

VAPAM FUMIGANT TREATMENTS IN SUGAR BEETS AND ONIONS

Charles E. Stanger and Joey Ishida
Malheur Experiment Station
Oregon State University
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Purpose

Sugar beets and onions were treated with the fumigant Vapam to test seedling vigor and yield.

Procedures

Vapam at 22 and 44 gallons per acre and two herbicides (Roneet 3 lbs/ac in sugar beets and Ramrod 4 lbs/ac in onions) tank-mixed with 22 gallons of Vapam per acre were applied March 31 and mechanically incorporated in fall-bedded soil. Before application, the fall-bedded soil was harrowed with a spike-tooth bed-harrow. Vapam and Vapam/herbicide were applied to the flattened beds in 11-inch bands. The fumigant and herbicide were incorporated to a depth of 3 inches of soil with a tractor power driven row tiller. After incorporation, the tilled beds were rehilled leaving the Vapam treatments in a 3-inch layer at the base of each bed. Spacing between beds was 22 inches. The rehilled beds were left 14 days before sugar beets (variety WS-PM9) and onions (variety Petoseed Vision) were seeded on April 18. After planting, the crops were furrow irrigated April 19 to promote moisture for seedling emergence and growth.

To apply the fumigant and herbicide/fumigant tank-mixes, the required amount of chemicals was mixed with water and sprayed in 11-inch bands using a single bicycle wheel plot sprayer with fan Teejet nozzles, size 8006. Spray pressure was 42 psi, and total spray volume was about 45 gallons per acre for all treatments (fumigant/water and herbicide). For the lower volume of fumigant, water made up the extra volume for total spray solution.

Postemergence herbicides were applied to control weeds escaping fumigant and soil active herbicides in treated plots and weeds present in untreated check plots. Postemergence herbicides used in sugar beets and onions were Betamix Progress + Poast at 0.25 and 0.1 lb ai and Buctril/Nortron/Poast at 0.15 + 0.25 + 0.1 lb ai. Two applications were applied to each crop. The initial application was applied to sugar beets at two true leaves and onions with one true leaf. The second application was applied 14 days later. Each plot was 4 rows wide and 25 feet long. Each treatment was replicated four times, and treatments were arranged using a randomized complete block experimental design.

The onions were lifted on September 21 and were hand-topped, boxed, and placed in storage on September 26. Onions were removed from storage on December 21 and 22 and graded to determine bulb yield by bulb size and measure the storage quality by determining the amount of rot occurring in storage (Table 1). Bulbs were evaluated subjectively for pinkroot at harvest.

The sugar beets were harvested on October 13. Root yields were determined by harvesting all roots from the two center rows of each four row plot. Percent sucrose, conductivity, and root NO_3N was measured from two-eight root samples taken from each plot and analyzed by Amalgamated Sugar Company at the Nyssa, Oregon tare laboratory. Percent extraction and estimated recoverable sugar per acre and ton of beets were calculated (Table 2).

Results

Vapam at both rates caused some initial injury to the emerging sugar beets and onions. Crop injury stunting from Vapam may have resulted from the high percent soil moisture causing the Vapam to remain active in the soil for a longer period of time. Initial weed control was excellent for all treatments, resulting in 80 to 95 percent control of redroot pigweed, kochia, lambsquarters, artemisia, hairy nightshade, and barnyardgrass. Roneet or Ramrod tank-mixed with Vapam did improve initial weed control but did not persist longer than normal to control later germinating weeds. Weeds escaping the Vapam or Vapam/Herbicide tank-mix were controlled with the postemergence applied herbicides. After the initial injury (stunting) from Vapam treatments, the crops in the treated area made more rapid growth and appeared more vigorous than the crops in the untreated area. Ramrod tank-mixed with Vapam increased the control of weeds.

Vapam treatments did not affect sugar beet root yield or lbs/ac of recoverable sugar. Percent sucrose and percent extractable sugar were lower and conductivity and root NO_3N were higher in the 44 gal/ac treatment of Vapam. The yield of recoverable sugar/ac was similar for all treatments. Sugar yield in lb/ton of sugar beet roots was less for the Vapam 44 gal/ac treatment.

Even with the early Vapam injury to the seedling onions, harvested bulb yields were higher the 22 gal/ac rate of Vapam. Bulb yields were about 100 cwt/ac higher in the Vapam 44 gallon treatments compared to the yield in the untreated check, but the yield increase was below the 131 cwt/ac required for statistical significance. Bulb yield increases from Vapam treatments may have been due to more rapid early growth and no competition from early weed populations. Bulbs were larger in the untreated check plots, indicating wider spacing between onion plants because some onion plants were accidentally removed with weeds when hand weeding. The percent storage rot (4.4 percent) was low for all treatments, and differences between treatments were not significant. Pinkroot ratings taken at time of harvest did not show that Vapam reduced pinkroot infection. Pinkroot was on all onion bulbs regardless of treatment.

Table 1. Crop tolerance and percent weed control from Vapam and Vapam/Roneet tank-mix treatments applied preplant in March to sugar beets. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1995.

Treatments			Percent weed control																																
			Crop Injury				Pigweed				Lambsquarters				Kochia				Artemisia				H. nightshade				Barnyardgrass								
Rate				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
gal/ac		lb/ac		----- % -----				----- % -----																											
Vapam	22	--		15	10	15	10	85	90	90	85	90	80	85	80	80	80	85	85	85	80	85	85	80	85	80	80	85	90	90	90				
Vapam	44	--		25	20	20	25	98	95	95	95	95	98	98	98	90	95	90	95	95	90	90	95	90	95	95	90	98	95	95	98				
Vapam + Roneet	22	3.0		35	30	30	30	100	100	100	100	98	98	98	100	98	95	95	98	90	95	95	95	100	100	100	100	100	100	100	100				
Untreated check	--	--		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

Evaluated May 12.

Ratings: 0 = no chemical effect. 100 = all plants killed.

56 Table 2. Root yield, sugar yield, and root quality from Vapam and Vapam/Roneet tank-mix treatments applied preplant in March to sugar beets. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1995.

Treatments			Sugar beet yield and quality							
			Rate		Root yield	Sugar content	Gross sugar	Conductivity	Nitrate-N	Extraction
gal/ac		lb/ac	tons/ac	%	lb/ac	µ mhos	ppm	%	lb/ac	lb/ton
Vapam	22	--	41.64	16.31	13,540	778	228	84.49	11,440	275.7
Vapam	44	--	42.74	15.94*	13,630	829*	305*	83.73*	11,410	266.9*
Vapam + Roneet	22	3.0	41.32	16.14	13,330	780	212	84.42	11,250	272.6
Untreated check	--	--	40.93	16.50	13,480	751	188	84.87	11,440	280.2
Mean			41.66	16.22	13,490	784	234	84.38	11,390	273.8
LSD (0.05)			2.82	0.55	836	59	72	0.86	751	11.4
CV (%)			6.5	3.2	5.9	7.2	29.7	0.98	6.3	4.0
Significance			ns	s	ns	s	s	s	ns	s

Table 3. Crop tolerance and percent weed control from Vapam and Vapam/Ramrod tank-mix treatments applied preplant in March to onion ground. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1995.

Treatments			Percent weed control																							
			Crop injury				Pigweed				Lambsquarters				Kochia				H. nightshade				Barnyardgrass			
Rate		1 2 3 4				1 2 3 4				1 2 3 4				1 2 3 4				1 2 3 4								
gal/ac	lb/ac	----- % -----				----- % -----																				
Vapam	22	--	10	15	15	10	80	85	80	85	85	80	80	80	75	85	80	80	75	85	80	80	85	90	90	90
Vapam	44	--	25	30	30	25	95	90	90	90	98	95	95	95	95	90	90	90	90	85	90	90	95	95	98	95
Vapam + Ramrod	22	4.0	10	10	15	10	100	100	100	100	85	85	85	85	100	100	100	100	98	95	98	98	100	100	100	100
Untreated check	--	--	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Evaluated May 12.

Ratings: 0 = no chemical effect. 100 = all plants killed.

57 Table 4. Onion bulb yield and grade from Vapam and Vapam/Ramrod tank-mix treatments applied preplant in March to onion ground. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1995.

Treatments	Rates		Bulb yield (cwt/ac)								
			Storage rot		2 1/4 - 3 inch		3 - 4 inch		> 4 inch		Total
gal/ac	lb/ac	cwt/ac	%	cwt/ac	%	cwt/ac	%	cwt/ac	%	cwt/ac	
Vapam	22	--	37	4.2	46	5.1	654	72.9	158	17.6	897
Vapam	44	--	32	4.2	51	6.5	596	76.6	97	12.5	778
Vapam + Ramrod	22	4.0	35	4.4	56	6.9	589	73.4	117	14.6	802
Untreated check	--	--	35	5.1	25	3.6	461	66.3	168	24.1	695
Mean				4.4	44		575		135		794
LSD (0.05)				2.3	24		146		52		131
CV (%)				16	17		8		12		5