USE OF METHYL BROMIDE AND OTHER CHEMICAL PEST CONTROL BY STRAWBERRY AND FRESH TOMATO GROWERS

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U.S. production of methyl bromide is currently restricted to the level produced in 1991. On January 1, 2001, production and importation of methyl bromide in the United States will be prohibited. Methyl bromide inventories could be used up within a few years following the ban. Other industrialized countries will phase out production of methyl bromide, with a total ban by the year 2010 (7). For developing nations, there will be a freeze on production in 2002 based upon an average of the years 1995-1998. These agreements are being revisited in September 1997 at the *Ninth Meeting of the Parties to the Montreal Protocol*, an international treaty developed to protect the earth from the detrimental effects of ozone depletion.

About 60 million pounds of methyl bromide are used annually in U.S. agriculture, primarily for soil fumigation (87%), for commodity and quarantine treatment (8%), and for structural fumigation (5%) (7). Crops, which use methyl bromide as a soil fumigant, include almonds, apples, apricots, cherries, citrus, grapes, nectarines, peaches, plums/prunes, walnuts, carrots, cucumbers, eggplants, fresh tomatoes, melons, peppers, strawberries, sweet potatoes, tobacco, ornamentals, and forest seedlings (6).

Strawberries and fresh tomatoes account for about 13-14 million pounds of methyl bromide used annually. California is the number one strawberry producing state and Florida the number one fresh tomato producing state. Sales of strawberries averaged $553 million during 1993-95, and sales of Florida fresh tomatoes averaged $216 million (5). About 90 percent of California's strawberry acreage and Florida's fresh tomato acreage are fumigated with methyl bromide.

The primary fumigant alternatives, or combination of alternatives, likely to replace methyl bromide on both strawberries and fresh tomatoes include 1,3-D (Telone), metam sodium, and chloropicrin (including a herbicide on tomatoes). Based on field testing to date, these alternatives are considered by some researchers to be "generally equally effective" as methyl bromide (1,3). The two potential alternatives are currently about 10 percent higher in cost of materials and can be applied using essentially the same equipment as with methyl bromide.

As heavy users of methyl bromide, without a history of viable fumigant alternatives, strawberry growers in California and fresh tomato growers in Florida are especially vulnerable to the methyl bromide phaseout. The reasons that use of 1,3-D and metam sodium have been limited to date include the State-related restrictions pertaining to acreage treated, application method, and soil type. For example, 1,3-D use from 1990 to 1994 was prohibited in California. There are new

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safety precautions that could be taken using these two alternatives, combined with less restrictionson use, that could potentially allow them to replace methyl bromide (1,2,3). However, there are still unanswered questions about the risks associated with the new safety precautions and the lessened restrictions in use that are being considered.

Given the lack of history of viable chemical alternatives and the close proximity of the 2001 deadline, the chemical industry is faced with responding quickly to shifting demand conditions for alternatives to methyl bromide. Shortages of fumigant alternatives could result in lower quality or quantity of yield. Lower quality could lower prices growers receive for their crop. Reduced yields could increase prices at the retail level. In the longer term, domestic markets and the balance of trade could be adversely affected by increased imports.

Chemical Use for California Strawberries and Florida Fresh Tomatoes (4)

• During the 1992, 1994, and 1996 survey years, California strawberry growers reported an average of 4.4 million pounds of methyl bromide on 89 percent of the 23,967 acres grown. Growers reported a stable use of methyl bromide with a three-year range of 85 to 92 percent of the 23,300 to 25,200 planted acres treated using 4.0 to 4.9 million pounds of active ingredients (Table 1).

• During the 1992-96 survey years, strawberry growers, in the seven major-producing states (CA, FL, NY, NC, OR, WA, WI), reported an average of 5.7 million pounds of methyl bromide on 61 percent of the 44,550 acres grown. The only other fumigant reported was chloropicrin.

• In 1996, California strawberry growers reported 2.1 million pounds of chloropicrin applied on 87 percent of the acres planted. Other pesticides, applied during the growing season, included herbicides (2,4-D, DCPA, Glyphosate, napropamide, paraquat, sethoxydim, simazine, terbacil), insecticides (abamectin, azinphos-methyl, Bt, carbaryl, carbofuran, chlorpyrifos, diazinon, dicofol, endosulfan, fenbutatin-oxide, fenpropathrin, malathion, methomyl, naled, oxydemeton-methyl, potassium salts, propargite), fungicides (benomyl, captan, copper hydroxide, fosetyl-al, iprodione, metalaxyl, myclobutanil, sulfur, thiophanate-methyl, thiram, vinclozolin), and other chemical: metaldehyde. (Table 2).

• During 1992-1996, Florida fresh tomato growers reported an average of 7.2 million pounds of methyl bromide on 94 percent of the 45,767 acres grown. Compared with the 1992 and 1994 survey years, the growers in 1996 reported about 3 million fewer pounds used, which was due to less acreage planted and a lower rate per acre than reported in previous years.

• During 1992-96, fresh tomato growers in the six major-producing states surveyed (CA, FL, GA, NJ, NC, TX), reported an average of 7.8 million pounds of methyl bromide on 47 percent of the 99,233 acres grown. Chloropicrin was the only other fumigant reported.

• In 1996, Florida fresh tomato growers reported 1.8 million pounds of chloropicrin applied on 79 percent of the acres planted. Other pesticides, applied during the growing season, included herbicides (metribuzin, paraquat), insecticides (abamectin, Bt, endosulfan, esfenvalerate, imidacloprid, methamidophos, methomyl, permethrin) and fungicides (benomyl, chlorothalonil, copper hydroxide, mancozeb, metalaxyl) (Table 3).

References

1. Patterson, David. Personal Communication, Project Leader, Methyl Bromide Florida Demonstration Project, Florida, ARS, U.S. Department of Agriculture, September 8, 1997.

2. Thomas, William. Personal Communication, U.S. Environmental Protection Agency, September 5,
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3. Trout, Thomas. Personal Communication, Project Leader, Methyl Bromide California Demonstration Project, California, ARS, U.S. Department of Agriculture, September 5, 1997.

4. U.S. Department of Agriculture. *Agricultural Chemical Usage, Vegetables, 1992, 1994, and 1996 Summary*, NASS, ERS.

5. U.S. Department of Agriculture. *Agricultural Statistics, 1995-96*, NASS, 1997.

6. U.S. Department of Agriculture. *The Biologic and Economic Assessment of Methyl Bromide*, National Agricultural Pesticide Impact Assessment Program, July 1992.

7. World Wide Web Home Page: **http://www.epa.gov/docs/onone/mbr/mbrqa.html**.

Table 1. Methyl bromide: Strawberries, California and Fresh Tomatoes, Florida

Survey year	Acres planted	Area applied	Rate per crop year	Total applied
		Percent	Pounds per acre	Million lbs.
Strawberries, California				
1992	23,400	85	203	4.0
1994	23,300	91	212	4.5
1996	25,200	92	211	4.9
Average	23,967	89	209	4.4
Strawberries, 7 States 1/				
1992	46,300	53	201	5.0
1994	45,800	61	207	5.8
1996	44,550	68	207	6.3
Average	45,550	61	205	5.7
Fresh tomatoes, Florida 2/				
1992	49,400	93	172	7.9
1994	47,900	94	183	8.2
1996	40,000	94	143	5.4
Average	45,767	94	166	7.2
Fresh market tomatoes, 6 States				
1992	105,100	46	168	8.4
1994	103,900	48	179	8.9
1996	88,700	50	138	6.1
Average	99,233	48	162	7.8

1/ Survey states included CA, FL, NY, NC, OR, WA, and WI.

2/ Survey states included CA, FL, GA, NJ, NC, and TX.

Sources:

1. *Agricultural Chemical Use, Vegetables, 1992 Summary*, USDA, NASS, ERS, Ag Ch 1(93), June 1993

2. *Agricultural Chemical Use, Vegetables, 1994 Summary*, USDA, NASS, ERS, Ag Ch 1(95), July 1995

3. *Agricultural Chemical Use, Vegetables, 1996 Summary*, USDA, NASS, ERS, Ag Ch 1(97), July 1997

Table 2. Strawberries: Agricultural Chemical Application, California, 1996 1/

Agricultural chemical	Area applied	Rate per crop year	Total applied
	Percent	Pounds per acre	1,000 lbs.
Herbicides:			
Napropamide	6	2.01	3.1
Insecticides:			
Abamectin	67	0.05	0.8
Bt	42	2/	2/
Carbaryl	16	2.98	12.0
Chlorpyrifos	15	1.40	5.4
Dicofol	13	1.65	5.6
Fenbutatin-oxide	19	1.55	7.3
Fenpropathrin	11	1.28	0.8
Malathion	35	9.28	81.4
Methomyl	30	1.58	12.1
Naled	21	2.09	11.3
Potassium salts	7	9.41	16.0
Propargite	12	1.11	3.3
Fungicides:			
Benomyl	27	1.05	7.1
Captan	77	12.63	244.0
Iprodione	50	2.50	31.5
Myclobutanil	63	0.29	4.6
Sulfur	65	13.12	214.3
Thiram	48	8.61	104.8
Vinclozolin	39	2.19	21.4
Other Chemicals:			
Chloropicrin	87	95.60	2,102.5
Metaldehyde	8	1.64	3.5
Methyl bromide	92	210.66	4,858.5

1/In 1996, 25,200 acres of strawberries were planted in California.

2/Rates and total applied are not available because amount of active ingredients are not comparable between products.

Source: *Agricultural Chemical Usage, Vegetables, 1996 Summary*, NASS, ERS, Washington, DC, Ag Ch 1(97).

Benomyl	48	0.79	15.1
Chlorothalonil	95	8.34	317.6
Copper hydroxide	96	7.44	285.1
Mancozeb	93	10.22	379.3
Metalaxyl	35	0.17	2.3
Other Chemicals:			
Chloropicrin	79	58.55	1,842.1
Methyl bromide	94	142.52	5,345.7

1/ In 1996, 40,000 acres of tomatoes were planted in Florida for the fresh market.

2/ Rates and total applied are not available because amount of active ingredients are not comparable between products.

Source: *Agricultural Chemical Usage, Vegetables, 1996 Summary*, NASS, ERS, Washington, DC, Ag Ch 1(97).

Table 3. Tomatoes, Fresh: Agricultural Chemical Application, Florida, 1996 1/

Agricultural Chemical	Area applied	Rate per crop year	Total applied
		Pounds	1,000
	Percent	per acre	lbs.
Herbicides:			
Metribuzin	62	0.57	14.1
Paraquat	66	0.87	22.9
Insecticides:			
Abamectin	74	0.02	0.6
Bt	88	2/	2/
Endosulfan	44	1.93	34.2
Esfenvalerate	22	0.14	1.2
Imidacloprid	70	0.39	11.1
Methamidophos	47	2.96	55.8
Methomyl	55	1.27	28.2
Permethrin	57	0.45	10.2
Fungicides:			