

ADDITIVE EFFECTS OF TELONE® C-17 AND VAPAM® SOIL FUMIGANTS ON YELLOW NUTSEDGE IN DRY-BULB ONIONS

Joel Felix and Joey Ishida
Malheur Experiment Station
Oregon State University
Ontario, OR, 2009

Introduction

Yellow nutsedge is increasingly becoming a major crop production problem in the Treasure Valley of eastern Oregon and southwestern Idaho, especially when fields are planted to direct-seeded dry bulb onions. Control of yellow nutsedge presents a major challenge because of its ability to reproduce by underground propagules (rhizomes and tubers). Without effective control, yellow nutsedge can produce millions of tubers per acre in a single season. Successful control of yellow nutsedge in the Treasure Valley will partly rely on tuber destruction by effective soil fumigation procedures. Evidence suggests that the use of Telone® C-17 soil fumigant followed by Vapam® could enhance the control of yellow nutsedge. Similarly, supplementing soil fumigants with fall application of Dual Magnum® herbicide could provide synergistic effects and further enhance nutsedge control. The objective of this study was to evaluate the effectiveness of Telone C-17, Vapam, and s-metolachlor (Dual Magnum) when applied alone and the synergistic effects of combination treatments to reduce yellow nutsedge tuber viability in fields intended for dry bulb onion production.

Materials and Methods

An experiment was conducted in 2009 in a grower field approximately 5 miles from the Malheur Experiment Station, Ontario, Oregon. The field was naturally infested with yellow nutsedge. The predominant soil was an Owyhee sandy loam. The field was furrow irrigated on September 1 and disked on October 17, 2008. The experimental design was a randomized complete block with four replicates. Each plot was 16 ft wide and 60 ft long. On October 22, five soil cores (4.25-inch diameter each) were taken from the center of each plot to a 12-inch depth. Yellow nutsedge tubers from the composite soil sample were separated by washing and sieving, counted, and weighed. Yellow nutsedge tubers were placed in ziplock bags and stored in a dark cooler at 40°F until counted. The treatments tested included two fumigants (Telone C-17 and Vapam) and Dual Magnum herbicide either as stand-alone applications or in combinations. An untreated check was also included. The herbicide s-metolachlor at 1.27 lb ai/acre (Dual Magnum at 1.33 pt/acre) was applied on October 24 followed by soil fumigation with Telone C-17 at 23 gal/acre on October 27, 2008. The field was moldboard plowed on November 4 and fumigated with Vapam at 50 gal/acre on November 6, 2008. Beds were formed on 22-inch spacing and left undisturbed until planting.

Telone C-17 was applied using tractor-drawn equipment with shanks spaced 20 inches apart and set to fumigate at 18-inch depth. Vapam soil fumigant was shanked in to the respective plots both at 10- to 12-inch depth and 5- to 6-inch depth using tractor-drawn equipment with shanks spaced 5 inches apart.

Red onion variety 'Salsa' was planted on March 19, 2009 in double rows spaced 3 inches apart with seeds dropped at 4-inch spacing within the row. Onion rows were banded with Chlorpyrifos (Lorsban® 15G) insecticide at 0.125 lb ai/acre (3.7 oz/1,000 ft) on March 23, 2009.

Soil samples to quantify the yellow nutsedge population after treatment were taken on April 6, 2009 using the procedure described above. Soil samples were taken again on August 24 to quantify yellow nutsedge tubers at the end of the season. All plots except the untreated control were sprayed with herbicides as practiced by the host grower. Similarly, fertilizer and disease and insect preventive sprays were done by the grower. Plots were evaluated for late-season yellow nutsedge control on August 26, 2009 just before onion harvest. Onions were harvested from 20-ft lengths along 2 center rows on August 26, 2009 and graded according to quality using USDA standards. Dry bulbs without blemishes (No. 1s) and split bulbs (No. 2s). The No. 1 bulbs were graded according to diameter into small (<2.25 inches), medium (2.25-3 inches), jumbo (3-4 inches), colossal (4-4.25 inches), and supercolossal (>4.25 inches). The data were subjected to analysis of variance and means compared using LSD at $P < 0.05$.

Results

Soil samples taken at the beginning of the study indicated uniform tubers across the study area (Table 1). Samples drawn at the end of the season in 2009 indicated variation among treatments for yellow nutsedge tubers. Combination treatments provided better control and had the lowest number of yellow nutsedge tubers. Dual Magnum applied alone during fall reduced yellow nutsedge tubers by 20 percent. Fumigating the soil with Telone C-17 or Vapam alone provided 53 and 51 percent tuber reduction, respectively. Combination treatments with Dual Magnum followed by Telone C-17 or Vapam reduced yellow nutsedge tubers by 72 and 74 percent, respectively. The greatest yellow nutsedge tuber reduction was achieved with Dual Magnum followed by Telone C-17 and Vapam (78 percent), while Vapam tank-mixed with AdSorb FC reduced the tubers by 80 percent. AdSorb is a soil surfactant believed to enhance water movement in the soil profile.

The highest marketable onion yield (389 cwt/acre) was achieved with Telone C-17 followed by Vapam (Table 2). However, the yield with this treatment was not significantly different from that provided by Telone C-17 or Vapam alone, which was 280 or 361 cwt/acre, respectively. The yield for combination treatments was similar and lowest when Dual Magnum was used as a stand-alone treatment.

Conclusion

There seems to be an additive effect to yellow nutsedge tuber reduction when Telone C-17 is followed by Vapam. However, the reduction in yellow nutsedge tubers did not translate into increased dry bulb onion yield. But growers aiming to reduce yellow nutsedge in their farming operations would find combination treatments to be of great value in the long run.

Table 1. Yellow nutsedge tubers, percent change from fall 2008 to fall 2009, and percent control in response to soil fumigation and herbicide, Malheur Experiment Station, Ontario, OR 2009.

Treatment	Rate	Yellow nutsedge tubers [†]			change F08-F09 [‡]	Control 8/26/2009
		10/28/2008	4/8/2009	8/24/2009		
		----- No./yd ² -----			---- % ----	---- % ----
Untreated Check		1435 ab	1363 a	1815 a	29 a	0.0 f
Vapam	50 gal/a	1245 ab	1032 a	358 c	-51 bcd	71.3 abc
Dual Magnum	1.33 pt/a	1947 ab	1476 a	1308 ab	-20 abc	38.8 de
Telone C-17	23 gal/a	1766 ab	1118 a	797 bc	-53 bcd	32.5 e
Dual Magnum AdSorb FC	1.33 pt/a 2 gal/100gal	761 b	548 a	652 bc	-7 ab	61.0 bcd
Dual Magnum Vapam	1.33 pt/a 50 gal/a	951 ab	620 a	281 c	-71 cd	91.3 a
Telone C-17 Vapam	23 gal/a 50 gal/a	1553 ab	1173 a	430 c	-74 d	80.0 ab
Dual Magnum Telone C-17	1.33 pt/a 23 gal/a	2408 a	1440 a	756 bc	-72 cd	83.8 ab
Dual Magnum Telone C-17 Vapam	1.33 pt/a 23 gal/a 50 gal/a	2078 ab	1526 a	394 c	-78 d	87.5 a
Dual Magnum Vapam AdSorb FC	1.33 pt/a 50 gal/a 2.0 qt/a	937 ab	688 a	326 c	-59 bcd	93.5 a
Vapam AdSorb FC	50 gal/a 2.0 qt/a	1390 ab	973 a	430 c	-80 d	51.3 cde
Dual Magnum	1.33 pt/a	1974 ab	1335 a	471 c	-65 cd	88.5 a

[†]Means within a column followed by same letter do not significantly differ (P = 0.05, LSD).

[‡]Percent yellow nutsedge change from fall 2008 (fumigation) to fall 2009 (end of season).

Table 2. Yield and grade of onions in response to soil fumigation and herbicides, Malheur Experiment Station, Ontario, OR, 2009.

Treatment	Rate	Onion yield [†]					
		Small	Medium	Jumbo	Colossal	Super colossal	Marketable yield
		----- cwt/acre -----					
Untreated Check		22.3 ab	47 ab	77.2 c	0.0 a	41.7 bc	165.7 c
Vapam	50 gal/a	14.8 b	45 ab	231.6 a	20.8 a	63.7 abc	360.8 a
Dual Magnum	1.33 pt/a	25.2 ab	33 ab	111.4 bc	0.0 a	17.2 c	161.7 c
Telone C-17	23 gal/a	17.8 b	36 ab	173.7 abc	17.8 a	51.5 abc	279.5 abc
Dual Magnum AdSorb FC	1.33 pt/a 2 gal/100gal	22.3 ab	36 ab	83.2 c	0.0 a	63.7 abc	183.3 bc
Dual Magnum Vapam	1.33 pt/a 50 gal/a	25.2 ab	47 ab	161.9 abc	31.2 a	76.0 abc	315.8 abc
Telone C-17 Vapam	23 gal/a 50 gal/a	50.5 a	55 a	187.1 abc	38.6 a	107.8 a	388.5 a
Dual Magnum Telone C-17	1.33 pt/a 23 gal/a	28.2 ab	50 ab	158.9 abc	10.4 a	78.4 ab	297.2 abc
Dual Magnum Telone C-17 Vapam	1.33 pt/a 23 gal/a 50 gal/a	25.2 ab	41 ab	157.4 abc	8.9 a	49.0 abc	256.1 abc
Dual Magnum Vapam AdSorb FC	1.33 pt/a 50 gal/a 2.0 qt/a	31.2 ab	40 ab	126.2 abc	17.8 a	53.9 abc	238.2 abc
Vapam AdSorb FC	50 gal/a 2.0 qt/a	26.7 ab	44 ab	221.2 ab	23.8 a	49.0 abc	337.6 ab
Dual Magnum	1.33 pt/a	34.2 ab	28 b	86.1 c	10.4 a	41.7 bc	165.9 c

[†]Means within a column followed by same letter do not significantly differ (P = 0.05, LSD).