

## **The response of transplanted Pacific Lovegrass and Mau'u aki aki to two preemergence herbicides.**

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### **Introduction**

An essential part of using more native Hawaiian plants in landscapes and various conservation and road side revegetation efforts is the availability of a weed free seed production system. Two species identified for seed increase at the Plant Materials Center on Molokai are the native Hawaiian grass, Pacific Lovegrass (PL- *Eragrostis deflexa*, HA #5856, 9079813), and a native sedge Mau'u aki aki (MA-*Fimbristylus cymosa*, HA #5866, 9079806). These plants are generally started from transplants and require good weed control to allow them to establish quickly and produce seed in weed free production blocks.

An experiment was conducted to characterize the growth response of these 2 native Hawaiian plants to spray applications of 2 preemergence herbicide, Ronstar WP (oxadiazon, Bayer Crop Science) and Surflan (oryzalin, UPI). The research reported here will provide a starting point for developing large scale seed production blocks using chemical weed control tool.

### **Materials and Methods**

Seeds of MA were planted to 72-cell trays on 01/20/05 and seeds of PL were planted to similar cells on 04/04/05. A single row of each species was planted into field plots on 11/07/05 resulting in plant ages of 291 and 217 days for MA and PL respectively. MA was set in rows with a 2 foot in-row spacing; PL had a 4 foot in-row spacing. An experimental unit consisted of 2 rows of plants within a plot that was 6 feet x 15 feet. Overhead irrigation was supplied in a manner and amount consistent with maximum growth and establishment success.

On 11/08/05, 1 day after planting, herbicide treatments were applied with an electric powered 12-volt diaphragm pump sprayer calibrated to apply 40 gallons per acre with an operating pressure of 15 PSI using a 3 nozzle boom fitted with 8004 LP (TeeJet Spray Systems) spray tips. The finish spray volume was 3 liters. A detailed description of the herbicides rates of application are provided in Table 1. The 7 treatments were replicated 4 times. On 11/21/05, 14 days after planting, the entire experimental area was fertilized with 50 lb N/a as 16-16-16 16 with minors (1% Mg, 1% S, 1.5% B, and 1% Fe).

Visual ratings of plant vigor were recorded on 12/21/05 (43 days after spray application-DAS), 01/18/06 (71 DAS), 03/08/06 (120 DAS) and 06/07/06(211 DAS). On 06/07/06 seed head counts were recorded for two representative plans of MA as a measure of potential seed production. Data for visual ratings of vigor and seed head counts were analyzed as a completely randomized block design. When appropriate, means were separated using Duncan's Multiple Range test at the level of significance of the associated F-Test. All statistical analyses were conducted using the MSTAT computer program.

**Table 1**, Herbicides and rates of application to 2 native Hawaiian plants. The herbicide formulations used in the experiment were Ronstar 50WP (wetable power with 50% active ingredient (ai)) and Surflan (oryzalin 4.0 lb ai/a).

Herbicides	Amount per acre	lb. ai/a	Amount ml or grams/3liter
1 Ronstar (oxadiazon) 50WP	4.0 lb	2.0	36 grams
2 Ronstar (oxadiazon) 50WP	8.0 lb	4.0	72 grams
3 Surflan 4AS (oryzalin)	32 oz	2.0	37.5 ml
4 Surflan 4 AS (oryzalin)	64oz	4.0	75.0 ml
5 Ronstar + Surflan	4.0 lb + 32 oz	2.0 + 2.0 lb	36 grams + 37.5 ml
6 Ronstar + Surflan	8.0 lb + 64 oz	4.0 + 4.0	72 grams + 75.0 ml
7 Weeded non chemical			

### Results

PL was a weak transplants and many died in the untreated plots making it difficult to accurately evaluate this plant for response to herbicide sprays. All ratings and discussions in this report will be for MA only. The weed control for all herbicide treatments was generally excellent with inconsistent weed populations throughout the experiment in untreated plots. Therefore data will only be presented for MA growth vigor on 4 dates and seed head counts, see Table 2. On the first evaluation date (43 DAS) both rates of Ronstar WP alone and the high rate of the Ronstar WP and Surflan combination reduced visual ratings of MA growth vigor. On the second evaluation date (71 DAS), only the low rate of Ronstar WP did not significantly reduce MA vigor. By the third evaluation date (120 DAS) only the high rate of the Ronstar WP and Surflan combination was significantly reducing MA growth vigor. On the 4<sup>th</sup> evaluation date (211 DAS) weed pressure in the untreated plots was reducing MA vigor so that the highest levels of growth vigor were recorded in treatments containing Ronstar WP alone at the low rate and Surflan at the high rate, 80% and 90% of maximum vigor respectively.

PL seed head counts were not significantly different between treatments. However, the numerically highest seed head counts corresponded to the treatments with the highest vigor ratings. Although seed head counts were not significantly different, it is clear that the most vigorous plants would produce the highest amount of seeds. The images in Table 3 provide a clear representation of MA vigor at 211 DAS. The inset images for each treatment allow for direct visual comparisons between treatments, since all plants were evenly spaced at the start of the experiment. The plants with the smallest amount of space between plants were the most vigorous.

### Discussion

The data in this experiment provides clear and useful information for the use of Ronstar WP and Surflan for preemergence control of weeds in MA. The low rates of both herbicides provided excellent weed control with an acceptable level of growth suppression. New plantings of MA can be treated with either of these herbicides alone with the alternating chemical used in subsequent treatments. A recommended protocol for using Ronstar WP and Surflan for seed production of MP would be to establish the planting with a broadcast application of

Surflan at 32 oz/a. After weeds begin to grow in 65 to 75 days, a mechanical weed removal procedure should be employed. After weeds are removed a broadcast application of Ronstar WP can be made to carry the crop for another 55 to 65 days. Alternating herbicides will help to prevent the build up of solid stands of resistant weeds. Germination studies with PL seeds did not show a detrimental impact for any herbicide treatment, data not shown. Both Ronstar WP and Surflan should be considered for seed production of MA and a request to add MA to the product labels should be considered.

### **Acknowledgements and Disclaimer**

Trade names are used in this report for the convenience of readers and do not constitute an exclusive endorsement of the University of Hawaii, the Cooperative Extension Service, the USDA nor the Natural Resources Conservation Service. The information contained here is not a recommendation for use. It is a violation of state and federal law to use any pesticide in a manner inconsistent with its labeling.

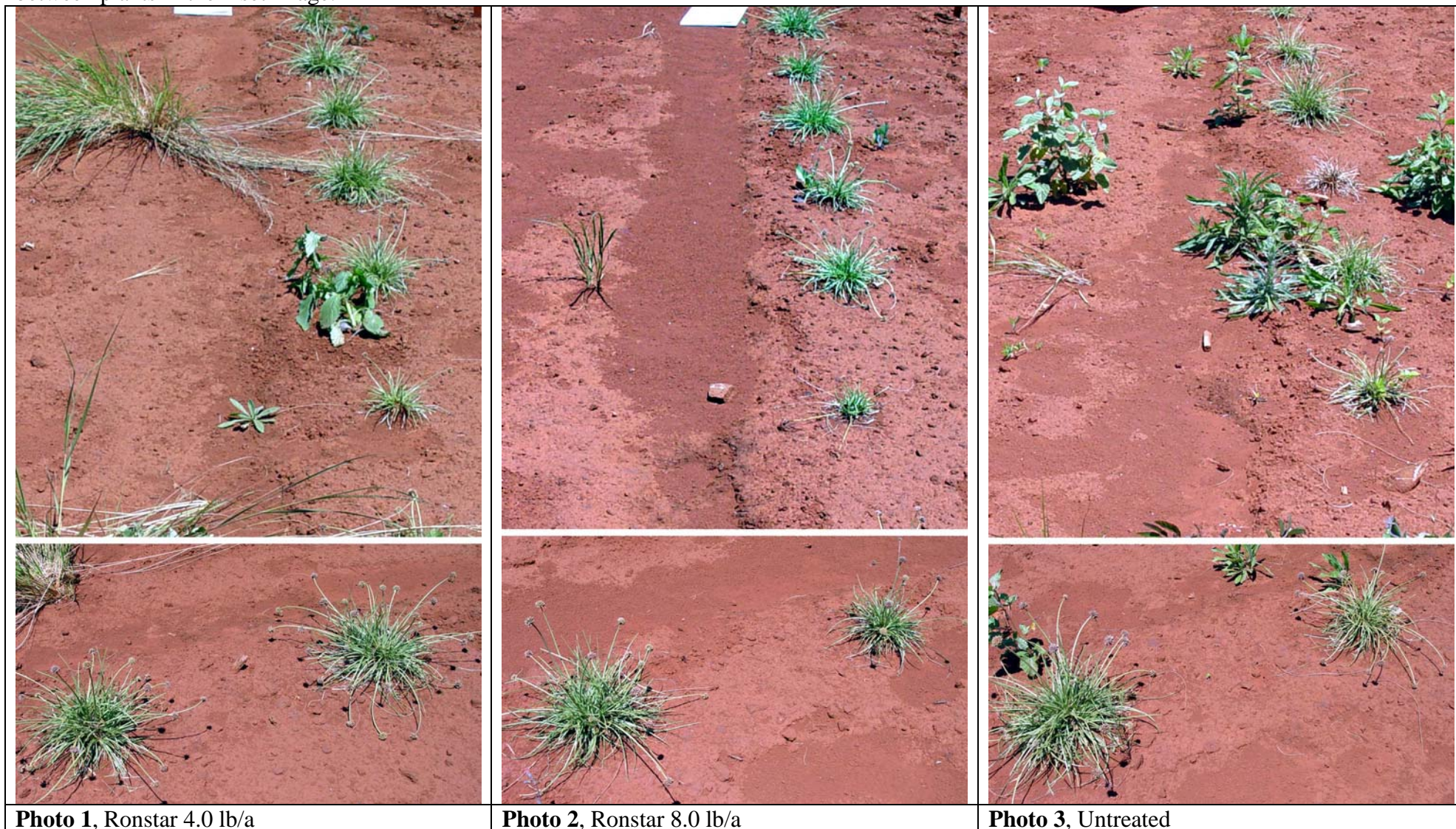
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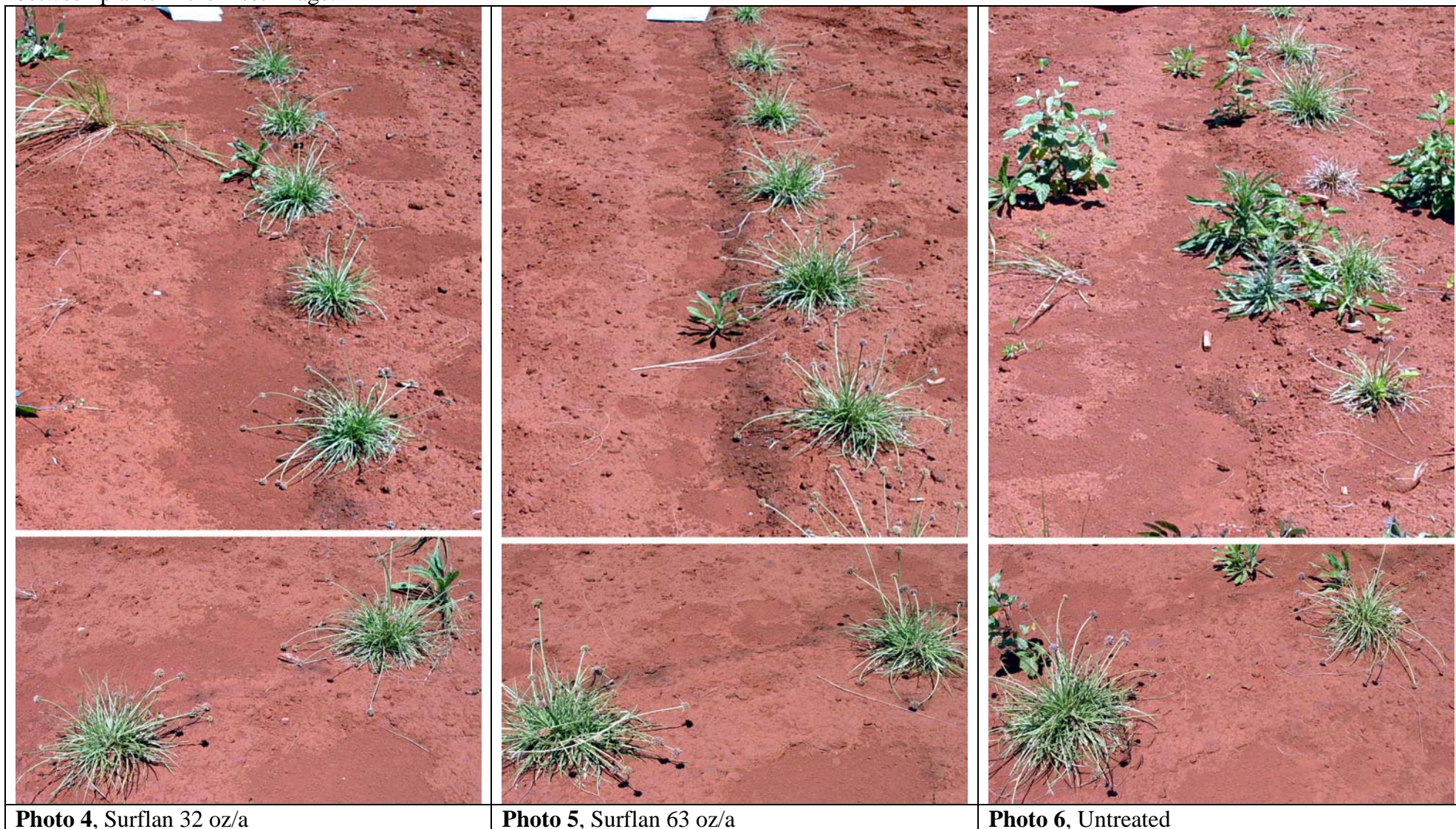
**Table 2**, visual ratings for growth vigor for MA expressed as % of maximum vigor recorded on 12/21/05 (43 days after spray application-DAS), 01/18/06 (71 DAS), 03/08/06 (120 DAS) and 06/07/06 (211 DAS). On 06/07/06 seed head counts were recorded for two representative plans of MA response of potential seed production to herbicide treatments. The sum of the two plants is presented.

Herbicide Treatments	Amount per acre	MA Growth Vigor (% of maximum)				MA Seed head count (sum of 2 plants)
		<b>43-DAS<sup>z</sup></b>	<b>71-DAS</b>	<b>120-DAS</b>	<b>211-DAS</b>	<b>211-DAS</b>
1 Ronstar	4.0 lb	57.5 b	63.8 ab	75.0 a	80.0 ab	114
2 Ronstar	8.0 lb	58.8 b	53.8 bc	66.3 ab	66.3 ab	103
3 Surflan	32 oz	71.3 ab	42.5 bc	76.3 a	77.5 ab	98
4 Surflan	64oz	68.8 ab	57.5 b	88.8 a	90.0 a	123
5 Ronstar + Surflan	4.0 lb + 32 oz	66.3 ab	50.0 bc	60.0 ab	66.3 ab	80
6 Ronstar + Surflan	8.0 lb + 64 oz	43.8 b	22.5 c	43.8 b	55.0 b	72
7 Untreated		88.8 a	92.5 a	89.5 a	53.8 b	74
F-test level of significance		1%	1%	1%	1%	NS <sup>y</sup>
Means within a column followed by the same letter are not significantly different according to Duncan's Multiple Range test.						
<sup>z</sup> DAS means days after spray application of herbicides.						
<sup>y</sup> NS, means not significantly different.						

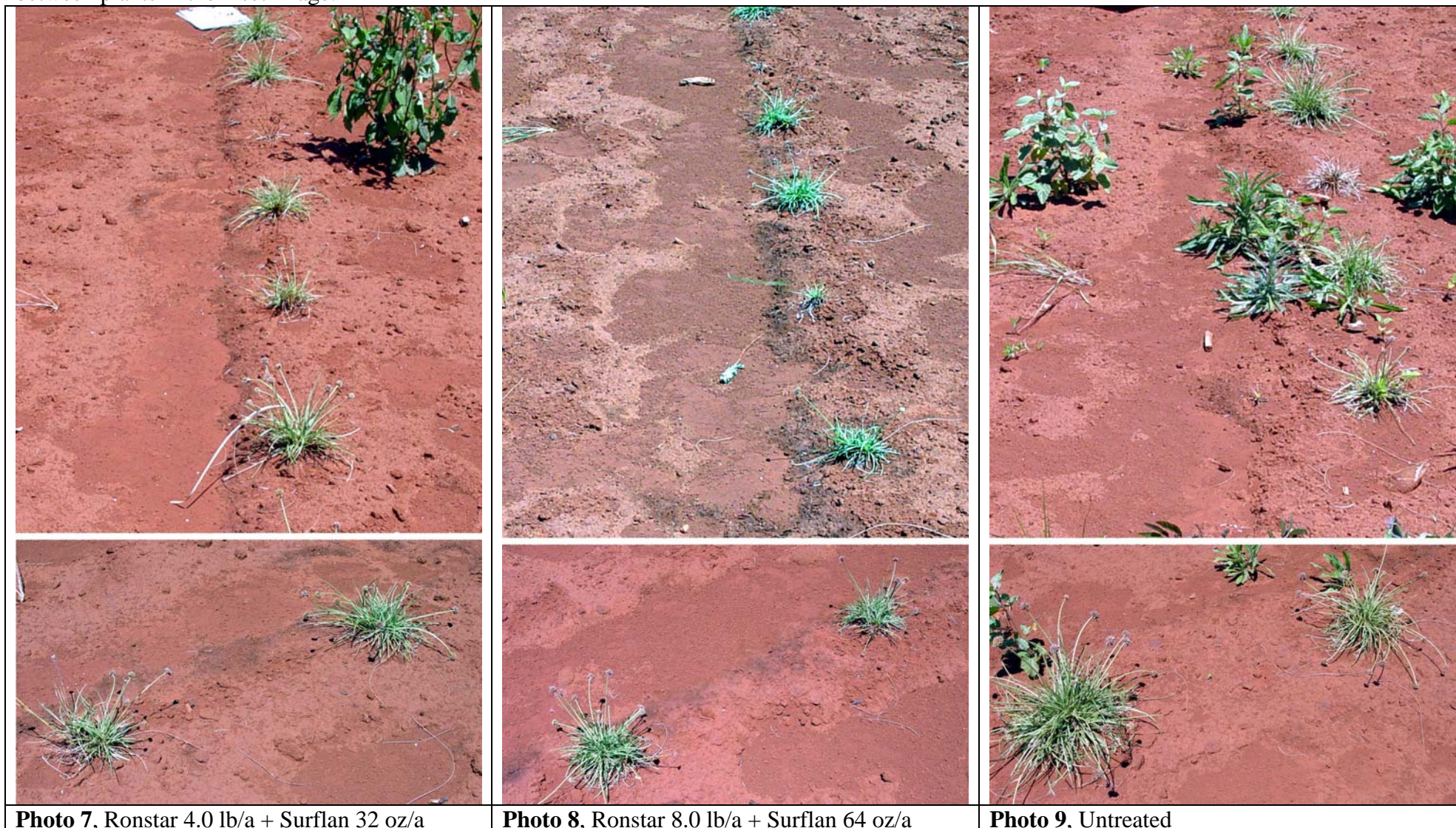
**Table 3**, images of representative treatments recorded on 06/07/06, 211 days after spraying. The inset image below the white line shows two representative plants from the larger image above. Since all plants were spaced evenly, relative growth effects can be estimated by the open space between plants in the inset image.



**Table 3 con't**, images of representative treatments recorded on 06/07/06, 211 days after spraying. The inset image below the white line shows two representative plants from the larger image above. Since all plants were spaced evenly, relative growth effects can be estimated by the open space between plants in the inset image.



**Table 3 con't**, images of representative treatments recorded on 06/07/06, 211 days after spraying. The inset image below the white line shows two representative plants from the larger image above. Since all plants were spaced evenly, relative growth effects can be estimated by the open space between plants in the inset image.



**Photo 7**, Ronstar 4.0 lb/a + Surflan 32 oz/a

**Photo 8**, Ronstar 8.0 lb/a + Surflan 64 oz/a

**Photo 9**, Untreated