcane as it emerges for the winter dormant period. Of equal concern is the amount of crop residue on the soil surface in early March and how it might impact sugarcane emergence and growth. Crop residue ground cover in mid-March was 79% when residue had not been removed and had remained on the soil surface since harvest in early to mid-December (Table 4). This is in contrast to 33 to 37% crop residue ground cover on the row top when residue was removed mechanically in December, January, or February, and 12% when residue was burned in December. An attempt was not made to quantify biomass of residue on the soil surface or thickness of the crop residue mat. Ground cover ratings are simply reflective of the soil surface area covered by crop residue.

Crop residue on the soil surface did not negatively affect activity of residual herbicides applied in March. For sugarcane height, population, and yield a significant interaction between residue removal timing and spring tillage was not observed. There was, however, a significant effect for some of the variables attributed to timing of residue removal. Sugarcane height in April (Table 4) and in June (Table 5) averaged across spring tillage was equal when crop residue was removed in December by burning or mechanically. Delaying mechanical removal until January resulted in sugarcane height in April equal to that of the March mechanical removal. Sugarcane height in August was equivalent when residue was removed in December, January, and February and averaged 7.6% more than when residue was removed in March (Table 5). Sugarcane shoot population in April, averaged across spring tillage, was equivalent when residue was removed in December, January, or February but population was reduced an average of 14.9% when residue removal was delayed until March (Table 4).

Averaged across spring tillage, sugarcane yield was greater when residue was removed by burning in December than when removed mechanically in February (Table 5). Yields did not differ for the December burn compared with mechanical removal of crop residue in December, January, or March. Sugar yield averaged across spring tillage was equivalent when crop residue was removed in December by burning or mechanically and averaged 8,670 kg/ha (7,740 lb/A). Compared with residue removal in December, delaying mechanical removal of residue until February or March decreased yields an average of around 13%. It is probable that yield reduction observed in this research is related to increased moisture and decreased temperature early in the growing season when residue was not removed from the row top.

Research clearly shows that sugarcane crop residue should be removed from the row top to maximize yield of the ratoon crop. Preferably crop residue should be removed as soon after harvest as possible and before the end of December. When sugarcane is not harvested until January, residue should be removed immediately after harvest. Results also show that a reduced tillage program can be successful both when crop residue is removed by burning or by mechanical means. The Trash Tiger® did an excellent job of removing residue from the top of the sugarcane rows but residue in the row middles was essentially doubled. As also noted in the previous study when residue was removed mechanically, the normal spring tillage operation and fertilizer application were not hindered. Mechanical removal of the crop residue in combination with a reduced tillage program can decrease cost of production by eliminating tillage operations without sacrificing yield and can help to reduce soil loss.

Table 1. Soil type, classification, pH, percent organic matter, and initial crop residue dry weight at the three locations used for the residue management/tillage study.

Variable	St. Gabriel, LA	Youngsville, LA	Franklin, LA
Soil type	Commerce silt loam	Coteau silt loam	Baldwin silt loam
Soil classification	fine-silty, mixed, superactive, nonacid, thermic Fluvaquentic Endoaquepts	fine-silty, mixed, active, hyperthermic Glossaquic Hapludalfs	fine, smectitic, hyperthermic Chromic Vertic Epiaqualfs
Soil pH	6.9	5.9	6.2
Soil organic matter (%)	2.11	1.32	1.35
Crop residue dry weight (kg/ha) [a]	13,740	19,420	10,310

[a] Crop residue was collected between December 11, 2003 and January 13, 2004 within three weeks after 'LCP 85-384' sugarcane was harvested with a chopper harvester.

Table 2. Effect of sugarcane crop residue management and tillage on sugarcane residue and winter weed ground cover in March and on sugarcane height in April, June, and August.[a]

Crop residue management[b]	Crop residue ground cover in March	Winter weed ground cover in March[c]	Sugarcane height April	Sugarcane height June	Sugarcane height August
	%	%	cm	cm	cm
Burn December/January	14 b[d]	14 a	34 a	184 a	208 a
Mechanical December/January	11 b	17 a	32 b	182 a	208 a
No removal	90 a	7 b	36 a	173 b	202 a

[a] Tillage programs consisted of spring tillage (mid to late March) with or without and layby tillage (mid to late May) with or without. A significant sugarcane crop residue management by tillage program interaction was not observed. Data for each parameter represent an average across tillage treatments and three locations.

[b] Crop residue was removed between December 11, 2003, and January 13, 2004, by burning or mechanically using a Sunco Trash Tiger® which raked residue from row tops to row middles. Residue removal was performed within three weeks after 'LCP 85-384' sugarcane was harvested with a chopper harvester.

[c] Winter weeds included spiny sowthistle (*Sonchus asper* (L.) Hill), annual bluegrass (*Poa annua* L.), and Italian ryegrass (*Lolium multiflorum* Lam.).

[d] Means for each parameter followed by the same letter are not significantly different ($P \leq 0.05$) using Fisher's protected LSD.

Table 3. Effect of sugarcane crop residue management and tillage on sugarcane shoot population in April and stalk population in August and on sugarcane yield and sugar yield.[a]

Crop residue management[b]	Sugarcane shoot population in April	Sugarcane stalk population in August	Sugarcane yield	Sugar yield
	1,000/ha	1,000/ha	1,000 kg/ha	kg/ha
Burn December/January	101.1 a[c]	121.2 a	78.7 a	8,450 a
Mechanical December/January	99.2 a	123.7 a	78.9 a	8,490 a
No removal	94.2 a	120.8 a	74.9 a	7,800 b

[a] Tillage programs consisted of spring tillage (mid to late March) with or without and layby tillage (mid to late May) with or without. A significant sugarcane crop residue management by tillage program interaction was not observed. Data for each parameter represent an average across tillage treatments and three locations.

[b] Crop residue was removed between December 11, 2003, and January 13, 2004, by burning or mechanically using a Sunco Trash Tiger® which raked residue from row tops to row middles. Residue removal was performed within three weeks after 'LCP 85-384' sugarcane was harvested with a chopper harvester.

[c] Means for each parameter followed by the same letter are not significantly different ($P \leq 0.05$) using Fisher's protected LSD.

Table 4. Effect of residue removal timing and tillage on sugarcane residue and winter weed ground cover in mid-March and on sugarcane height and shoot population in April.[a]

Residue removal timing [b]	Winter weed ground cover in March [d]	Crop residue ground cover in March	Sugarcane height in April	Sugarcane shoot population in April
	%		cm	1,000/ha
Burn December	10 b [e]	12 c	37 a	121.8 a
Mechanical December	18 a	34 b	36 a	120.7 a
Mechanical January	4 c	33 b	33 bc	118.1 a
Mechanical February	4 c	37 b	35 ab	117.5 a
Mechanical March [c]	5 c	79 a	32 c	101.7 b

[a] Tillage programs consisted of spring tillage (mid-March) with or without. A significant sugarcane crop residue management by spring tillage interaction was not observed. Data for each parameter represent an average across tillage treatments and two locations.

[b] Crop residue was removed by burning December 8, 2003 or December 16, 2004, or by mechanical removal using a Sunco Trash Tiger® which raked residue from row tops to row middles on December 8 or 16, January 14 or 21, February 12 or 21, and March 23 or 24, respectively. 'LCP 85-384' sugarcane was harvested with a chopper harvester on December 4, 2003 and December 12, 2004.

[c] Residue had not been removed when data were collected.

[d] Winter weeds included spiny sowthistle (*Sonchus asper* (L.) Hill), annual bluegrass (*Poa annua* L.), and Italian ryegrass (*Lolium multiflorum* Lam.) and were present only at the St. Gabriel location.

[e] Means for each parameter followed by the same letter are not significantly different ($P \leq 0.05$) using Fisher's protected LSD.

Table 5. Effect of residue removal timing and tillage on sugarcane height in June and August and sugarcane and sugar yield.[a]

Residue removal timing[b]	Sugarcane height in June	Sugarcane height in August	Sugarcane yield[c]	Sugar yield[c]
	——— cm	———	1,000 kg/ha	kg/ha
Burn December	169 a[d]	203 a	73.1 ab	8,720 a
Mechanical December	166 ab	199 a	73.9 a	8,610 ab
Mechanical January	165 ab	201 a	71.4 abc	7,990 bc
Mechanical February	161 bc	202 a	65.4 c	7,500 c
Mechanical March	157 c	187 b	67.5 bc	7,560 c

[a] Tillage programs consisted of spring tillage (mid-March) with or without. A significant sugarcane crop residue management by spring tillage interaction was not observed. Data for each parameter represent an average across tillage treatments and two locations.

[b] Crop residue was removed by burning December 8, 2003 or December 16, 2004, or by mechanical removal using a Sunco Trash Tiger® which raked residue from row tops to row middles on December 8 or 16, January 14 or 21, February 12 or 21, and March 23 or 24, respectively. 'LCP 85-384' sugarcane was harvested with a chopper harvester on December 4, 2003 and December 12, 2004.

[c] Data collected only at the St. Gabriel location.

[d] Means for each parameter followed by the same letter are not significantly different ($P \leq 0.05$) using Fisher's protected LSD.

NUTSEDGE (*CYPERUS* SPP.) CONTROL PROGRAMS IN NEWLY PLANTED SUGARCANE

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The overall objective of this research was to evaluate sulfentrazone (Spartan), halosulfuron (Permit), and trifloxysulfuon (Envoke) applied postemergence (POST) in the fall and spring in sugarcane for nutsedge control and sugarcane tolerance. The competitive effect of nutsedge on growth and establishment of newly planted sugarcane was also studied.

Fall POST Study. Field experiments were conducted over the 2005-2006 growing season in New Roads and Vacherie, LA. Locations were selected due to heavy infestations of nutsedge species that had emerged with the sugarcane crop after planting on August 5, 2005, at New Roads and August 8, 2005, at Vacherie. All plots were planted with sugarcane variety LCP 85-384 either as sectioned stalks (billets) (Vacherie) or whole stalks (New Roads) depending on grower preference and machinery available. At the New Roads the soil type was a Commerce silt loam (fine-silty, mixed, superactive, non-acid, thermic Fluvaquentic Endoaquepts) with 1.5% OM and a pH of 5.7. The soil type at Vacherie was also a Commerce silt loam with 1.5% OM and a pH of 6.2. The experimental design was a randomized complete block with 8 herbicide treatments and a nontreated control for comparison with 4 replications. Experimental plots consisted of three 15.2 m long sugarcane rows spaced 1.8 m apart. Command plus Direx was applied at planting to the entire experimental area to control annual grasses and broadleaves. Command has little activity on purple or yellow nutsedge.

Treatments consisted of halosulfuron at 53.0 and 70.6 g/ha (1.0 and 1.33 oz/A Permit 75DF), halosulfuron at 53.0 g/ha plus 2,4-D at 1870 g ai/ha (1.0 oz/A Permit + 3.5 pt/A 2,4-D ester), a premix of halosulfuron at 70.6 g/ha plus dicamba at 270 g ai/ha and at 106.0 g/ha plus 410 g/ha (6 and 8 oz/A Yukon), and trifloxysulfuron at 10.5 and 15.7 g/ha (0.2 and 0.3 oz/A Envoke 75DF, and trifloxysulfuron at 10.5 g/ha plus 2,4-D at 1870 g/ha (0.2 oz/A Envoke 75DF + 3.5 pt/A 2,4-D ester). 2,4-D was evaluated because of local reports of its activity on nutsedge and the possibility that it may increase control when applied with either halosulfuron or trifloxysulfuron. The halosulfuron/dicamba premix was evaluated as a means to reduce cost compared with halosulfuron alone. Treatments were applied when average sugarcane height was 20 to 25 cm (8 to 10 inches) and nutsedge species were 10 to 15 cm (4 to 6 inches) in height on September 9, 2005, at New Roads and September 12, 2005, at Vacherie. Nonionic surfactant at 0.25% (v/v) was added to all treatments, except where 2,4-D was used.

Visual estimates of nutsedge (purple and yellow nutsedge combined) control and sugarcane injury were made 2, 4, and 6 weeks after treatments (WAT) in 2005 based on a scale of 0 to 100% with 0 = no control or injury and 100 = all plants present at application dead and no new plants emerged. An additional rating for nutsedge control was made in April 2006, only at New Roads based on the same scale previously mentioned. Sugarcane shoot population was determined 6 WAT in 2005 and in March 2006. Sugarcane stalk height, measured from the soil surface to the collar of the youngest leaf on ten randomly selected stalks, was recorded in June and August 2006. Stalk population was also determined in August 2006. At each location during the 2006 growing season the entire experimental area received standard weed control programs and cultural practices depending on grower preference. Sugarcane yield and sugar yield were not determined because shortly after the August rating sugarcane was severely lodged making it impossible to collect data.

Nutsedge (purple and yellow nutsedge combined) was controlled no more than 44% 2 WAT with the halosulfuron and trifloxysulfuron treatments (Table 1). Nutsedge control with all halosulfuron treatments was equivalent and averaged 80% 4 WAT and 77% 6 WAT. Control with the trifloxysulfuron treatments averaged 74% 4 WAT and at 6 WAT control ranged from 64 to 71%. The combination of 2,4-D and trifloxsulfuron slightly improved nutsedge control 6 WAT compared with trifloxsulfuron alone (71 vs. 64%). The true value of treatments for nutsedge control would be the residual effect the following year in the plant cane crop. In April 2006, nutsedge control with the halosulfuron treatments averaged 74% compared with an average of 44% for the trifloxysulfuron treatments (Table 1). The combination of dicamba or 2,4-D and halosulfuron or 2,4-D and trifloxsulfuron did not improve nutsedge control.

The effect of the herbicide treatments were also evaluated in sugarcane. For the halosulfuron treatments sugarcane injury at 2, 4, and 6 WAT was no more than 4% (Table 2). In contrast for the trifloxysulfuron treatments, sugarcane was injured an average of 31% 2 WAT and 13% 4 WAT, but injury was not observed 6 WAT. Although nutsedge was controlled 64 to 79% with the halosulfuron and trifloxysulfuron treatments 6 WAT (Table 1), sugarcane shoot population 6 WAT was not increased (Table 2). However, by March of the following year sugarcane shoot populations reflected the value of the herbicide treatments (p=0.064). All halosulfuron treatments except halosulfuron applied alone at 53.0 g/ha resulted in greater sugarcane shoot population compared with the nontreated control. Shoot population in March was also increased when trifloxysulfuron was applied at 15.7 g/ha and when trifloxysulfuron at 10.5 g/ha plus 2,4-D at 1870 g/ha. Of interest is that the greater nutsedge control in April 2006 with the halosulfuron treatments compared with the trifloxysulfuron treatments (Table 1) was not reflected in differences in sugarcane shoot population among the treatments in 2006. There were also no differences among the herbicide treatments in sugarcane height in June or August or sugarcane stalk population in August of the next year even though residual effect of the fall applied herbicide treatments on nutsedge control were observed early in the growing season.

Spring POST Study. Field experiments were conducted in 2005 at Loreauville and in 2006 at Franklin, LA, to evaluate nutsedge control and sugarcane response with herbicides applied POST in the spring of the first production year. Specific locations were selected due to heavy infestations of both purple and yellow nutsedge that had either emerged from the winter dormant period with the sugarcane crop that had been planted in August of the previous year or that had not been winter killed. The sugarcane variety was 'HoCP 96-540' and both locations were planted as whole stalks. At Loreauville the soil type was a Loreauville silt loam (fine-silty, mixed, thermic Udollic Ochraqualfs) with 1.5% OM and a pH of 6.4. The soil type at Franklin was a Baldwin silty clay loam (fine, smectitic, hyperthermic Chromic Vertic Epiaqualfs) with 1.3 OM and a pH of 6.1.

The experimental design at Loreauville was a randomized complete block with 4 herbicide treatments and a nontreated control with 4 replications. The experimental design at Franklin was a randomized complete block with 9 herbicide treatments and a nontreated control with 4 replications. Experimental plots consisted of three 15.2 m long sugarcane rows spaced 1.8 m apart. Command plus Direx was applied at planting in 2004 at Loreauville and Sencor was applied at planting in 2005 at Franklin to the entire experimental area to control annual grasses and broadleaves.

Treatments at Loreauville consisted of halosulfuron at 53.0 and 70.6 g/ha (1.0 and 1.33 oz/A Permit 75DF) and trifloxysulfuron at 10.5 and 15.7 g/ha (0.2 amd 0.3 oz/A Envoke 75DF). Treatments at Franklin consisted of halosulfuron at 35.3, 53.0, and 70.6 g/ha (0.67, 1.0, and 1.33 oz/A Permit 75DF), trifloxysulfuron at 5.3, 10.5 and 15.7 g/ha (0.1, 0.2 and 0.3 oz/A Envoke 75DF), a premix of halosulfuron at 53.0 g/ha plus dicamba at 200 g/ha and 70.6 g/ha plus 270 g/ha (4 and 6 oz/A Yukon), and 2,4-D at 1870 g/ha (3.5 pt/A 2,4-D ester). Treatments were applied POST when average sugarcane height was 20 to 25 cm (8 to 10 inches) and nutsedge was 5 to 10 cm (2 to 4 inches) in height on March 24, 2005 at Loreauville and March 8, 2006, at Franklin. Nonionic surfactant at 0.25% (v/v) was added to all treatments, except where 2,4-D was applied alone. Treatments were applied on a band which covered a 91 cm (36 inch) area of the row top. Typically in Louisiana herbicides are banded following spring tillage where only the row shoulders and middles are worked.

Visual estimates of nutsedge (purple and yellow nutsedge combined) control and sugarcane injury were made 3 and 5 WAT based on a scale of 0 to 100% with 0 = no control or injury and 100 = all plants present at application dead and no new plants emerged. An additional rating for nutsedge control was made at 8 WAT in 2005, at Loreauville using the same rating scale. Sugarcane shoot population was determined 5 WAT in 2006, only at Franklin. Sugarcane stalk height, measured from the soil surface to the collar of the youngest leaf on ten randomly selected stalks, was recorded in May and July at both locations. Stalk population was also determined in July of 2006, only at Franklin. All plots within each location during the growing season received standard weed control programs and cultural practices depending on grower preference. Sugarcane yield and sugar yield were not determined.

In this study, halosulfuron and trifloxysulfuron treatments were applied in March of the first production year. Application was made to sugarcane and nutsedge that had emerged from the winter dormant period. Some of the nutsedge had not been winterkilled from the previous year due to a mild winter. Nutsedge (purple and yellow nutsedge combined) control averaged over two years was 80 and 77% 3 WAT for halosulfuron at 70.6 g/ha and trifloxysulfuron at 15.7 g/ha, respectively (Table 4). For both herbicides a decrease in nutsedge control occurred when rate was reduced. By 5 WAT for the two years, nutsedge control averaged 79% for halosulfuron at 53.0 and 70.6 g/ha and trifloxysulfuron at 15.7 g/ha. At 8 WAT nutsedge was controlled in 2005 70% for halosulfuron at 53.0 g/ha and control was no more than 61% for the trifloxysulfuron. In 2006 additional treatments were included for evaluation, halosulfuron at 35.3 g/ha, trifloxysulfuron at 5.3 g/ha, a halosulfuron plus dicamba premix, and 2,4-D ester applied alone. At 3 WAT all rates of halosufuron and halosulfuron plus dicamba provided equivalent nutsedge control and averaged 80% (Table 3). Trifloxysulfuron controlled nutsedge 74 and 79% at the two highest rates 3 WAT, but control decreased to 66 when applied at 5.3 g/ha. At 5 WAT halosulfuron at 53.0 and 70.6 g/ha applied alone or with dicamba provided equivalent control and averaged 81%. Control for the lower rate of halosulfuron was 64% 5 WAT. Trifloxysulfuron at 10.5 and 15.7 g/ha 5 WAT controlled nutsedge 71 and 81%, respectively, but control was 53% when applied at 5.3 g/ha. 2,4-D ester provided no more than 36% nutsedge control.

Sugarcane injury averaged over two years was as high as 24 and 10% 3 and 5 WAT, respectively, for trifloxysulfuron, but injury was not observed for halosulfuron treatments (Table 4). In 2006 when additional treatments were evaluated, sugarcane injury at 3 and 5 WAT increased as trifloxysulfuron rate increased from 5.3 to 15.7 g/ha. For the highest rate of trifloxysulfuron sugarcane was injured 36% 3 WAT and 20% 5 WAT. As noted earlier, sugarcane was not injured with any of the halosulfuron treatments. Injury associated with trifloxysulfuron included white banding on leaves that were in the whorl when application was made and also some stunting. Injury, however, was not reflected in shoot population 5 WAT (Table 4).

The residual effect of nutsedge control and sugar cane injury associated with the herbicide treatments was evaluated as the growing season progressed. In comparing treatment means either averaged across years or for a single year, the level of nutsedge control and sugarcane injury observed with the various treatments (Tables 3 and 4) were not reflected in differences in sugarcane height in May or June or stalk population in July (Table 5). Obviously sugarcane was able to recover from the initial injury from trifloxysulfuron and the level of nutsedge control for the various treatments was sufficient to allow sugarcane to out compete nutsedge. Even though nutsedge was emerged in March when the herbicides were applied the soil temperature was not conducive to rapid growth and establishment. The variability in plant population in sugarcane fields because of variation in planting/seeding rates can often lead to considerable variation in stands. This may have contributed to the inability to detect significant differences among the treatments in sugarcane height and population, although values were numerically lowest for the nontreated control. In considering sugarcane stalk population in July 2006, halosulfuron increased population 12 to 14% and 2,4-D which was ineffective on nutsedge increased population by only 4% ($p=0.53$). Even so, results from this study suggest that application of halosulfuron or trifloxysulfuron for nutsedge control in the spring would not be economical due to the ability of sugarcane to adequately compete with nutsedge at that time of the year.

Both purple and yellow nutsedge are becoming more problematic in sugarcane grown in both Louisiana and Florida. The nutsedge problem should be addressed first in the fallow period to prevent weeds from removing moisture from the seedbeds and causing problems in opening of rows and in covering of planted sugarcane. When nutsedge emerges with the planted sugarcane a timely application of either halosulfuron or trifloxysulfuron should be made. The reduction in the ability of nutsedge to reestablish a significant underground tuber population will allow sugarcane to establish a stable root system that will help sustain the sugarcane plant through the wet and cool winter dormant period and promote development of buds that will affect shoot emergence in the spring. A healthy and vigorous early emerging sugarcane plant is more competitive with weeds and better able to maximize its yield potential.

Table 1. Nutsedge control 2, 4, and 6 weeks after treatment (WAT) in 2005 and in the following spring (2006) following postemergence (POST) herbicide treatments in newly planted sugarcane.[a]

Treatment[b]	Rate	Nutsedge control			
		2 WAT 2005	4 WAT 2005	6 WAT 2005	April 2006
	g ai/ha	--%--			
Halosulfuron	53.0	40 ab[c]	79 ab	75 abc	78 a
Halosulfuron	70.6	44 a	81 a	78 ab	76 ab
Halosulfuron + 2,4-D	53.0 + 1870	43 ab	81 a	76 ab	78 a
Halosulfuron + dicamba	70.6 + 270	39 b	80 a	75 abc	68 b
Halosulfuron + dicamba	106.0 + 410	43 ab	80 a	79 a	71 ab
Trifloxysulfuron	10.5	39 b	73 c	64 d	43 c
Trifloxysulfuron	15.7	41 ab	74 bc	68 cd	45 c
Trifloxysulfuron + 2,4-D	10.5 + 1870	43 ab	76 abc	71 bc	45 c
Nontreated	-- --	0 c	0 d	0 e	0 d

[a] POST herbicide applications were made 5 weeks after planting on September 9 and 12, 2005 at New Roads, LA, and Vacherie, LA, respectively. Both purple and yellow nutsedge were present and weeds were 10 to 15 cm tall at POST application. Sugarcane at application was 20 to 25 cm.

[b] All herbicides were applied with a surfactant at 0.25% v/v, except where 2,4-D was used. 2,4-D formulation used was a low volatile ester with 0.8 kg ai/L. The halosulfuron plus dicamba treatment is a premix sold under the trade name, Yukon, Gowan Company, 370 Main Street, Yuma, AZ 85364.

[c] Data represent an average across two locations except for the April rating which represents only the New Roads, LA location. Treatment means followed by the same letter are not significantly different ($P > 0.05$).

Table 2. Sugarcane injury 2, 4, and 6 weeks after treatment (WAT) and shoot population in 2005 and sugarcane shoot population, height, and stalk population in 2006 following postemergence (POST) herbicide treatments for nutsedge control in newly planted sugarcane.[a]

Treatment[b]	Rate	Sugarcane injury			Shoot population		Height[c]		Stalk population
		2 WAT 2005	4 WAT 2005	6 WAT 2005	6 WAT 2005	March 2006	June 2006	August 2006	August 2006
	g ai/ha	------------------%----------------			-----1,000/ha-----		---------cm---------		1,000/ha
Halosulfuron	53.0	4 b[d]	3 b	0	13.4	19.1	122	198	19.2
Halosulfuron	70.6	1 bc	2 b	0	14.2	22.0*[d]	127	198	21.6
Halosulfuron + 2,4-D	53.0 + 1870	0 c	1 b	0	15.6	21.4*	130	209	21.4
Halosulfuron + dicamba	70.6 + 270	2 bc	4 b	0	14.0	19.8*	124	200	21.4
Halosulfuron + dicamba	106.0 + 410	1 bc	4 b	0	14.6	19.9*	130	201	22.2
Trifloxysulfuron	10.5	30 a	13 a	1	14.0	19.4	126	196	20.2
Trifloxysulfuron	15.7	31 a	14 a	1	15.2	20.1*	126	200	19.6
Trifloxysulfuron + 2,4-D	10.5 + 1870	31 a	13 a	0	14.9	22.9*	121	199	20.9
Nontreated	-- --	0 c	0 c	0	11.4	16.3	115	189	19.2
P-value > F[e]	-- --	0.001	0.001	0.446	0.186	0.064	0.173	0.366	0.286

[a] POST herbicide applications were applied 5 weeks after planting on September 9 and 12, 2005 at New Roads, LA, and Vacherie, LA, respectively. Both purple and yellow nutsedge were present and weeds were 10 to 15 cm tall at POST application. Sugarcane at application was 20 to 25 cm.

[b] All herbicides were applied with a surfactant at 0.25% v/v, except where 2,4-D was used. 2,4-D formulation used was a low volatile ester with 0.8 kg ai/L. The halosulfuron plus dicamba treatment is a premix sold under the trade name, Yukon, Gowan Company, 370 Main Street, Yuma, AZ 85364.

[c] Sugarcane height was measured from the soil surface to the upper most leaf collar.

[d] Data represent an average across two locations; New Roads, LA, and Vacherie, LA. Treatment means followed by the same letter are not significantly different ($P > 0.05$). An asterisk (*) represents a significant increase in percent shoots compared to the nontreated.

[e] Based on ($P < 0.05$) differences among treatments for the parameters measured were not detected. Specific P-values are provided for all parameters measured.

Table 3. Postemergence (POST) control of nutsedge 3, 5, and 8 weeks after treatment (WAT) with herbicides applied in March as sugarcane regrowth was initiated following the winter dormant period.[a]

		Nutsedge control				
		3 WAT		5 WAT		8 WAT
Treatment[b]	Rate	2-yr. Avg.	2006	2-yr Avg.	2006	2005
	g ai/ha	%				
Halosulfuron	35.3	-- --	76 ab	-- --	64 c	-- --
Halosulfuron	53.0	73 b[c]	83 a	77 a[c]	78 ab	70 ab
Halosulfuron	70.6	80 a	80 ab	81 a	81 ab	71 a
Trifloxysulfuron	5.3	-- --	66 c	-- --	53 d	-- --
Trifloxysulfuron	10.5	68 c	74 b	71 b	71 b	56 b
Trifloxysulfuron	15.7	77 ab	79 ab	79 a	81 ab	61 b
Halosulfuron + dicamba	53.0 + 200	-- --	79 ab	-- --	80 ab	-- --
Halosulfuron + dicamba	70.6 + 270	-- --	83 a	-- --	83 a	-- --
2,4-D	1870	-- --	36 d	-- --	30 e	-- --
Nontreated	-- --	0 d	0 e	0 d	0 f	0 c

[a] POST herbicide applications were applied on March 21, 2005 and March 8, 2006 at Loreauville, LA, and Franklin, LA, respectively. Both purple and yellow nutsedge were present and weeds were 5 to 10 cm tall at POST application. Sugarcane at application was 25 to 30 cm.

[b] All herbicides were applied with a surfactant at 0.25% v/v except where 2,4-D was applied alone. .2,4-D formulation used was a low volatile ester with 0.8 kg ai/L. The halosulfuron plus dicamba treatment is a premix sold under the trade name, Yukon, Gowan Company, 370 Main Street, Yuma, AZ 85364.

[c] Data represent an average across two locations for all treatments except the lowest rates of halosulfuron and trifloxysulfuron, both rates of the premix halsulfuron plus dicamba, and 2,4-D which were only applied in 2006. Treatment means followed by the same letter are not significantly different (P > 0.05). Treatment means in each column (2005 or 2006) followed by the same letter are not significantly different (P > 0.05) using LSD.

Table 4. Sugarcane injury 3 and 5 weeks after treatment (WAT) and shoot population 5 WAT following postemergence herbicides applied in March as sugarcane regrowth was initiated following the winter dormant period.[a]

		Sugarcane injury				Shoot population
		3 WAT		5 WAT		5 WAT
Treatment[b]	Rate	2-yr. Avg.	2006	2-yr. Avg.	2006	2006
	g ai/ha	-------------------------------------%-----------------------------------				1,000/ha
Halosulfuron	35.3	-- --	0 d	-- --	0 d	18.3
Halosulfuron	53.0	0 b[c]	0 d	0 b[c]	0 d	18.9
Halosulfuron	70.6	0 b	0 d	2 b	0 d	17.0
Trifloxysulfuron	5.3	-- --	20 c	-- --	11 c	16.9
Trifloxysulfuron	10.5	18 a	28 b	7 a	14 b	18.8
Trifloxysulfuron	15.7	24 a	36 a	10 a	20 a	17.3
Halosulfuron + dicamba	53.0 + 200	-- --	0 d	-- --	0 d	17.1
Halosulfuron + dicamba	70.6 + 270	-- --	0 d	-- --	0 d	17.0
2,4-D	1870	-- --	0 d	-- --	0 d	16.9
Nontreated	-- --	0 b	0 d	0 b	0 d	17.6
P-value >F	-- --	-- --	-- --	-- --	-- --	0.891

[a] POST herbicide applications were applied on March 21, 2005 and March 8, 2006 at Loreauville, LA, and Franklin, LA, respectively. Both purple and yellow nutsedge were present and weeds were 5 to 10 cm tall at POST application. Sugarcane at application was 25 to 30 cm.

[b] All herbicides were applied with a surfactant at 0.25% v/v except where 2,4-D was applied alone. .2,4-D formulation used was a low volatile ester with 0.8 kg ai/L. The halosulfuron plus dicamba treatment is a premix sold under the trade name, Yukon, Gowan Company, 370 Main Street, Yuma, AZ 85364.

[c] Data represent an average across two locations for all treatments except the lowest rates of halosulfuron and trifloxysulfuron, both rates of the premix halsulfuron plus dicamba, and 2,4-D which were only applied in 2006. Treatment means in each column (2006) followed by the same letter are not significantly different ($P > 0.05$) using LSD.

Table 5. Sugarcane height and stalk population in May and July following postemergence herbicides applied in March as sugarcane regrowth was initiated following the winter dormant period.[a]

		Height				Stalk population
		May		July		July
Treatment[b]	Rate	2-yr. Avg.	2006	2-yr. Avg.	2006	2006
	g ai/ha	----------------------------cm	------------------------------			1,000/ha
Halosulfuron	35.3	-- --	99	-- --	223	14.8
Halosulfuron	53.0	89	104	215	219	14.6
Halosulfuron	70.6	89	98	219	221	14.5
Trifloxysulfuron	5.3	-- --	100	-- --	213	15.3
Trifloxysulfuron	10.5	93	107	219	227	13.5
Trifloxysulfuron	15.7	86	94	211	213	15.2
Halosulfuron + dicamba	53.0 + 200	-- --	101	-- --	223	13.9
Halosulfuron + dicamba	70.6 + 270	-- --	104	-- --	215	15.2
2,4-D	1870	-- --	100	-- --	215	13.5
Nontreated	-- --	84	92	211	207	13.0
P-value >F	-- --	0.168	0.200	0.096	0.165	0.530

[a] POST herbicide applications were applied on March 21, 2005 and March 8, 2006 at Loreauville, LA, and Franklin, LA, respectively. Both purple and yellow nutsedge were present and weeds were 5 to 10 cm tall at POST application. Sugarcane at application was 25 to 30 cm. Sugarcane height was measured from the soil surface to the upper most leaf collar.

[b] All herbicides were applied with a surfactant at 0.25% v/v except where 2,4-D was applied alone. 2,4-D formulation used was a low volatile ester with 0.8 kg ai/L. The halosulfuron plus dicamba treatment is a premix sold under the trade name, Yukon, Gowan Company, 370 Main Street, Yuma, AZ 85364.