Observations of TADS Foramsulfuron Formulations on Sea Isle I Paspalum as Affected by Mowing Height and Foliar Applied Iron

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Introduction

Foramsulfuron herbicide (TADS) has been successfully evaluated as a transitional aid in overseeded bermudgrass when applied in May in Tucson (2000, 2001, and 2002). Common bermudagrass is much more competitive against perennial ryegrass when it receives an application of this herbicide, coupled with extra water soluble –N- in May and June. The tolerance of the warm season grass Sea Isle I paspalum (P. vaginatum), to foramsulfuron (TADS) is not known. Therefore, an unreplicated pilot experiment was conducted in August of 2002 to observe initial responses of Sea Isle I paspalum to (1) two formulations of TADS, applied at (2) three different rates (0.4, 0.6, 1.2 ounces product/1000 ft^2, at (3) two mowing heights of 3/8" and 5/8", both with and without (4) a supplemental iron treatment at the time of application.

Materials and Methods

A four year old turf of Sea Isle I paspalum was used for this test. The large plot areas were mowed for the last three summers at two separate mowing heights (3/8" = tee, 5/8" = fairway) three times per week. Each mowing height was dissected into four strips. Each was then subdivided into rows of 5 x 10 plots, which received individual application of both the A8 and A1 liquid formulation of TADS. Immediately after application of TADS, one half of each plot was sprayed with 4-ounces/product/1000 ft^2 of Sequestrene 338 chelated iron. Therefore, each plot evaluated was 5' x 5'. All applications were made in the late afternoon of August 7, 2002 using a pressurized Co2 backpack sprayer delivering a final solution spray volume of 46 GPA. No traffic or irrigation occurred for 18 hours afterwards.

Plots were evaluated by visual means for response to TADS as degree of leaf yellowing, percent plot exhibiting those symptoms, overall plot color, turf quality, and relative degree of canopy stunting compared to untreated control after two successive days of growth. There were four evaluation dates (5, 7, 14, 21, 28 DAT) with 616 observations assigned to plots. Treatment combinations appeared once only and are not capable of statistical analysis. Observational patterns are discussed based on observations among treatments on a given date and across dates for trend and relative response discussion.

<u>Sea Isle I – 3/8" Tee Height</u>
Discoloration was evident as early as the end of day three, with all plots showing some initial response at 5 DAT and 7 DAT. The major impact at this time was that of the supplemental iron. The A8 formulation had lesser color scores <u>without</u> iron then the A1 formulation did, and the A1 had slightly greater color scores than the A8 formulation, when iron was added (Table 1). Discoloration occurred as a yellow leaf appearance throughout the turf on all leaf positions. This was evident by as early as day five, which increased by 7 DAT as well. Percent plot yellow was minimal when iron <u>was</u> included for the A1 formulation at the two lowest rates (Table 4). Both formulations <u>without</u> iron had significant percent plot yellowing, noting that the lowest (0.4 ounce) applications of the A1 formulation produced the least amount (10%) while other plots produced up to 35% plot yellowing at 7 DAT (Table 4). The degree of leaf yellow expression was noticeably greater for both A1 and A8 formulations when iron was not applied (Table 3). This was true at 7, 14, 21 and 28 DAT.

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At 14, 21, and 28 DAT, the A8 formulation treated turf plus iron produced acceptable quality turf, with exception of the 1.2 ounce rate of the A8 formulation, which was marginal in color and quality at 14 DAT (Table 2). At 14 DAT to 21 DAT, percent leaf yellowing was extremely noticeable for both A1 and A8 formulations, which lacked the extra iron treatment. At 14 DAT, all three product rates at A1 with iron had minimal or none leaf yellowing present (0-10%), compared to the same product rates of A8 with iron (5-20%) (Table 4).

At 21 DAT, the A1 formulation responded in rate dependent fashion for percent plot yellow turf (no iron), while the A8 was more extreme (5-50%) in response. By the close of the test at 28 DAT, percent plot yellowing decreased (no iron) for both formulations (5-20%) and only the A1 formulation at the low and middle rate had trace leaf yellowing expression (score = 2.0) (Table 4). The 3/8" iron-only control always produced the darkest color and best overall quality turf (Tables 1,2). The no iron non-treated control did produce 10-25% plot yellow turf, with slight-moderate degree of expression (scores = 2-3) (Tables 3,4).

In summary, the high rate of TADS A8 (1.20 ounce) without iron caused decreased quality and color by 7 DAT, which produced unsatisfactory turf up to 21 DAT, with marginal performance up to and including 28 DAT. The A1 formulation without iron had unacceptable quality at 5 and 7 DAT at both the 0.6 and 1.2 ounce rates, and were marginal at 14 and 21 DAT as well (Table 2). Without iron, only the lowest rate (0.4 ounce) of A1 produced fully acceptable color and quality turf at the 3/8" height (Tables 1,2).

When iron <u>was added</u>, the A1 formulation generally produced a darker and overall better quality turf, up to 28 DAT (Tables 1,2). When iron <u>was applied</u>, the 0.6-ounce rate was fully acceptable for A1 and A8 formulations, while the 1.2-ounce rate was slightly better in response for A1 than A8 on only one occasion. At the high rate of 1.2 ounce, neither formulation of A1 or A8 with or without iron seemed safe on paspalum. When not receiving the herbicide, the paspalum did respond most favorably to Sequestrene 138 at the 4.0-ounce rate at 3/8" (Tables 1,2.3.4).

<u>Sea Isle I @ 5/8" Fairway Turf</u>

When iron was <u>not</u> applied, both formulations showed definite rate responses (within each respective formulation). The 0.4-ounce rate produced good color and overall quality turf throughout the test period, with A1 providing better performance values than A8 (Tables 1,2). At the 0.6-ounce rate, both formulations produced a marginal turf condition throughout the test, while the 1.2-ounce rate proved highly unacceptable. Leaf yellowing was generally inversely related to color and quality scores at the 5/8" cut paspalum. Slight to moderate leaf yellowing occurred slightly more so for A8 than A1 at 0.4 ounce rate when no iron was applied. At the medium and high rates, leaf yellowing and percent plot expression were highly noticeable (Tables 3,4).

High levels of percent plot yellowing reached 55% and 85% for A8 and 40-45% for A1 at the 1.2-ounce rate (21 DAT) (Table 4). The lesser but still obvious discoloration at the mid-rate of 0.6 ounces was still unacceptable for both formulations.

When iron was added, the degree and percent of leaf yellowing was greatly reduced, and was completely avoided for the A1 formulation at the 0.4 ounce (low) rate all together. At the medium and high application rates of TADS, the A1 formulation produced much less percent plot discoloration than A8 did even though the degrees of expression were similar (slight) Table 3). The A1 formulation produced slight discoloration at a 10% plot maximum at 14 DAT at the high rate. The A8 formulation produced 20-30% discoloration from 7-21 DAT (Table 4). Likewise, color and quality responses were inversely related to the yellowing response at 5/8" as well. At the low and medium rates of TADS, turfgrass color was more acceptable for A1, when iron was not included. The high rate (1.2-ounce) for iron treated A8 produced unacceptable turf quality at 14 DAT (4.0) and marginal turf at 21 DAT (5.0). When iron was added, the A1 turf produced quality scores of 6.0 on all dates except at 14 DAT (5.0) at the 1.2-ounce rate (Table 2). At the high height of cut, TADS A1 with iron had fully acceptable turf up to and including the 0.6-ounce rate (Tables 1,2,3,4).

Note that a high quality source of chelated iron was used as an industry standard for alkaline soils. It is unknown if ferrous sulphate or other iron forms would have produced similar results. Since ferrous sulphate is the least expensive form of iron, it should be evaluated for fairway use conditions with TADS as both (1) a pre-iron treatment as a urf turf protectant and (2) as a tank mix for suitability as a lower cost application option for the turf manager.

Apparent Stunting at Both Mowing Heights

Sea Isle I was noticeably stunted by both formulations of TADS. At the 3/8” mowing height, the A8 formulation produced more visual stunting than the A1 formulation and the addition of iron appeared to minimize this across all rates of the A1 formulation (data not shown). At the 5/8” height, Sea Isle I paspalum produced equal stunting between formulations by 7 DAT, although there was more of a positive visible rate response with A1 (across application rates and iron levels). In essence, both formulations did prevent vertical elongation at both mowing heights, noting that A1 at the low mowing height was affected least (for stunting).

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Tables 1-4: FN:TADSpaspTOL.xls / Toshiba 12/02

Table 1. Color of Sea Isle I Paspalum After TADS formulations A8 and A1, University of Arizona, 2002. Applied August 7, 2002.

FORM	RATE o/p/M	Mow height	Iron	*COLOR* 5 DAT	7 DAT	14 DAT	21 DAT	28 DAT
A8	0.4	0.375	yes	5	6	6	7	8
A8	0.6	0.375	yes	7	6	6	8	7
A8	1.2	0.375	yes	7	5	5	6	7
A8	0.4	0.375	no	4	5	4	5	5
A8	0.6	0.375	no	6	6	5	6	6
A8	1.2	0.375	no	6	4	4	5	5
A1	0.4	0.375	no	6	6	7	7	7
A1	0.6	0.375	no	5	5	6	6	6
A1	1.2	0.375	no	5	5	5	5	5
A1	0.4	0.375	yes	7	7	8	7	7
A1	0.6	0.375	yes	7	6	7	8	6
A1	1.2	0.375	yes	6	5	6	6	7
UTC	none	0.375	no	5	6	6	6	6
UTC	none	0.375	yes	7	8	8	7	7
A8	0.4	0.625	yes	6	6	7	7	7
A8	0.6	0.625	yes	6	6	6	7	8
A8	1.2	0.625	yes	6	5	5	5	7
A8	0.4	0.625	no	6	5	6	6	6
A8	0.6	0.625	no	5	5	4	6	6
A8	1.2	0.625	no	3	4	4	4	3
A1	0.4	0.625	no	6	6	7	7	6
A1	0.6	0.625	no	5	5	6	6	5
A1	1.2	0.625	no	4	4	4	5	4
A1	0.4	0.625	yes	6	6	8	8	7
A1	0.6	0.625	yes	7	6	7	7	7
A1	1.2	0.625	yes	7	5	6	7	8
UTC	none	0.625	no	5	6	5	7	7
UTC	none	0.625	yes	7	8	7	8	7

Color = 1-9, 1= dead, 5= marginal accepance, 6= fully acceptable, 9= best possible.

Plot value reported, non replicated observational trial only.

Form = formulation type.

Rate o/p/m = ounce/product /1000 sq. ft

UTC = non treated control.

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Table 2. Quality of Sea Isle I Paspalum After TADS formulations A8 and A1, University of Arizona, 2002. Applied August 7, 2002.

				QUALITY				
FORM	**RATE o/p/M**	**MOW HEIGHT**	**IRON**	**5 DAT**	**7 DAT**	**14 DAT**	**21 DAT**	**28 DAT**
A8	0.4	0.375	yes	6	5	6	8	6
A8	0.6	0.375	yes	7	6	6	7	7
A8	1.2	0.375	yes	6	5	5	5	6
A8	0.4	0.375	no	5	4	5	5	4
A8	0.6	0.375	no	6	5	6	6	6
A8	1.2	0.375	no	5	4	4	5	5
A1	0.4	0.375	no	5	6	6	6	5
A1	0.6	0.375	no	4	5	5	5	4
A1	1.2	0.375	no	5	4	5	5	5
A1	0.4	0.375	yes	8	7	8	8	8
A1	0.6	0.375	yes	7	6	6	8	7
A1	1.2	0.375	yes	6	5	5	7	6
UTC	none	0.375	no	5	6	6	6	5
UTC	noen	0.375	yes	7	7	8	7	7
A8	0.4	0.625	yes	7	6	6	7	7
A8	0.6	0.625	yes	6	5	5	7	6
A8	1.2	0.625	yes	6	6	4	5	6
A8	0.4	0.625	no	6	5	5	6	6
A8	0.6	0.625	no	5	5	4	5	5
A8	1.2	0.625	no	4	4	3	3	4
A1	0.4	0.625	no	6	6	7	7	6
A1	0.6	0.625	no	5	5	5	5	5
A1	1.2	0.625	no	4	4	4	4	4
A1	0.4	0.625	yes	8	7	8	8	8
A1	0.6	0.625	yes	7	6	6	7	7
A1	1.2	0.625	yes	6	6	5	6	6
UTC	none	0.625	no	6	5	5	6	6
UTC	none	0.625	yes	7	8	7	7	7

Qulaity = 1-9, 1= dead, 9 =best condition posible, 5= minimal accepatnce 6= standard acceptable.

Plot value reported, non replicated observational trial only.

Form = formulation type.

Rate o/p/m = ounce/product /1000 sq. ft

UTC = non treated control.

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Table 3. Degree of Yellowing of Sea Isle I Paspalum After TADS formulations A8 and A1, University of Arizona, 2002. Applied August 7, 2002.

FORM	RATE o/p/M	MOW HEIGHT	IRON	5 DAT	7 DAT	14 DAT	21 DAT	28 DAT
A8	0.4	0.375	yes	2	2	2	1	1
A8	0.6	0.375	yes	1	2	2	1	1
A8	1.2	0.375	yes	2	2	2	2	1
A8	0.4	0.375	no	2	4	4	3	4
A8	0.6	0.375	no	4	2	3	2	2
A8	1.2	0.375	no	3	4	4	4	3
A1	0.4	0.375	no	2	3	2	2	2
A1	0.6	0.375	no	2	3	3	2	2
A1	1.2	0.375	no	3	4	4	3	3
A1	0.4	0.375	yes	1	1	1	1	1
A1	0.6	0.375	yes	2	2	2	1	1
A1	1.2	0.375	yes	2	2	2	1	1
UTC	none	0.375	no	3	2	3	3	2
UTC	none	0.375	yes	1	1	1	1	1
A8	0.4	0.625	yes	2	2	1	1	2
A8	0.6	0.625	yes	2	2	2	1	1
A8	1.2	0.625	yes	2	2	2	3	1
A8	0.4	0.625	no	2	3	2	3	2
A8	0.6	0.625	no	3	4	3	3	3
A8	1.2	0.625	no	4	4	4	4	4
A1	0.4	0.625	no	2	3	2	2	1
A1	0.6	0.625	no	3	4	3	3	3
A1	1.2	0.625	no	4	4	4	4	3
A1	0.4	0.625	yes	1	1	1	1	1
A1	0.6	0.625	yes	2	1	2	1	1
A1	1.2	0.625	yes	2	2	2	1	1
UTC	none	0.625	no	3	3	20	3	2
UTC	none	0.625	yes	1	1	0	2	2

Yellowing = 1-6, 1= none , 2=slight, 3=slite/mod, 4=moderate 5=mod/severe, 6= severe.

Plot value reported, non replicated observational trial only.

Form = formulation type.

Rate o/p/m = ounce/product /1000 sq. ft

UTC = non treated control.

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Table 4. Percent plot yellow of Sea Isle 1 Seashore Paspalum after applications of two fromulations of TADS herbicide, with and without iron. University of Arizona, 2002. Materials applied August 7, 2002.

						% PLOT YELLOW TURF		
FORM	**RATE o/p/M**	**MOW HEIGHT**	**IRON**	**5 DAT**	**7 DAT**	**14 DAT**	**21 DAT**	**28 DAT**
A8	0.4	0.375	yes	10	10	10	0	0
A8	0.6	0.375	yes	0	15	5	0	0
A8	1.2	0.375	yes	5	15	20	25	0
A8	0.4	0.375	no	10	25	30	30	20
A8	0.6	0.375	no	15	20	20	5	10
A8	1.2	0.375	no	20	35	40	50	10
A1	0.4	0.375	no	5	10	10	5	10
A1	0.6	0.375	no	10	20	30	10	5
A1	1.2	0.375	no	20	35	40	30	15
A1	0.4	0.375	yes	0	0	0	0	0
A1	0.6	0.375	yes	10	5	5	0	0
A1	1.2	0.375	yes	15	30	10	0	0
UTC	none	0.375	no	10	1	20	25	20
UTC	none	0.375	yes	0	0	0	0	0
A8	0.4	0.625	yes	5	5	0	0	5
A8	0.6	0.625	yes	5	20	5	0	0
A8	1.2	0.625	yes	10	20	30	25	0
A8	0.4	0.625	no	15	10	20	20	15
A8	0.6	0.625	no	20	20	25	55	20
A8	1.2	0.625	no	25	40	40	85	75
A1	0.4	0.625	no	10	5	5	10	0
A1	0.6	0.625	no	25	20	25	20	15
A1	1.2	0.625	no	20	40	35	45	40
A1	0.4	0.625	yes	0	0	0	0	0
A1	0.6	0.625	yes	5	0	5	0	0
A1	1.2	0.625	yes	5	5	10	0	0
UTC	none	0.625	no	10	15	15	15	10
UTC	none	0.625	yes	0	0	0	10	5

Percent plot yellow = (0-100%).

Plot value reported, non replicated observational trial only.

Form = formulation type.

Rate o/p/m = ounce/product /1000 sq. ft

UTC = non treated control.

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