

Efficacy of Norflurazon for Nutsedge Control in Parker Valley Alfalfa

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Abstract

Summer weeds such as nutsedge are of economic concern to alfalfa growers in western Arizona. A two year replicated evaluation of the effectiveness of granular norflurazon herbicide for purple nutsedge control was conducted on an established alfalfa field in La Paz County. Zorial Rapid 80 WP and Evital 5G herbicides were tested for their effectiveness at controlling purple nutsedge when applied following hay harvest but prior to irrigation in early spring and late summer. Zorial 80 WP was applied at 2.0 lb a.i./acre. Evital 5G was applied in spring 1996 at application rates of 1.0, 1.5, 2.0, and 3.0 lb a.i./acre. Split applications were made the following summer to four plots for a total of 2.0, 3.0, and 4.0 lb a.i./acre/year. In 1996, purple nutsedge control resulting from a single application of Evital 5G at 2.0 lb a.i./acre was 41, 82, and 35% at 35, 63, and 99 DAT, respectively. However, Zorial 80 WP applied at 2.0 lb a.i./acre provided poor purple nutsedge control due to poor soil incorporation since the liquid was unable to penetrate the dense nutsedge foliage. The treatments were reapplied in spring and summer of 1997.

Introduction

Nutsedge is a perennial weed that can become a serious problem in weak alfalfa stands, especially in sandy soils. Purple nutsedge reproduces primarily by sending out rhizomes from below ground tubers. Prior to planting alfalfa, purple nutsedge can be controlled with repeated summer tillage of dry soil since its tubers are killed by drying. However, tillage to control purple nutsedge in moist soil is not very effective. Tillage is not effective against yellow nutsedge because its tubers can survive up to four years in dry soil. Yellow nutsedge plants do not compete well in the shade, thus purple nutsedge can outcompete yellow nutsedge, and is the predominate weed species in western Arizona cropland.

Nutsedge is difficult to control in established alfalfa stands. EPTAM granules applied just before irrigation will suppress nutsedge in established alfalfa when treatment is initiated prior to emergence of above ground stems and continued four to five times throughout the season (Tickes, 1990). Nutsedge is only suppressed and not controlled. Furthermore, EPTAM treatments must be continued for more than one season and probably for the life of the stand.

Norflurazon (Zorial or Evital) is applied as a preemergence herbicide to control many annual broadleaf and grass weeds. It is absorbed by soil colloids and is not subject to leaching with an average half life of 45-180 days in soil. Susceptible weed seedlings must absorb norflurazon by the roots, then translocate the herbicide to shoots. It causes

light-grown weed seedlings to emerge with chlorotic leaves and die following exhaustion of food reserves. It does this by inhibiting the biosynthesis of carotenoids that protect plant chlorophyll from photo degradation, thus it destroys chlorophyll. Two formulations are available; 1) Zorial Rapid 80 WP labeled as a preemergence herbicide for nutsedge control in cotton, alfalfa, peanuts, and soybeans; and 2) Evital 5G labeled as a preemergence herbicide for nutsedge control in cranberries.

Field experiments are being conducted to examine the effectiveness of norflurazon applications for nutsedge control in established alfalfa. Currently, only the wettable powder (Zorial Rapid 80 WP) formulation is labeled for this use. The granular (Evital 5G) formulation is still under product development. Two applications (late winter and early summer) of Evital 5G broadcast following alfalfa hay baling, but prior to irrigation, provided satisfactory nutsedge control in established alfalfa grown in experimental field plots located in Maricopa County (McCloskey, personal communication). Zorial Rapid 80 has provided poor nutsedge control since it is difficult to get the liquid spray material past the foliage of thick stands of nutsedge and into the soil where the herbicide is active. Research continues to help obtain an alfalfa label for the granular norflurazon formulation, however this is the first experiment conducted in western Arizona.

Materials and Methods

A field experiment was conducted during 1996 and 1997 in Parker Valley (located in southwestern La Paz County) to determine the effect of norflurazon herbicide formulations on actively growing purple nutsedge in two year old alfalfa. The experiment was conducted on a sandy loam soil. In 1996, three herbicide treatments consisted of three rates of Evital 5G (1.5, 2.0, and 3.0 lb a.i./acre) applied in a single spring time application on April 30. Three more treatments examined three rates of Evital 5G (1.0, 1.5, and 2.0 lb a.i./acre) applied twice in split applications on April 30 and again to plots receiving 2 applications/year on August 7. Another treatment consisted of Zorial Rapid 80 WP applied at 2.0 lb a.i./acre, and the eighth treatment was an untreated control. In 1997, treatments were reapplied on March 6 and split treatments were applied on June 17. Since the Zorial Rapid 80 WP treatment provided poor nutsedge control in established alfalfa during the 1996 study, it was replaced with a treatment consisting of 1.0 lb. a.i./acre Evital 5G applied in spring followed by 2.0 lbs. a.i./acre applied in summer. Granular herbicide applications were made with a small plot granular applicator. The eight treatments were replicated four times in randomized complete blocks. Individual plots were 20 ft wide by 60 feet long.

The first spring weed ratings of purple nutsedge control in 1996 were made on June 4 which was 35 days after treatment (DAT). Plots were rated again for nutsedge control on July 2 (63 DAT) and August 7 (99 DAT) prior to the second herbicide application, then again on September 10 at 133 days after initiation of treatments (DAI) and October 23 (176 DAI). In 1997, visual nutsedge control ratings were taken on April 22, May 20, June 17 prior to the application of split Evital treatments, and again on July 15. Visual ratings of weed control were on a rating system from 0 to 100 with 0 to 50 representing yellow and white symptoms, and 50 to 100 representing death and population reduction. Statistical analyses were performed on the data using ANOVA and the least significant difference Duncan's Multiple Range Test at the 0.05 level of probability when appropriate.

Results and Discussion

1996:

In 1996, nutsedge control in the two-year-old alfalfa field was initially judged on a scale of 0 to 100 by degree of bleaching or shoot die back (0-50) to death and population reduction (51-100) on June 4 (35 DAT). Nutsedge control ranged from 41 to 48% with a single application of Evital 5G at or above 2 lb a.i./acre application rate, 26 to 33% nutsedge control at lower rates, and 5% nutsedge control for the Zorial WP spray solution applied at 2.0 lb a.i./acre, compared to untreated plots. On July 2 (63 DAT) visual herbicide symptoms on nutsedge such as

bleaching and shoot tip die back were striking ranging from 83 to 91% control within plots treated once with Evital 5G at or above the 2.0 lb a.i./acre application rate. Furthermore, at 63 DAT nutsedge control at the low 1.0 and 1.5 lb a.i. application rates of Evital 5G ranged from 50 to 70%, however Zorial 80 WP application at 2.0 lb a.i./acre resulted in only 23% nutsedge control. None of the herbicide treatments applied in this study resulted in visual damage symptoms to established alfalfa.

Following each irrigation, regrowth from nutsedge tubers, followed by uptake of norflurazon, then bleaching and eventual browning and death of regrowth was observed once plants were exposed to sunlight following cutting and baling of alfalfa. By August 7 (99 DAT), regrowth from tubers and new plant emergence resulted in an 11% increase in nutsedge plot coverage compared to June 4. Thus, due to nutsedge regrowth, nutsedge control had tapered off by 99 DAT to 34 to 55% control for one application each of Evital 5G at rates of 2.0 and 3.0 lb a.i./acre, 19 to 25% control for one application of Evital 5G at the 1.0 and 1.5 lb a.i./acre rate, and 0% control for the Zorial 80 WP application at 2.0 lb a.i./acre. This indicates that at least two split norflurazon applications are necessary to provide adequate season long nutsedge control in established alfalfa.

Nutsedge control following Zorial 80 WP application was substantially less than the control achieved with Evital 5G applied at the same rate of a.i. on April 30. The limited effectiveness of the Zorial 80 WP spray formulation for nutsedge control was due to poor soil incorporation which reduced positional availability and uptake of the herbicide by nutsedge plant roots. Results from this experiment for control of purple nutsedge in established alfalfa with the granular formulation of norflurazon applied at the 2.0 lb a.i. rate were encouraging.

On August 7 (99 DAT), the second Evital 5G application was applied at rates of 1.0, 1.5, and 2.0 lb a.i./acre to the nutsedge regrowth to determine the effectiveness of two split applications (one in early spring and one in late summer) for season long nutsedge control in alfalfa. On September 10, visual nutsedge control rating indicated that Evital 5G split applied at the 2+2 lb. a.i./acre rate provided the best purple nutsedge control, followed by the single application of Evital 5G at the 3 lb a.i./acre rate on April 30. By October 23, this same trend was observed with more than 90% control achieved with either the 2+2 or 3 lb a.i./acre Evital rates, however the treatment consisting of 1.5+1.5 lb. a.i. Evital 5G also provided maximum purple nutsedge control. These treatments were followed closely by two split applications of Evital 5G at the 1+1 lb. a.i./acre rate (76% control) and the single application of Evital 5G at the 3 lb a.i./acre rate (78% control).

1997:

On March 6, spring Evital applications were initiated for the second year. Evital 5G was reapplied to plots receiving split applications on June 17. Visual nutsedge control ratings were made on April 22 (46 DAT), May 20 (74 DAT), June 17 (pre-treatment, 102 DAT), and July 15 (Table 2). Initially, poor to fair purple nutsedge control (26-51%) was observed 46 DAT with the application of 1.5 to 3 lbs a.i./acre Evital 5G. Similar nutsedge control trends were noted at 74 DAT. Following 4 seasonal irrigations at 102 DAT, and 6 seasonal irrigations on July 15, good to excellent nutsedge control (50-86%) was observed in plots receiving from 1.5 to 3 lbs a.i./acre Evital 5G. Purple nutsedge appeared to be nearly eliminated from plots receiving annual application rates of norflurazon ranging from 3 to 4 lbs a.i./acre.

References

Tickes, Barry R. 1990. Nutsedge control in alfalfa. 1990 Yuma County Farm Notes. University of Arizona Cooperative Extension. Yuma, AZ. p. 7.

Tickes, Barry R. 1993. Herbicide recommendations for alfalfa slide chart. University of Arizona Cooperative Extension. Tucson, AZ.

Table 1. 1996 purple nutsedge weed control evaluations in Parker Valley alfalfa after the first of two split norflurazon treatments were applied on April 30. The split treatments were applied on August 7.

Treatment	Formulation	Rate lb a.i./A	Nutsedge Cover		Nutsedge Control				
			June 4 %	August 7 %	June 4 %	July 2 %	August 7 %	September 10 %	October 23 %
1. untreated	---	---	70	76	0 d	0 f	0 e	0 f	0 e
2. norflurazon	5 G	1.0 +							
norflurazon	5 G	1.0	74	81	26 c	50 d	19 d	26 de	76 b
3. norflurazon	5 G	1.5	61	74	35 abc	70 c	25 c	20 e	30 d
4. norflurazon	5 G	1.5 +							
norflurazon	5 G	1.5	70	79	33 bc	65 c	25 c	39 c	91 a
5. norflurazon	5 G	2.0	65	80	41 ab	83 b	34 b	29 d	43 c
6. norflurazon	5 G	2.0 +							
norflurazon	5 G	2.0	66	81	41 ab	81 b	36 b	69 a	94 a
7. norflurazon	5 G	3.0	64	81	48 a	91 a	55 a	58 b	78 b
8. norflurazon	80 WP	2.0 +							
norflurazon	5 G	1.0	73	80	5 d	23 e	0 e	23 de	33 cd

Means within columns followed by the same letter are not significantly different at the 0.05 level of probability according to Duncan's Multiple Range Test.

Table 2. 1997 purple nutsedge weed control evaluations in Parker Valley alfalfa after the first of two split norflurazon treatments were applied on March 6. The split treatments were applied on June 17.

Treatment	Formulation	Rate lb a.i./A	Nutsedge Control			
			April 22 %	May 20 %	June 17 %	July 15 %
1. untreated	---	---	0 d	0 f	0 e	0 d
2. norflurazon	5 G	1.0 +				
norflurazon	5 G	1.0	23 d	13 cd	41 c	50 c
3. norflurazon	5 G	1.5	26 cd	16 cd	50 c	50 c
4. norflurazon	5 G	1.5 +				
norflurazon	5 G	1.5	41 b	39 b	75 ab	76 ab
5. norflurazon	5 G	2.0	31 c	23 c	65 b	65 b
6. norflurazon	5 G	2.0 +				
norflurazon	5 G	2.0	54 a	56 a	86 a	88 a
7. norflurazon	5 G	3.0	46 b	51 ab	75 ab	78 ab
8. norflurazon	5 G	1.0 +				
norflurazon	5 G	2.0	24 d	15 cd	45 c	45 c

Means within columns followed by the same letter are not significantly different at the 0.05 level of probability according to Duncan's Multiple Range Test.