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NOTES

Evaluation of SP1001 (Pelargonic Acid) in Combination with Glyphosate on Cattail and Alligatorweed

STRATFORD H. KAY[1]

Cattail (*Typha latifolia* L.) is a common and troublesome weed in shallow, freshwater environments throughout the United States. Alligatorweed (*Alternanthera philoxeroides* (Mart.) Griseb.), in spite of the introduction and success of several insects as biological controls, remains a troublesome weed in a number of locations in the Southeast where there are frequent human disturbances (e.g., insecticide spraying, mechanical removal, etc.) and/or weather conditions that affect the life cycle of the insects (Kay 1992, Vogt et al. 1992). Both of these weeds routinely are managed by foliar applications of the herbicide, glyphosate [*N*-(phosphonomethyl)glycine]. Regrowth and reinfestation of previously treated areas usually necessitates additional herbicide application during subsequent years. A new product that could enhance the activity of glyphosate on these weeds would be useful in their management. In 1997, SePRO Corp. initiated testing of an experimental compound, SP1001, to determine its efficacy either as a herbicide or as an adjuvant to boost the activity of glyphosate for use in aquatic sites.

The objective of this study was to evaluate the potential for using SP1001 as an adjuvant to replace surfactants customarily used during application of glyphosate for control of cattail and alligatorweed.

MATERIALS AND METHODS

Testing was initiated in North Carolina to evaluate SP1001 alone and in combination with glyphosate (Rodeo[R]) on alligatorweed and cattail. All tests were conducted in roadside drainage ditches, due to the experimental nature of the product. The test sites for alligatorweed and cattail were located on Frying Pan Road in Tyrrell County and on U.S. Highway 17 in Brunswick County, NC, respectively. Each test included a total of eight treatments: SP1001 alone at 5% v/v, 7.5% v/v, and 10% v/v, Rodeo (1.25% v/v) combined with either 1.5% v/v or 3% v/v SP1001, diquat dibromide (Reward[R]) at 2 gal/acre (+ 1/2% v/v Cide-Kick[R]), Rodeo 1.25% v/v (+ 1/2% v/v Cide- Kick), and an untreated reference. Reward was used as a contact-herbicide comparison

[1]Department of Crop Science, Box 7620, North Carolina State University, Raleigh, NC 27695. Received for publication June 1, 1998 and in revised form October 5, 1998.

with the SP1001-only treatments. All products were sprayed using a handgun applicator with a total solution volume of 100 gpa. The cattail treatments were applied on August 7 and were replicated three times; alligatorweed treatments were applied on August 12 and were replicated four times. Plot size in each test was 3 by 15.2 m (10 by 50 ft.)

Plots were observed within two hours after application to determine whether or not there were any rapidly-observable symptoms resulting from the SP1001 treatments. Subsequent observations were made at periodic intervals until frost (1, 2, and 5 weeks after treatment (WAT) for alligatorweed; 2 and 6 WAT for cattail). On each observation date, we visually estimated the percent dead plants in each plot and, for alligatorweed, we also estimated the average mat height across each entire plot. Final evaluations were made in late April and early May 1998, approximately 36 WAT. At this time, estimates were made of percent cover and average mat height for the alligatorweed; for cattail, counts were made of new shoots in three, 1 m^2 quadrats within each plot. Data were subjected to an analysis of variance, and treatment means were separated using the Waller-Duncan procedure. Other plants were present in some of the plots, and their presence and responses to the treatments were noted qualitatively. No attempt was made to analyze the data statistically for these other plants, as distribution was not uniform throughout the sites.

RESULTS AND DISCUSSION

Within a few hours after treatment, alligatorweed treated either with Reward or the two higher rates of SP1001 showed damage symptoms (slight darkening of the sprayed plants). Table 1 shows that alligatorweed had sustained almost complete top kill with Reward by 1 WAT, but almost complete regrowth had occurred by 5 WAT. There was significantly less response to the SP1001 at any of the three application rates used and, as in the case with Reward, almost complete regrowth had occurred by 5 WAT. Rodeo + Cide-Kick or Rodeo in combination with either rate of SP1001 gave 65 to 73% top kill by 1 WAT and 86 to 90% by 2 WAT. However, by 5 WAT, the alligatorweed had recovered about one third. Plant heights in alligatorweed plots in which Rodeo was used as a component of the treatment still were reduced significantly at 5 WAT compared with the reference. In light of the significant regrowth prior to frost, we expected to see complete recovery during the spring of 1998, which was confirmed during our April 1998 evaluation 36 WAT. At this time, there was considerable variation across the plots and no evidence of any significant differences among treatments.

Several other aquatic plants were present and fairly abundant in some of the treated alligatorweed plots and had varying responses to the different treatments. The other species also showed similar rapid symptoms to either Reward or the SP1001 treatments, as was observed for alligatorweed. At five WAT, two or three species of unidentified grasses still exhibited some damage from the Reward treatment. Rodeo + Cide-Kick caused significant mortality of these same grasses and smartweed (*Polygonum hydropiperoides* Michaux and another *Polygonum* sp.). There was some slight indication of grass damage in one replicate from each of the two highest rates of SP1001. We also observed damage to the same grasses, smartweeds, spatterdock (*Nuphar luteum* L.) and parrotfeather (*Myriophyllum aquaticum* (Vell.) Verdc.) in treatments combining Rodeo with SP1001. The damage from the combination treatments appeared to be more extensive (more dead plants and less sign of recovery) than that in any of the other treatments. Most of the non-target plants in the treated plots appeared to have recovered by the April 1998 evaluation.

Like the alligatorweed, cattail showed the same rapid discoloration response to treatment with Reward or SP1001 as did the alligatorweed. By 2 WAT, cattail treated with Reward had excellent shoot mortality, but there was substantial recovery by 6 WAT (Table 1). The initial shoot mortality and subsequent recovery of plants treated with SP1001 alone were similar to that with Reward. Rodeo + Cide-Kick gave slow initial mortality of cattail compared with the Rodeo + SP1001 treatments. Any apparent initial advantage to using combinations of Rodeo with SP1001 on cattail disappeared with time, as there were no significant differences in plant

TABLE 1. EFFECTS OF SP1001 ALONE AND IN COMBINATION WITH GLYPHOSATE ON ALLIGATORWEED AND CATTAIL TREATED DURING 1997.[1]

	Alligatorweed							Cattail		
	Initial percent	Percent Dead Plants			Percent Cover	Mat height, cm		Percent Dead Plants		Shoots m^2
Treatment	Cover	1 WAT	2 WAT	5 WAT	36 WAT	5 WAT	36 WAT	2 WAT	6 WAT	36 WAT
Reference	86 (9) a	0 a	10 (4) a	10 (12) a	26 (17) a	23.6 (5.6) a	3.8 (1.8) a	0 (0) a	10 (0) a	8.7 (7.8) a
Reward	86 (5) a	98 (3) d	80 (14) b	9 (12) a	45 (21) a	14.0 (4.3) bc	6.4 (1.8) c	86 (10) c	45 (23) b	12.4 (1.7) a
SP1001, 5%	76 (14) a	24 (13) b	14 (5) a	0 (0) a	33 (10) a	24.1 (7.9) a	5.3 (2.5) a	85 (5) c	45 (5) b	11.3 (6.4) a
SP1001, 7.5%	79 (14) a	29 (9) b	18 (7) a	8 (10) a	36 (17) a	19.1 (6.6) ab	5.6 (2.3) a	90 (5) c	50 (10) b	10.7 (1.7) a
SP1001, 10%	80 (16) a	28 (17) b	16 (6) a	0 (0) a	33 (10) a	21.1 (7.4) ab	6.4 (1.8) a	88 (8) c	43 (6) b	14.6 (9.0) a
Rodeo + Cide-Kick	80 (9) a	73 (10) c	90 (0) c	67 (32) b	29 (9) a	5.6 (2.5) d	6.4 (1.5) a	58 (34) b	95 (5) c	0.2 (0.4) b
Rodeo + 1.5% SP1001	76 (14) a	65 (23) c	90 (0) c	66 (39) b	33 (12) a	5.6 (4.3) d	4.8 (0.5) a	95 (0) c	98 (3) c	0.0 (0.0) b
Rodeo + 3% SP1001	81 (14) a	70 (19) c	86 (8) bc	74 (30) b	24 (5) a	8.1 (2.5) cd	4.1 (1.3) a	93 (3) c	98 (3) c	0.2 (0.4) b

[1]Data shown are means of four replicates ± 1 sd for alligatorweed and three replicates ± 1 sd for cattail. Two means in a column followed by the same letters are not significantly different at alpha = 0.05 according to the Duncan-Waller procedure.

damage at 6 WAT. There was little other vegetation present in the cattail plots other than occasional soft rushes, grasses, and sedges. Herbicide burn on these plants was minimal, probably because they were protected by the cattails and had little contact with the herbicide. At the spring evaluation, all treatments receiving Rodeo alone or in combination with SP1001 had essentially no regrowth, as measured by live stem counts, compared with significant growth in the references and plots treated either with Reward or SP1001 alone.

The data from this study indicate that SP1001 could be used instead of a traditional surfactant when applying Rodeo to alligatorweed and cattail. This product applied alone will give only temporary suppression of the target weeds due to its contact activity. It is similar in this respect to Reward. I am not sure why mortality of alligatorweed did not occur more rapidly when SP1001 was used as an adjuvant with Rodeo rather than Cide-Kick. This could have been an artifact resulting from very small stem and leaf size at the time of application and might have been avoided by treatment earlier in the season when the alligatorweed was more robust. Another possible reason is the flooding that occurred a few days after treatment, due to the combination of runoff from rainfall and northeasterly winds that caused water from Albemarle Sound to back up into the ditches. The increasing response of cattail over time was expected, as these plants are perennials that require several weeks after treatment to achieve maximum mortality of the root and rhizome system.

The use of SP1001 does not appear to be an economically feasible replacement as a surfactant for use with glyphosate. At the current application rates of both products, the cost probably would be prohibitive for management of these weeds. No further testing is planned.

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