YELLOW NUTSEDGE COMPETITION IN DRY BULB ONION PRODUCTION

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Ontario, OR, 2003

Introduction

Yellow nutsedge is a perennial weed common in irrigated row crop production in eastern Oregon and southwestern Idaho. Yield losses of up to 87 and 89 percent for agronomic and horticultural crops, respectively, have been attributed to yellow nutsedge competition (Keeley 1987). Yellow nutsedge is problematic in many crops, especially those that are short in stature such as onion. Because of its short stature and relatively small leaf area, much of the available sunlight reaches the soil surface and is not intercepted by the onion canopy. Yellow nutsedge has a C_4 photosynthetic pathway and therefore responds well to conditions of high light intensity that exist in onion production. Keeley and Thulen (1978) used several artificial shading regimes to determine that the number of yellow nutsedge shoots, tubers, and total dry matter increased in direct proportion to increasing amounts of light. In the same trial it was determined that the time required for 95 percent canopy interception of photosynthetically active radiation in onion took considerably longer within the drill rows and was less overall in the furrows when compared to several other crops having faster developing and more complete canopies (Keeley and Thullen 1978). In addition to high light conditions, management practices including frequent irrigation and high nitrogen fertilization required to maximize onion yield also stimulate yellow nutsedge growth (Keeling et al. 1990).

Chemical options for yellow nutsedge control are limited. Of the products currently registered only Dual Magnum (s-metolachlor) and Vapam (metham sodium) have activity on yellow nutsedge. Dual Magnum can be applied postemergence to two-leaf or larger onions while Vapam is applied typically in the fall prior to onion planting the following spring.

The objective of this trial was to determine the effect of yellow nutsedge competition on onion yield in several commercial fields.

Methods

Five commercial onion fields were sampled between August 19 and 29. At each location paired samples consisting of 5-ft sections of row inside and immediately adjacent to a yellow nutsedge patch were harvested. Onion varieties and management practices varied among locations. At each field location six paired samples were taken each from a different yellow nutsedge patch. Onion bulbs and yellow nutsedge shoots

were harvested from the sample area. Onions were graded according to diameter: small (<2.25 inches), medium (2.25-3.0 inches), jumbo (3-4 inches), colossal (4-4.25 inches), and super colossal (>4.25 inches) in order to evaluate total onion yield loss and yield loss by market class due to yellow nutsedge competition. Bulb counts were taken for each market class. Yellow nutsedge shoot numbers and biomass were recorded. Paired samples were compared using a *t* test at the 0.05 level for onion yield (cwt/acre) and at 0.10 for onion bulb counts (number/acre).

Results and Discussion

Yellow nutsedge shoot densities at the different locations ranged from 28 to 67 shoots/ft^2. Yellow nutsedge shoot dry weight biomass from the sampled patches ranged from 0.27 to 0.98 ton/acre (data not shown). On average, small onion bulbs (number/acre) increased by 43 percent, medium bulbs were unchanged, jumbo decreased by 44 percent, colossal decreased by 72 percent, and marketable (i.e., medium, jumbo, and colossal) bulbs decreased by 34 percent from yellow nutsedge competition. Location 2 had the highest density of yellow nutsedge, resulting in a 61 percent decrease in marketable onion bulbs from yellow nutsedge competition (Table1).

Small onion yields (cwt/acre) were significantly ($P \leq 0.05$) greater with yellow nutsedge competition at only one of the five locations (Table 2). Yellow nutsedge competition did not influence medium onion yields at any of the five locations. Jumbo onion yields were significantly ($P \leq 0.05$) less with yellow nutsedge competition at locations 1, 2, and 5, resulting in yield losses from 53 to 67 percent. Colossal onion yield trended lower with yellow nutsedge competition at all locations but was only statistically less when averaged over all locations. Marketable onion yields were 23 to 64 percent less with yellow nutsedge competition than without. This trial was previously conducted in 1998 with similar results. In 1998, when averaged across five locations, yellow nutsedge competition increased small onion yields, did not influence medium onion yields, and decreased jumbo and colossal onion yields.

References

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Keeley, P. E., and R. J. Thulen. 1978. Light requirements of yellow nutsedge *(Cyperus esculentus)* and light interception by crops. Weed Sci. 26:10-16.

Keeling, J.W., D.A. Bender, and J. R. Abernathy. 1990. Yellow nutsedge *(Cyperus esculentus)* management in transplanted onions *(Allium cepa)*. Weed Technol. 4:68-70.

Table 1. Onion bulbs by grade and total marketable bulbs with and without yellow nutsedge competition from five commercial fields near Ontario, OR, 2003.

Location	Yellow nutsedge density	Onion yield*									
		Small		Medium		Jumbo		Colossal		Marketable†	
		-YNS	+YNS	-YNS	+YNS	-YNS	+YNS	-YNS	+YNS	-YNS	+YNS
	no/ft²	------ no/acre ------		------ no/acre ------		------ no/acre ------		------ no/acre ------		------ no/acre ------	
1	39	10,296	42,768*	24,568	29,320	81,592	26,944*	3,184	0	109,296	56,216*
2	67	6,320	808	9,504	5,560	49,896	17,440*	3,184	1,568	62,584	24,568*
3	40	4,752	4,752	19,008	12,688	79,976	65,720	6,320	3,184	106,112	81,592*
4	28	11,880	17,440	36,448	26,136	91,856	64,960*	5,560	808	133,864	91,856*
5	47	19,816	27,704	45,144	57,832*	49,896	24,568*	1,568	0	96,608	82,352
Average	44	10,597	18,675*	26,944	26,279	70,662	39,917*	3,944	1,092*	101,693	67,336*

*Values marked with an asterisk represent significant differences between paired samples at the 0.10 level. Without yellow nutsedge = -YNS, with yellow nutsedge = +YNS.
†Marketable onion counts consisted of medium, jumbo, and colossal bulbs.

Table 2. Onion yield by grade and total marketable yield with and without yellow nutsedge competition from five commercial fields near Ontario, OR, 2003.

Location	Yellow nutsedge density	Onion yield*									
		Small		Medium		Jumbo		Colossal		Marketable†	
		-YNS	+YNS	-YNS	+YNS	-YNS	+YNS	-YNS	+YNS	-YNS	+YNS
	no/ft²	------ cwt/acre ------		------ cwt/acre ------		------ cwt/acre ------		------ cwt/acre ------		------ cwt/acre ------	
1	39	9	33.3*	39	48	275.1	84.1*	16.6	0	331.2	132.1*
2	67	5.7	0.9	17.1	8.6	173.9	57.5*	18.5	10.4	209.6	76.5*
3	40	5.2	5.2	31.4	22.3	267.1	220.5	41.3	21.9	345.9	264.7*
4	28	12.4	15.7	65.1	45.6	288.4	202	35.6	5.2	389.2	252.8*
5	47	21.9	26.6	79.8	94.6	145.4	68.4*	9.5	0	234.7	162.5*
Average	44	10.9	16.1	46.6	43.7	229.9	126.4*	24.2	7.6*	302.2	177.7*

*Values marked with an asterisk represent significant differences between paired samples at the 0.05 level. Without yellow nutsedge = -YNS, with yellow nutsedge = +YNS.
†Marketable onion yield consisted of medium, jumbo, and colossal yields.