SUGARCANE WEED MANAGEMENT

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Investigating the Control of Suspected Paraquat Resistant Italian Ryegrass with paraquat and PSII Tank Mixtures

A study was initiated at the Sugar Research Station in St. Gabriel, LA on February 11, 2020 to investigate postemergence control of a suspected paraquat resistant population of Italian ryegrass (*Lolium multiflorum*) with several rates of paraquat and tank mixes of paraquat and PSII herbicides. Herbicide treatments were applied to 0.5 – 1.5 in. tall (top leaf collar) Italian ryegrass in the tillering stage. The experimental design was a randomized complete block design with 4 replications, and the plot size was 6 ft. X 40 ft. in length. Herbicide treatments included Gramoxone SL 2.0® (paraquat) applied at 1.5, 3, 6, and 12 pt/A, as well as Gramoxone® at 3 pt/A tank-mixed individually with TriCor® (metribuzin) at 2 lb/A, Atrazine® (atrazine) at 2 qt/A, Karmex® (diuron) at 3.13 lb/A and Evik® (ametryn) at 1.5 lb/A. Non-ionic surfactant was added to all herbicide treatments at 0.25% v/v. Visual control was recorded at 7 days after application (DAA). Ryegrass control averaged 20% for the 3 pt/A Gramoxone® treatment (highest labeled use rate in sugarcane) (Table 1). The addition of TriCor®, Atrazine®, Karmex®, and Evik® to paraquat provided no improvement in ryegrass control as compared to the stand alone paraquat 3 pt/A treatment and ranged from 15-16% control. The 12 pt/A paraquat treatment provided the greatest ryegrass control, yielding 56%; however, this level is still greatly below an acceptable level of control.

Efficacy of Experimental Compounds on Suspected Paraquat Resistant Italian Ryegrass

A study was conducted in Bunkie, LA on February 17, 2020 to investigate the efficacy of alternative herbicides on a suspected paraquat resistant population of Italian ryegrass (*Lolium multiflorum*) following emergence. Herbicide treatments were applied to 0.5 – 1.5 in. tall (top leaf collar) Italian ryegrass in the tillering stage. The experimental design was a randomized complete block design with 4 replications, and the plot size was 6 ft. X 30 ft. in length. Herbicide treatments included Resolve Q® (rimsulfuron + thifensulfuron-methyl) at 2.5 oz/A, Caprino® (thiencarbazone-methyl + tembotrione) at 6 oz/A, and Asulox® (asulam) + Envoke® (trifloxysulfuron-sodium) at 2 qt + 0.5 oz/A. Gramoxone SL 2.0® at 3 pt/A was also included as well as an untreated control for comparison. Non-ionic surfactant was added to all herbicide treatments at 0.25% v/v. Visual control was recorded at 18 and 35 DAA (Table 2). At the 35 DAA rating, the Asulox® + Envoke® treatment controlled 88% of Italian ryegrass whereas the Gramoxone SL 2.0® treatment controlled 9%. Resolve Q® and Caprino® controlled 70 and 55% of Italian ryegrass, respectively, and warrants further investigation on sugarcane tolerance to these products. Resolve Q® and Caprino® are not labeled for use in sugarcane.

Investigating the Control of Suspected Paraquat Resistant Italian Ryegrass with Increased Rates of Paraquat

A study was initiated in a commercial sugarcane field in Bunkie, LA on February 17, 2020 to investigate postemergence control of a suspected paraquat resistant population of Italian ryegrass (*Lolium multiflorum*) with increasing rates of paraquat. Herbicide treatments were

applied to 0.5 – 1.5 in. tall (top leaf collar) Italian ryegrass in the tillering stage. The experimental design was a randomized complete block design with 4 replications, and the plot size was 6 ft. X 30 ft. in length. Gramoxone SL 2.0® was applied at 3, 6, 12, 24, and 48 pt/A. Additionally, an Asulox® treatment at 4 qt/A was included to evaluate the products efficacy on Italian ryegrass. Non-ionic surfactant was added to all herbicide treatments at 0.25% v/v. Visual control was recorded at 18 and 35 DAA (Table 3). Ryegrass control averaged 5, 23, 41, 73, and 89 % for the 3, 6, 12, 24, and 48 pt/A paraquat treatments, respectively 18 DAA. At 35 DAA, ryegrass control averaged 4, 17, 29, 49, and 79% for the 3, 6, 12, 24, and 48 pt/A Gramoxone SL 2.0® treatments, respectively. The Asulox® treatment controlled 27% of ryegrass 18 DAA, but control was increased to 75% at 35 DAA. In order to obtain commercially acceptable POST control of the Bunkie, LA population of Italian ryegrass required a 48 pt/A application of paraquat, which is 16X greater than the highest rate allowed by the current paraquat label.

Effect of Paraquat Rate on Sugarcane Yield Parameters

A study was initiated in a commercial sugarcane field in Vacherie, LA. The experimental design was a randomized complete block design with 4 replications, and the plot size was 18 ft. X 30 ft. in length. Paraquat was applied in the spring of 2020 to second ratoon L 01-299 at the 3-4 leaf stage on March 12, 2020 and at the 7-8 leaf stage on April 13, 2020 at rates of 3, 6, and 12 pt/A. Additional treatments included a sequential application of Gramoxone SL 2.0® at 3 pt/A (March and April), and Satellite Flex® (pendimethalin) + TriCor® at 2.1 qt + 2 lb/A (March) followed by a sequential application of Satellite Flex® 2.1 qt/A (April). Non-ionic surfactant was added to all paraquat herbicide treatments at 0.25% v/v. A non-treated control was also included for comparison. Plots were hand-sampled (10-stalks) then were harvested with a sugarcane chopper harvester on October 26, 2020 and plots were loaded into a wagon equipped with load cells to gain theoretical recoverable sugar (TRS) per ton of sugarcane and sugarcane yield (tons/A). Sugarcane yield was similar for the Gramoxone SL 2.0® treatments within a given application timing, and averaged 44.4 and 29.6 tons/A for the March and April timings, respectively (Table 4). Sugarcane yield for the sequential paraquat treatment (March followed by April) was equivalent to that of a single April Gramoxone SL 2.0®application. Sugarcane yield for the non-treated check averaged 48.2 tons/A. Sugarcane yield was statistically similar for the March application of paraquat as compared to the check. TRS was similar for all treatments. Sugar yield per acre, the product of sugarcane yield and stalk sucrose followed the trend of sugarcane yield. The non-treated check treatment averaged 10,980 lb of sugar/A as compared to the average of the April Gramoxone SL 2.0® treatments which averaged 8,660 lb of sugar/A.

Effect of Spring Applied Experimental Compounds on Sugarcane Yield Parameters

A study was initiated at the Sugar Research Station in St. Gabriel, LA to investigate the effects of two experimental herbicides on sugarcane yield parameters. On March 12, 2020, herbicide treatments were applied over-the-top of first stubble, L 01-299, which was at the 3-4 leaf stage. The experimental design was a randomized complete block design with 4 replications, and the plot size was 18 ft. X 30 ft. in length. Herbicide treatments included Fusilade® II (fluazifop-P-butyl) at 12 oz/A and Liberty® (glufosinate ammonium) at 29 oz/A. A Gramoxone SL 2.0® treatment (3 pt/A) and a non-treated control was also included for comparison. Non-ionic surfactant was added to all herbicide treatments at 0.25% v/v. Plots were hand-sampled (10-stalks) them were harvested with a sugarcane chopper harvester on November 18, 2020 and

plots were loaded into a wagon equipped with load cells to gain TRS and sugarcane yield. Sugarcane yield was significantly reduced with the Fusilade® II and Gramoxone SL 2.0® treatments by 17.3 and 5.4 tons/A, respectively as compared to the non-treated control which yielded 38.2 tons/A (Table 5). TRS and sugar yield were also significantly reduced by 10 and 50%, respectively for the Fusilade® II treatment as compared to the non-treated control. Fusilade® II and Liberty® are not labeled for use in sugarcane.

Investigating the Control of Purple Nutsedge in the Fallow Period with Glyphosate Mixtures

A study was initiated in a fallowed sugarcane field in Thibodaux, LA on May 20, 2020 to investigate postemergence control of purple nutsedge (*Cyperus rotundus*) with several glyphosate mixtures. The experimental design was a randomized complete block design with 4 replications, and the plot size was 6 ft. X 20 ft. in length. Treatments included Roundup PowerMaxII® (glyphosate) at 3 qt/A, Roundup PowerMaxII® + Vandal® (sulfentrazone) at 3 qt + 10 oz/A, Roundup PowerMaxII® + Vandal XL® (sulfentrazone & chlorimuron) at 3 qt + 4 oz/A, Roundup PowerMaxII® + Vandal® + Undercover® (mesotrione) at 3 qt + 6 oz + 3 oz/A, Roundup PowerMaxII® + Vandal® + Undercover® at 3 qt + 6 oz + 7 oz/A and Roundup PowerMaxII® + Permit® (halosulfuron) at 3 qt + 1 oz/A. Purple nutsedge control was recorded at 27 and 42 DAA. At 27 DAA, purple nutsedge control was similar for all treatments and averaged 86% for the Roundup PowerMaxII® treatment alone (Table 6). Purple nutsedge control was reduced for the Roundup PowerMaxII® treatment at 42 DAA and averaged 74%. The Roundup PowerMaxII® + Permit® treatment provided the highest level of control at 42 DAA (91%).

Efficacy of Labeled Sugarcane Herbicides on Preemergence Vaseygrass Control

Twelve labeled sugarcane herbicides were evaluated for preemergence vaseygrass (*Paspalum urvillei*) control at the Sugar Research Station in St. Gabriel, LA. Vaseygrass seeds were collected from mature vaseygrass plants. Seeds were broadcast seeded to fallow sugarcane beds and the seeds were lightly incorporated. The experimental design was a randomized complete block design with 4 replications, and the plot size was 6 ft. X 8 ft. in length. Herbicide treatments included TriCor® at 2 lb/A, Visor S-Moc® (s-metolachlor) at 1.22 qt/A, Velossa® (hexazinone) at 1.6 pt/A, Karmex® at 3lb/A, Satellite Flex® at 3.4 qt/A, Command® (clomazone) at 3.3 pt/A, Atrazine® at 4 qt/A, Lumax EZ® (s-metolachlor + mesotrione + atrazine) at 3.75 qt/A, Tripzin ZC® (pendimethalin + metribuzin) at 4 qt/A, Vandal® at 12 oz/A, Treflan EC® (trifluralin) at 2 qt/A, and Sinbar® (terbacil) 1.5 lb/A and were applied May 29, 2020. Visual control was recorded at 41 DAA. The Visor S-Moc®, Velossa®, Karmex®, Command®, Lumax EZ®, and Treflan EC® treatments averaged at least 90% control as compared to the TriCor®, Atrazine®, and Sinbar® treatments which averaged no more than 25% control (Table 7).

Efficacy of Trycera and TriCor Tank Mixes on Bermudagrass

A study was initiated at the Sugar Research Station in St. Gabriel, LA on July 9, 2020 to investigate postemergence control of bermudagrass (*Cynodon dactylon*) with tank mixes of Trycera® (triclopyr) and TriCor®. The experimental design was a randomized complete block design with 4 replications, and the plot size was 6 ft. X 20 ft. in length. Herbicide treatments were applied to highly established bermudagrass growing on buffer rows and included, Trycera®

+ TriCor® at 40 oz + 1 lb/A, Trycera® + TriCor® at 40 oz + 2 lb/A, TriCor® at 2 lb/A, and Trycera® at 40 oz/A. Bermudagrass injury was recorded at 14 and 28 DAA, and the Trycera® + TriCor® at 40 oz + 2 lb/A treatment resulted in 79 and 73% injury at 14 and 28 DAA, respectively (Table 8). Bermudagrass injury averaged 48 and 33% for the Trycera® + TriCor® at 40 oz + 1 lb/A and the Trycera® treatments, respectively. The TriCor® treatment provided little to no control of bermudagrass.

Efficacy of Visor S-Moc on Preemergence Vaseygrass and Browntop Panicum Control

A study was initiated at the Sugar Research Station in St. Gabriel, LA on July 9, 2020 to investigate preemergence vaseygrass (*Paspalum urvillei*) control. Vaseygrass seeds were collected from mature vaseygrass plants. Seeds were broadcast seeded to fallow sugarcane beds and the seeds were lightly incorporated. The experimental design was a randomized complete block design with 4 replications, and the plot size was 6 ft. X 14 ft. in length. Visor S-Moc® was applied at 1, 1.5, and 2pt/A on July 15, 2020. Visual control was recorded at 22 and 49 DAA. All treatments yielded 100% vaseygrass control at 22 DAA and averaged at least 90% control at 49 DAA (Table 9). Browntop panicum (*Panicum fasiculatum*) control was also recorded and averaged 71, 89, and 96% for the 1, 1.5, and 2pt/A Visor S-Moc® treatments respectively 49 DAA.

Tolerance of Sugarcane and Postemergence Control of Itchgrass with Mission Herbicide

A study was conducted in a newly established commercial sugarcane field in Raceland, LA to investigate the tolerance of sugarcane and investigate the efficacy of Mission® (flazasulfuron) on itchgrass (*Rottboellia cochinchinensis*). Itchgrass was 6 to 12 in. at the time of treatment. Treatments were applied on October 5, 2020, and non-ionic surfactant was added to all herbicide treatments at 0.25% v/v. Mission® was applied at 2.14 and 2.85 oz/A and was compared with Asulox® at 3 qt/A. Sugarcane injury and visual itchgrass control was recorded at 14 and 29 DAA. No sugarcane injury was noted at both evaluation dates. Itchgrass control was greatest for the 2.85 oz/A Mission® and Asulox® treatments at 29 DAA and averaged 55% (Table 10). At 29 DAA, itchgrass control for the Asulox® treatment averaged 95%, as compared to 50% for both Mission® treatments. Mission® is not labeled for use in sugarcane.

Table 1. Mean percentage POST control of 0.5 to 1.5 inch tall suspected paraquat resistant Italian ryegrass with several herbicide treatments in St. Gabriel, LA in 2020

Treatment[1]	Rate/A	% Ryegrass Control 7 DAA[2]
Gramoxone SL 2.0®	1.5 pt	7 d[3]
Gramoxone SL 2.0®	3 pt	20 bc
Gramoxone SL 2.0®	6 pt*	36 ab
Gramoxone SL 2.0®	12 pt*	56 a
Gramoxone SL 2.0® + TriCor®	3 pt + 2 lb	15 cd
Gramoxone SL 2.0® + Atrazine®	3 pt + 2 qt	16 cd
Gramoxone SL 2.0® + Karmex®	3 pt + 3.13 lb	16 cd
Gramoxone SL 2.0® + Evik®	3 pt + 1.5 lb	16 cd
Non-treated Control		0 d

[1] Treatments applied 2/11/2020. Induce® non-ionic surfactant at 0.25% v/v added to all treatments.
[2] DAA = Days after application.
[3] Means within a column followed by the same lowercase letter are not significantly different at P=0.05.
* This application rate is not labeled for use in sugarcane.

Table 2. Mean percentage POST control of 0.5 to 1.5 inch tall suspected paraquat resistant Italian ryegrass with two experimental compounds in Bunkie, LA in 2020

Treatment[1]	Rate/A	% Ryegrass Control 18 DAA[2]	% Ryegrass Control 35 DAA
Resolve Q®*	2.5 oz	69 a[3]	70 b
Capreno®*	6 oz	40 c	55 c
Asulox® + Envoke®	2 qt + 0.5 oz	54 b	88 a
Gramoxone SL 2.0®	3 pt	5 d	9 d
Non-treated Control		0 d	0 d

[1] Treatments applied 2/17/2020. Induce® non-ionic surfactant at 0.25% v/v added to all treatments.
[2] DAA = Days after application.
[3] Means within a column followed by the same lowercase letter are not significantly different at P=0.05.
* Experimental compound; not labeled for use in sugarcane.

Table 3. Mean percentage POST control of 0.5 to 1.5 inch tall suspected paraquat resistant Italian ryegrass with increased rates of paraquat in Bunkie, LA in 2020

Treatment[1]	Rate/A	% Ryegrass Control 18 DAA[2]	% Ryegrass Control 35 DAA
Gramoxone SL 2.0®	3 pt	5 c[3]	4 c
Gramoxone SL 2.0®	6 pt	23 bc	17 c
Gramoxone SL 2.0®	12 pt*	41 b	29 bc
Gramoxone SL 2.0®	24 pt*	73 a	48 ab
Gramoxone SL 2.0®	48 pt*	89 a	79 a
Asulox®	4 qt	26 bc	75 a
Non-treated Control		0 c	0 c

[1] Treatments applied 2/11/2020. Induce® non-ionic surfactant at 0.25% v/v added to all treatments.
[2] DAA = Days after application.
[3] Means within a column followed by the same lowercase letter are not significantly different at P=0.05.
* This application rate is not labeled for use in sugarcane.

Table 4. Mean sugarcane yield, theoretical recoverable sugar (TRS), and sugar yield of second stubble L 01-299 treated with paraquat (Gramoxone SL 2.0) at two application timings in Vacherie, LA in 2020.

Treatment[1]	Application Timing[2]	Rate/A	Cane Yield (tons/A)	TRS (lb/ton)	Sugar Yield (lb/A)
Check			48.2 a[3]	227	10,980 a
Gramoxone SL 2.0®	March	3 pt	44.4 abc	225	9,992 abc
Gramoxone SL 2.0®	March	6 pt*	44.2 abc	238	10,502 ab
Gramoxone SL 2.0®	March	12 pt*	44.7 ab	218	9,712 abc
Gramoxone SL 2.0®	April	3 pt	39.9 bcd	222	8,848 bc
Gramoxone SL 2.0®	April	6 pt*	40.2 bcd	215	8,612 bc
Gramoxone SL 2.0®	April	12 pt*	38.4 d	222	8,519 c
Gramoxone SL 2.0® followed by Gramoxone SL 2.0®	March April	3 pt 3 pt	38.8 cd	225	8,730 bc
Satellite Flex® + TriCor® followed by Satellite Flex®	March April	2.1 qt + 2 lb 2.1 qt	47.0 a	214	10,063 abc

[1] Induce® non-ionic surfactant at 0.25% v/v added to all treatments. Harvested 10/26/2020.
[2] Application Timing = March 12, 2020 at the 3-4 leaf stage; April 13, 2020 at the 7-8 leaf stage.
[3] Means within a column followed by the same lowercase letter are not significantly different at P=0.05.
* This application rate is not labeled for use in sugarcane.

Table 5. Mean sugarcane yield, theoretical recoverable sugar (TRS), and sugar yield of first stubble L 01-299 treated with two experimental postemergence herbicides in St.Gabriel, LA in 2020.

Treatment[1]	Rate/A	Cane Yield (tons/A)	TRS (lb/ton)	Sugar Yield (lb/A)
Check		38.2 a[2]	228 a	8,683 a
Fusilade®*	12 oz	20.9 c	205 b	4,276 b
Liberty®*	29 oz	35.5 ab	231 a	8,134 a
Gramoxone SL 2.0®	3 pt	32.8 b	227 a	7,399 a

[1] Treatments applied 3/12/2020. Induce® non-ionic surfactant at 0.25% v/v added to all treatments. Harvested 11/18/2020.
[2] Means within a column followed by the same lowercase letter are not significantly different at P=0.05.
* Experimental compound; not labeled for use in sugarcane.

Table 6. Mean percentage POST control of purple nutsedge in a fallowed sugarcane field in Thibodaux, LA in 2020.

Treatment[1]	Rate/A	% Purple Nutsedge Control 27 DAA[2]	% Purple Nutsedge Control 42 DAA
Roundup PowerMaxII®	3 qt	86 ab	74 c
Roundup PowerMaxII® + Vandal®	3 qt + 10	86 ab	83 b
Roundup PowerMaxII® + Vandal XL®	3 qt + 4 oz	84 b	83 b
Roundup PowerMaxII® + Vandal® + Undercover®	3 qt + 4 oz + 3 oz	86 ab	81 bc
Roundup PowerMaxII® + Vandal® + Undercover®	3 qt + 4 oz + 7 oz	88 ab	83 b
Roundup PowerMaxII® + Permit®	3 qt + 1 oz	94 a	91 a
Non-treated Control		0 c	0 d

[1] Treatments applied 5/20/2020. Induce® non-ionic surfactant at 0.25% v/v added to all treatments.
[2] DAA = Days after application.
[3] Means within a column followed by the same lowercase letter are not significantly different at P=0.05.
* Experimental compound; not labeled for use in sugarcane.

Table 7. Mean percentage PRE control of vaseygrass with 12 labeled sugarcane herbicides in St. Gabriel, LA in 2020.

Treatment[1]	Rate/A	% Vaseygrass Control 41 DAA[2]
TriCor®	2 lb	25 de
Visor S-Moc®	1.22 qt	100 a
Velossa®	1.6 pt	90 abc
Karmex®	3 lb	98 ab
Satellite Flex®	3.4 qt	38 d
Command®	3.3 pt	100 a
Atrazine®	4 qt	0 e
Lumax EZ®	3.75 qt	98 ab
Tripzin ZC®	4 qt	69 c
Vandal®	12 oz	70 bc
Treflan EC®	2 qt	90 abc
Sinbar®	1.5 lb	11 de
Non-treated Control		0 e

[1] Treatments applied 5/29/2020.
[2] DAA = Days after application.
[3] Means within a column followed by the same lowercase letter are not significantly different at P=0.05.

Table 8. Mean percentage POST injury of bermudagrass on buffer rows in St.Gabriel, LA in 2020.

Treatment[1]	Rate/A	% Bermudagrass Injury 14 DAA[2]	% Bermudagrass Injury 28 DAA
Trycera® + Tricor®	40 oz + 1 lb	40 b	48 b
Trycera® + Tricor®	40 oz + 2 lb	79 a	73 a
Tricor®	2 lb	5 c	0 c
Trycera®	40 oz	29 bc	33 b

[1] Treatments applied 7/9/2020. Induce® non-ionic surfactant at 0.25% v/v added to all treatments.
[2] DAA = Days after application.
[3] Means within a column followed by the same lowercase letter are not significantly different at P=0.05.

Table 9. Mean percentage PRE control of vaseygrass and browntop panicum with s-metolachlor (Visor S-Moc®) in St. Gabriel, LA in 2020.

Treatment[1]	Rate/A	% Vaseygrass Control 22 DAA[2]	% Vaseygrass Control 49 DAA	% Browntop Panicum Control 49 DAA
Visor S-Moc®	1 pt	100 a	90 a	71 b
Visor S-Moc®	1.5 pt	100 a	93 a	89 a
Visor S-Moc®	2 pt	100 a	99 a	96 a
Non-treated Control		0 b	0 b	0 c

[1] Treatments applied 7/15/2020.
[2] DAA = Days after application.
[3] Means within a column followed by the same lowercase letter are not significantly different at P=0.05.

Table 10. Mean percentage POST control of 6 to 12 inch tall itchgrass with flazasulfuron (Mission®) herbicide in Raceland, LA in 2020.

Treatment[1]	Rate/A	% Ryegrass Control 14 DAA[2]	% Ryegrass Control 29 DAA
Mission®*	2.14 oz	50 b[3]	50 b
Mission®*	2.85 oz	55 a	50 b
Asulox®	3 qt	55 a	95 a
Non-treated Control		0 c	0 c

[1] Treatments applied 2/11/2020. Induce® non-ionic surfactant at 0.25% v/v added to all treatments.
[2] DAA = Days after application.
[3] Means within a column followed by the same lowercase letter are not significantly different at P=0.05.
* Experimental compound; not labeled for use in sugarcane.