

## PREPLANT PEST MANAGEMENT IN RANUNCULUS PRODUCTION

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Ranunculus is a perennial field-grown flower used for cut flower production, and production of tubers for the landscape trade. It is planted from seed on beds in the field in the fall, grown through the winter and flowers in spring and early summer then matures a storage tuber by summer. Flowers are cut fresh in the spring and tubers are harvested in July/August to dry and package for fall planting in the landscape.

Soil-borne pests are problems in the flower production system. Weeds have the greatest effect during the early growth and harvesting. Weed control requires hand weeding and hoeing to reduce competition and visual problems. Residual tubers are weeds that are reservoirs for nematodes and soil-borne pathogens in the following crop. If a color display is needed, off-colored plants are weeds. Soil pathogens can reduce flower production and tuber harvest by 50%.

Three studies were conducted in 2001-02. Two studies were applied with commercial equipment in large field plots and replicated four times. Plot size was either 11 or 13 feet wide and 125 feet or longer per plot. Soil moisture was established with sprinkler irrigation before treatment. In soil with moisture in the 12 to 15% range (dry side) the treatments of methyl bromide/chloropicrin (350 lb of 50:50%) was shanked in at 18 inch spacing 12 inches deep, iodomethane/chloropicrin either 300 or 350 lb at 50:50% was shanked in the same depth and spacing then covered immediately after treatment.

In the higher moisture area (35%) (wet side) dazomet was placed on the soil surface at 200 lb/A with a Scott drop spreader. Metam was applied at 75 gal/A through a subsurface blade 6 inches below the soil and then incorporated to 8 inches depth with a power tiller and followed with a compacting roller. Following these treatments a second piece of equipment shanked either C-35 (mixture of 1,3-D and chloropicrin) at 35 gal/A or 1,3-D (Telone II) at 15 gal and chloropicrin at 200 lb/A and followed immediately with a tarp. The tarp remained on the ground for one week before cutting it to allow the soil to air, and the plastic was removed from the field. Two beds were formed in the center of each plot.

Other treatments were applied through two drip lines per 30 inch beds under clear plastic tarps (Table 3). The application was made in 1 acre (A) inch of water after pre-wetting the soil with 1A inch and the treatment was followed with 1A inch of water. Tarps were left on the beds for 1 week, cut and removed. All planting was done on November 27, 2001.

*Malva parviflora* was controlled with treatments in the wet side compared to the untreated plots (Table 1). There were no differences between treated and untreated plots for the control of clover. No differences were noted in number of bunches of *Ranunculus* harvested (Table ).

In the dry side, *Malva* control was not different with shank applied iodomethane/chloropicrin than the equivalent amount of methyl bromide /chloropicrin at 350 lb/A (Table 2). There were more *Ranunculus* seedling germination in treated plots than in the untreated plots. Harvested bunches of *Ranunculus* was increased by 33% or more when treated preplant compared to untreated soil for one year (Table ).

Using drip application, there were fewer *Malva*, bur clover and common sow thistle seedlings in all treatments compared to the control treatments (Table 3).

Table1. Number of *Malva* and Clover seedlings after preplant fumigation in moist soil.\*

Treatments and Rate/A	Malva control**	Clover control
Metam + C-35 (75 gal + 35 gal)	2.0 b***	6.2
Metam + 1,3-D + Pic (75 + 15 gal + 200 lb*)	2.1 b	4.5
Metam (75 gal)*	3.1 b	3.2
Dazomet + C-35 (200 lb + 35 gal*)	2.8 b	6.1
Dazomet + 1,3-D + Pic (200 + 15g + 200 lb)*	2.1 b	5.5
Control*	7.8 a	6.8
LSD P = 0.05	4.435	NS

\* Tarped for 1 week, evaluated two months after treatment

\*\* Weed counts per 5 square feet.

\*\*\* Means in columns followed by the same letter are not significantly different as separated by Fischers LSD P = 0.05

Table 2. Weed Control and *Ranunculus* germination after preplant fumigation.\*

Treatment and Rate /A	Malva control**	Clover control**	<i>Ranunculus</i> seedlings***
MBr/pic 350 lb (50:50)	0.8 b****	55.5	48.0 ab
Iodo/pic 300 lb (50:50)	0.5 b	61.1	50.0 a
Iodo/pic 350 lb (50:50)	0.5 b	43.6	52.6 a
Control *	2.1 a	62.5	45.1 b
LSD P = 0.05	1.194	NS	4.763
Probability	0.0371	0.3990	0.0337

\* Tarped for 1 week, evaluated three months after treatment

\*\* Number/5 square feet

\*\*\* Number of seedlings from two rows, 3 feet long

\*\*\*\* Means in columns followed by the same letter are not significantly different as separated by Fischers LSD P = 0.05

Table 3. Weed control and affect on Ranunculus germination from preplant drip applied fumigants.

Treatment	Rate (lb/A)	Clover	Sow thistle	Malva	Ranunculus
		-----1/11/02*		----- 1/22/02*	
Metam sodium	320	0.0 b	0.0 b	0.2 b	41.8
Iodomethane/chloropicrin	350 (50:50)	0.9 b	0.0 b	0.0 b	46.0
Chloropicrin	200	0.5 b	0.0 b	0.3 b	46.0
Chloropicrin	300	0.1 b	0.0 b	0.4 b	56.2
Sodium Azide	60	0.0 b	0.0 b	0.0 b	45.2
Sodium Azide	100	0.0 b	0.0 b	0.0 b	47.0
1,3-D + chloropicrin	150 +150	0.0 b	0.0 b	0.0 b	41.4
Untreated - water	-----	39.1 a	2.8 a	1.9 a	41.8
LSD 0.05	-----	6.002	0.8662	0.8059	NS
Probability	-----	0.0000	0.0000	0.0005	0.2623

\* Evaluated using a 1 foot by 4 feet quadrat on the bedtop on 1/11/02 and a 2.5 feet by 2.0 feet on the bedtop on 1/22/02

Table 4. Harvest of Ranunculus flower bunches after preplant fumigation.\*

Treatment	Rate	1 <sup>st</sup> harvest	2 <sup>nd</sup> harvest	Total bunches
Metam + C-35	320 +35 g	102	251.2	353.2
Metam + 1,3-D + chloropicrin	320 +15g + 200 lb	97	260.0	357.0
Metam	320	106.8	250.5	357.3
Dazomet + C-35	200 + 35g	89.8	268.5	358.3
Dazomet + 1,3-D + chloropicrin	200 + 15g + 200 lb	92.5	240.0	332.5
Untreated - tarped	----	92.8	255.5	348.3
LSD 0.05	----	NS	NS	NS

\* Number of bunches from two beds (4 rows) by 145 feet.

Table 5 Harvest of Ranunculus flower bunches after preplant fumigation.\*

Treatments	Rate	1 <sup>st</sup> harvest	2 <sup>nd</sup> harvest	Total bunches
Methyl bromide/chloropicrin	350 (50:50)	79.8 a	352.0 a	431.8 a
Iodomethane/chloropicrin	300 (50:50)	81.8 a	375.8 a	457.6 a
Iodomethane/chloropicrin	350 (50:50)	86.0 a	340.5 a	426.5 a
Untreated - tarped	----	66.0 b	221.0 b	287.0 b
LSD 0.05	----		60.134	

\* Number of bunches from two beds (4 rows) by 150 feet.

Table Harvest of Ranunculus flower bunches after preplant fumigation.\*

Treatments	Rate (lb/A)	Bunches**		
		1 <sup>st</sup> harvest	2-8 harvests	Total bunches
Metam sodium	320	17.4	110.8	128.2
Iodomethane/chloropicrin	350 (50:50%)	15.3	112.8	128.1
Chloropicrin	200	18.6	144.0	162.6
Chloropicrin	300	17.2	120.8	138.0
Sodium azide	60	20.0	119.0	139.0
Sodium azide	100	18.4	105.4	123.8
1,3-D + chloropicrin (EC)	400	19.0	124.0	143.0
Untreated--water	---	16.4	127.2	143.6
LSD 0.05		NS	NS	
Probability		0.3023	0.3536	

\* All treatments were treated through driplines under clear plastic (2 lines per bed)

\*\* Number of flower bunches from one bed ( 2 rows) by 125 feet