5. PRODUCTION, IMPORT/EXPORT, USE, AND DISPOSAL

5.1 PRODUCTION

Methyl parathion is an organophosphorus insecticide that is commercially produced in the United States and abroad. Methyl parathion, O,O-dimethyl O-(4-nitrophenyl) phosphorothioate, is not known to occur as a natural substance (IARC 1983). It is commercially produced by the reaction of O,O-dimethyl phosphorochloridothionate and the sodium salt of 4-nitrophenol in acetone solvent (EPA 1974b; HSDB 1999; NIOSH 1976; NRC 1977; Worthing 1979).

Methyl parathion was first commercially produced in the United States in 1952 (U.S. Tariff Commission 1953) and was registered as an organophosphate insecticide in 1954 (NPIRS 1986). Production volume data are not available for the 1950s and 1960s and are sporadically available for the 1970s. In 1973, domestic production of methyl parathion was approximately 23.2 million kg (NRC 1977), while in 1975, it had increased to 24.4 million kg (USITC 1977a). A significant decline in production of methyl parathion occurred in 1977; the production levels dropped by 5.6 million kg from 1975 levels to 18 million kg (USITC 1979). Production volume statistics for methyl parathion are not listed separately after 1977. In 1983, the combined domestic production capacity of methyl parathion and parathion was estimated at 29 million kg (IARC 1983). In the same year, production in western Europe was estimated in the range of 10–15 million kg annually (IARC 1983). No recent production data are available.

Methyl parathion is produced or formulated in the United States by Cheminova Agro A/S, Griffin Corporation, and Elf Atochem North America (EPA 1999c). A summary of all of the manufacturers of methyl parathion in the United States was not located. Monsanto Co. and Kerr-McGee Chemical Corp. were the major producers for the period 1972 through 1988 (USITC 1973, 1975, 1977b, 1979, 1981, 1982, 1983, 1984, 1985, 1986a, 1986b, 1987, 1989). Table 5-1 provides the production year, number of facilities, and the state of their location for each known domestic producer or formulator required to report Toxics Release Inventory (TRI) data to satisfy EPA requirements. TRI data are available for this chemical because it is on the list of chemicals for which annual releases are required to be reported to the EPA.

Methyl parathion is marketed as a technical grade solution (80% methyl parathion) or in emulsifiable concentrate, wettable powder, ultra-low volume (ULV) liquid, dustable powder, and encapsulated suspension forms (HSDB 1999). The technical grade solution contains 80% active ingredient, 16.7%

Table 5-1. Facilities that Produce, Process, or Use Methyl Parathion

State[a]	Number of facilities	Minimum amount on site in pounds[b]	Maximum amount on site in pounds[b]	Activities and uses[c]
GA	1	1,000,000	9,999,999	8
MS	1	10,000	99,999	8
TX	1	10,000	99,999	13

Source: TRI99 2001

[a]Post office state abbreviations used
[b]Amounts on site reported by facilities in each state
[c]Activities/Uses:

1. Produce
2. Import
3. Onsite use/processing
4. Sale/Distribution
5. Byproduct
6. Impurity
7. Reactant
8. Formulation Component
9. Article Component
10. Repackaging
11. Chemical Processing Aid
12. Manufacturing Aid
13. Ancillary/Other Uses

xylene, and 3.3% inert ingredients. Stabilized methyl parathion solution is also available and contains 80.0% active ingredient, 14.8% xylene, and 5.3% inert ingredients (IARC 1983). Methyl parathion is formulated and sold in mixtures with parathion (ethyl), malathion, and endosulfan (Berg 1981; EPA 1999c). There are over 50 trade names for formulations and preparations of methyl parathion, including Methaphos, Gearphos, Cekumethion, and Devithion (IARC 1983; Meister et al. 1999; NPIRS 1986).

5.2 IMPORT/EXPORT

In 1971, 3 million kg of methyl parathion were imported into the United States (U.S. Tariff Commission 1972). There was a decline in imports in the mid-1970s with levels of 499,000 kg in 1972 and only 40,000 kg in 1975 (HSDB 1999). By 1980, this downward trend had reversed, and imports of methyl parathion were up to 413,000 kg (USITC 1981).

In 1972, 5.68 million kg of methyl parathion were exported from the United States (HSDB 1999). Exports dropped to 3.01 million kg in 1984 (Bureau of the Census 1984). However, in 1985, exports increased to 4.14 million kg (Bureau of the Census 1986). No recent import/export data addressing methyl parathion are available.

5.3 USE

Methyl parathion is a broad-spectrum, nonsystemic, contact and stomach insecticide with some respiratory action used to control insects on a wide variety of crops (HSDB 1999; Tomlin 1994). Methyl parathion controls a wide variety of insects including plant lice, thrips, aphids, and boll weevils (International Labour Office 1983; Meister 1988; NPIRS 1986; Weir and Hazleton 1981). Methyl parathion has also been used to control mites and tadpole shrimp (NPIRS 1986). Methyl parathion has been applied to cotton, field vegetables, rice, fruit trees, soybeans, alfalfa, nut crops, tobacco, ornamentals, forest trees, aquatic food crops, and mosquito breeding sites (IARC 1983; NPIRS 1986; Spencer 1982). Methyl parathion is generally applied to the leaves or the aerial portion of the crop using either aircraft or ground spray equipment (NPIRS 1986).

Because of its very high acute toxicity, methyl parathion is a restricted-use pesticide (EPA 1985b). In the United States, methyl parathion formulations must be used under the direct supervision of a certified pesticide applicator (EPA 1980b). The certified pesticide applicator must be physically present during mixing, loading, application, equipment repair, and equipment cleaning (NPIRS 1986). Originally, no

worker was allowed to enter a field treated with methyl parathion <48 hours after the treatment (EPA 1980b); that interval has been increased to 4–5 days (EPA 1999d). EPA has canceled many of the food crop uses of methyl parathion, including fruits and vegetables commonly eaten by children, some other vegetable uses, some feed uses, and all nonfood uses such ornamental plants and nursery stock uses. This action was taken because of a concern for risks to children and to workers. Some food and feed uses are to be maintained (EPA 1999d, 1999e).

Data related to the domestic use of methyl parathion by volume for the years 1973–1984 show that use of methyl parathion was estimated to be 18.1 million kg in 1973 (NRC 1977) and 21.8 million kg in 1974 (USDA 1978). In 1976, only 10.4 million kg of methyl parathion were used by U.S. farmers on major crops; however, this represents 17.5% of the total quantity of all active insecticide ingredients used on those crops in 1976 (USDA 1978). In 1978, total usage of methyl parathion is estimated to have been 11.3 million kg; of this amount, an estimated 9.7 million kg of methyl parathion were used on cotton (USDA 1978). The reduction in use from 1974 to 1978 is generally attributed to the development of resistant insect strains and the use of integrated pest management practices (USDA 1978). The use of methyl parathion as a substitute for DDT in the late 1970s and early 1980s served to increase usage and reverse this downward trend (Butler et al. 1981b). The amount of methyl parathion used in the United States in 1989 was estimated to be 7.65 million pounds active ingredient/year (HSDB 1999). For the period 1987–1997, the annual amount used was 4.2 million pounds of methyl parathion per 5 million acres treated (EPA 1999c).

Data collected from federal and state pesticide surveys of insecticide use (Giannessi and Anderson 1995) show the following crops were treated with methyl parathion in the United States during the 1992 crop year: alfalfa, apples, artichokes, barley, broccoli, brussel sprouts, cabbage, cantaloupes, carrots, cauliflower, celery, cherries, collards, corn, cotton, dry bean, dry peas, grapes, green beans, green peas, lettuce, nectarines, oats, onions, other hay, peaches, pears, pecans, potatoes, rice, soybeans, spinach, strawberries, sugarbeets, sunflowers, sweet corn, sweet peppers, tomatoes, watermelons, and wheat. Table 5-2 shows the total number of pounds per acre of methyl parathion that were applied to crops in each state in 1992.

Table 5-2. Methyl Parathion Use in Crop Production in 1992

State	Pounds active ingredient/acre/year
Alabama	365,640
Arizona	87,203
Arkansas	237,731
California	85,432
Colorado	12,682
Connecticut	1,449
Delaware	21,125
Florida	19,939
Georgia	75,576
Idaho	14,893
Illinois	101,443
Indiana	17,390
Iowa	5,927
Kansas	201,749
Kentucky	8,700
Louisiana	889,789
Maryland	6,654
Massachusetts	1,264
Michigan	61,118
Minnesota	21,080
Mississippi	1,818,501
Missouri	50,311
Montana	31,341
Nebraska	507,880
New Jersey	7,101
New Mexico	6,146
New York	28,018
North Carolina	5,227
North Dakota	163,620
Ohio	1,984
Oklahoma	484,960
Oregon	12,266
Pennsylvania	14,758

Table 5-2. Methyl Parathion Use in Crop Production in 1992 *(continued)*

State	Pounds active ingredient/acre/year
Rhode Island	178
South Carolina	83,670
South Dakota	12,540
Tennessee	3,850
Texas	274,446
Utah	5,328
Virginia	19,972
Washington	115,689
West Virginia	11,337
Wisconsin	59,485
Wyoming	169

5.4 DISPOSAL

In 1974, EPA recommended the incineration of methyl parathion at organic pesticide incinerators. If appropriate incineration facilities were not available, then open field burial at designated landfills was permitted (EPA 1974a). EPA also recommended that combustible containers used for methyl parathion be disposed of in pesticide incinerators or in designated landfills. Noncombustible containers should first be triple rinsed and, if in good condition, returned to the manufacturer or a drum reconditioner for reuse with methyl parathion. Noncombustible containers that are not to be reused should be punctured and transported to a scrap metal facility for recycling or buried in a designated landfill site (EPA 1974a).

In 1980, methyl parathion waste became subject to the Resource Conservation and Recovery Act (RCRA). According to RCRA, when methyl parathion becomes a waste (e.g., as an off-specification batch produced by a manufacturer) it must be managed as a hazardous waste according to federal and/or state regulations. Any containers used to hold this waste must also be managed as a hazardous waste (EPA 1980a). The RCRA hazardous waste code for methyl parathion is P071. When there is an accidental release of methyl parathion, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) reportable quantity is 45.4 kg or 100 pounds (EPA 1985f). Methyl parathion is on the list of chemicals for which annual releases to the environment must be reported to the TRI as established by the EPA (EPA 1999c).

Improved methods for the disposal of methyl parathion are being considered. In 1981, methyl parathion was considered as a potential candidate for rotary kiln incineration and fluidized bed incineration (EPA 1981b). An accelerated degradation process for methyl parathion, which involved reducing the compound in soil with acid and zinc to its less toxic degradates, was found to be effective (Butler et al. 1981b). No recent information on disposal is available.

Effluent containing methyl parathion may not be discharged into lakes, streams, ponds, estuaries, oceans, or public waters unless the compound is specifically identified in a National Pollutant Discharge Elimination System (NPDES) permit. Moreover, discharge of effluent that contains methyl parathion is forbidden without prior notice to the sewage treatment plant authority (NPIRS 1986).