

# Use Information and Air Monitoring Recommendation for Chlorthal-Dimethyl

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ENVIRONMENTAL HAZARDS ASSESSMENT PROGRAM

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## A. BACKGROUND

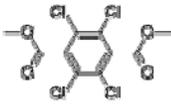
This recommendation contains general information regarding the physical and chemical properties of the pesticide active ingredient chlorthal-dimethyl (DCPA) and its reported historical uses in California. The California Department of Pesticide Regulation (CDPR) provides this information to assist the California Air Resources Board (CARB) in their selection of appropriate locations for conducting pesticide air monitoring operations.

### Physical and Chemical Properties

DCPA is a selective, non-systemic, pre-emergence herbicide used for control of annual grasses and certain broad-leaved weeds (BCPC, 2000).

DCPA is a colorless to beige crystalline solid that produces a slight aromatic odor (Montgomery 1997). It is stable in the presence of heat and UV light, but decomposes between 360 and 370 °C (BCPC, 2000). It is soluble in water (0.5mg/L), benzene (250 g/kg), toluene (170g/kg), xylene (140g/kg), dioxane (120g/kg), acetone (100g/kg), and carbon tetrachloride (70g/kg) at 25°C (BCPC 2000). Table 1 outlines some of DCPA's physical and chemical properties.

**Table 1. Physical and chemical properties of DCPA**

Chemical name	dimethyl-2,3,5,6-tetrachlorobenzene-1,4-dicarboxylic acid, dimethyl tetrachloroterephthalate
Common name	Chlorthal-dimethyl, DCPA
Chemical structure	
Registered Trade names or other names †	Dacthal Flowable Herbicide, Dacthal W-75, Dacthal W-75 Turf
CAS number	1861-32-1
CDPR Chemical Code	179
Empirical formula	C <sub>10</sub> H <sub>6</sub> Cl <sub>4</sub> O <sub>4</sub>
Molecular weight	332.0
Appearance	Colorless crystals, with slight aromatic odor
Vapor pressure	0.21 mPa (at 25°C, gas saturation method) 2.5 x 10 <sup>-6</sup> mmHg (at 25°C)
Melting point	155-156 °C
Solubility	0.5 mg/l (ppm) (at 25°C)
Henry's Law constant	1.39 x 10 <sup>-1</sup> Pa*m <sup>3</sup> /mol 2.2 x 10 <sup>-6</sup> atm*m <sup>3</sup> /mol (at 25°C)
Octanol-water partition coefficient (log Kow)	4.28
Soil adsorption coefficient (Koc)	2,830 cm <sup>3</sup> /g
Soil degradation half-life	26.5 days (aerobic conditions, 26°C)
Stability	Stable to heat and UV light; decomposes at 360-370°C
Breakdown products	Monomethyl tetrachloroterephthalate (MTP) and 2,3,5,6-tetrachloroterephthalic acid (TPA)
Sources: CDPR; BCPC 2000; EXTOXNET, www.chemicalbook.com	
† <b>Disclaimer:</b> The mention of commercial products, their source, or use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such products.	

### **Environmental Fate Overview:**

*Air:* DCPA can exist in air as a gas or bound to airborne soil particles. Despite a low Henry's law constant and moderate soil/water partition coefficient, volatilization is a major route of dissipation of DCPA. Volatilization of DCPA is more significant under warm and high soil moisture conditions (USEPA, 1998). In a study investigating the off-site transport of DCPA, Ross et al. measured the maximum flux one day after application, immediately following irrigation. A total of 10% of the DCPA applied in this study was released to the atmosphere within 21 days. Volatilization accounted for 29% of the DCPA lost from soil (Ross et al., 1989). The breakdown of DCPA in the vapor phase occurs via interaction with hydroxyl radicals. DCPA's estimated atmospheric half life is 36 days (HSDB, 2004).

*Soil and Groundwater:* Biodegradation of DCPA occurs via hydrolysis of the ester linkages, yielding two metabolites: monomethyl 2,3,5,6-tetrachloroterephthalic acid (MTP) and 2,3,5,6-tetrachloroterephthalic acid (TPA) (Ross et al., 1989). MTP is the less significant of the two metabolites, and is readily hydrolyzed to TPA (Wettasinghe and Tinsley, 1993). Under aerobic conditions, DCPA degrades to both MTP and TPA, with half life of 18-37 days. In anaerobic conditions, DCPA degrades to TPA, with a slightly longer half life of 37-59 days (USEPA, 1998).

TPA is highly persistent and mobile in soils (USEPA, 1998). In an effort to define the rate of decomposition of DCPA in soil, Wettasinghe and Tinsley reported that TPA remained stable over 290 days (Wettasinghe and Tinsley, 1993). Similarly, Ross et al. reported detectable levels of TPA at a soil depth of 91cm 336 days following the application of DCPA (Ross et al., 1989). These properties of TPA make it a likely candidate for groundwater contamination. DCPA and both of its metabolites have been detected in groundwater samples, but the occurrence of TPA outweighs the other chemicals. In a groundwater survey, the California Department of Food and Agriculture found 18 of 60 wells tested positive for TPA. One Monterey well tested positive for DCPA, MTP, and TPA (Ando et al., 1990).

*Surface water:* DCPA is stable to hydrolysis and photolysis, and can therefore persist in surface waters, particularly those with minimal microbial activity. Due to its low water solubility, DCPA would most likely enter runoff as a result of adsorption onto eroded soil particles. TPA is arguably more available for surface water contamination than DCPA owing to its longer soil persistence and lower partition coefficient. TPA is also more likely to be dissolved in the water column than DCPA (USEPA, 1998).

### **B. DCPA Use in California**

DCPA is a selective, non-systemic pre-emergent herbicide used to control annual grasses and some broad-leaved weeds (Montgomery, 1997). The current active products registered for use in California are Dacthal Flowable Herbicide, Dacthal W-75, and Dacthal W-75 Turf. Application of these products may be achieved by either aerial or

ground methods. In California, DCPA is used primarily on broccoli at a maximum application rate of 15 pounds DCPA/acre for all active products.

### **Pesticide Use Data Summary**

Agricultural usage data for DCPA in California for the years 2004 through 2009 were extracted from the Pesticide Use Reporting Database (PUR) maintained by the CDPR. The resulting data showed that DCPA use in California ranged from 218,043 pounds in 2004 to a low of 142,549 pounds in 2009 (Table 2). The data also show that DCPA use peaked in 2006, declining steadily each year thereafter. The highest use of DCPA from 2004 to 2009 occurred in Monterey County (37% of statewide use). Other counties that exhibited significant use from 2004 to 2009 include Imperial (24% statewide of use), Fresno (6.8%), Riverside (6.7%), Ventura (5%), and Santa Barbara (5%) (Table 2).

The heaviest use of DCPA occurred between the months of March and October, with the peak use months differing among the top six counties (Table 3). Monterey, Santa Barbara and Ventura Counties exhibited peak use during the spring (March and April, respectively) while peak use occurred during the summer (July and August) for and Fresno County, and during the fall for Riverside and Imperial Counties (September and October, respectively).

Table 4 shows the statewide annual use of DCPA on individual commodities from 2004 to 2009. The top five main crops included broccoli, onions, cauliflower, cabbage, and broccoli raab. Broccoli accounted for 45% of California's total DCPA use from 2004 to 2009.

Table 5 provides a summary of DCPA use on the primary commodities in the top six counties. These values are also illustrated in Figure 2. DCPA was used predominantly on broccoli in each of the top six counties. The highest use of DCPA in 2009 occurred in Monterey (Figure 1).

**Table 2. Annual DCPA use by county (2004-2009)**  
(Pounds Active Ingredient)

County	2004	2005	2006	2007	2008	2009	Total	% Total
Monterey	92,738	70,013	74,092	75,886	67,208	58,014	437,950	37.1
Imperial	52,740	63,504	57,973	53,337	32,189	27,156	286,898	24.3
Fresno	2,154	19,488	27,894	7,000	3,731	19,640	79,907	6.8
Riverside	9,850	9,123	24,040	19,230	16,036	1,034	79,313	6.7
Ventura	16,828	15,070	9,090	4,986	6,294	6,607	58,875	5
Santa Barbara	15,775	12,188	10,266	7,202	8,607	4,799	58,837	5
San Benito	7,251	6,456	8,142	4,981	5,056	3,463	35,350	3
San Luis Obispo	7,051	6,933	8,093	5,892	3,889	3,162	35,021	3
San Bernardino	3,774	3,902	4,661	5,945	5,279	7,676	31,236	2.6
Kern	324	1,772	4,612	7,871	6,684	4,024	25,287	2.1
Santa Clara	4,619	5,183	3,468	4,180	3,083	1,511	22,045	1.9
Stanislaus	1,467	3,778	1,776	1,978	1,479	3,361	13,839	1.2
San Joaquin	159	889	1,487	1,726	1,995	641	6,897	<1
Tulare	953	692		278			1,922	<1
Madera	1,013	392					1,404	<1
Los Angeles	137	44	1,023	144	9	17	1,373	<1
Merced	12	659				405	1,077	<1
Yolo	205	84	130	108	117	330	974	<1
Santa Cruz	372	110	241	156	78	5	962	<1
Kings						647	647	<1
Shasta	585						585	<1
Sonoma	23	26	34	38	38		158	<1
Contra Costa		35			16	15	67	<1
San Diego		9				38	47	<1
San Mateo			11	11	6	5	32	<1
Orange	12		1	2	1		16	<1
Placer	2			1			3	<1
<b>Grand Total</b>	<b>218,043</b>	<b>220,348</b>	<b>237,034</b>	<b>200,952</b>	<b>161,794</b>	<b>142,549</b>	<b>1,180,720</b>	<b>100</b>

**Table 3. Monthly DCPA use by top five counties (2004-2009).**  
(Pounds Active Ingredient) Peak use months are in bold.

**Fresno**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	-	-	353	-	-	-	-	101	256	36	<b>1,390</b>	18	2,154
2005	4,087	1,268	302	426	11	13	-	<b>10,124</b>	-	1,367	-	1,890	19,488
2006	3,523	4,314	590	442	-	9	2,727	<b>13,330</b>	-	513	733	1,713	27,894
2007	2,473	<b>2,905</b>	525	2	-	-	-	-	-	881	-	214	7,000
2008	<b>1,108</b>	697	935	-	-	-	-	-	-	992	-	-	3,731
2009	945	-	1,645	-	-	-	2,726	4,134	<b>8,486</b>	960	232	512	19,640
Total	12,136	9,183	4,350	869	11	23	5,453	<b>27,689</b>	8,742	4,750	2,355	4,348	79,907

**Imperial**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	324	-	-	-	-	-	-	931	<b>18,708</b>	17,154	13,669	1,953	52,740
2005	344	152	-	-	-	-	-	94	19,898	<b>29,720</b>	12,207	1,089	63,504
2006	496	197	-	-	-	-	-	770	11,499	<b>26,876</b>	16,141	1,994	57,973
2007	1,149	-	-	-	-	-	-	528	12,810	<b>27,165</b>	9,883	1,802	53,337
2008	-	-	-	-	-	-	-	-	7,390	<b>14,748</b>	8,872	1,177	32,189
2009	220	6	-	-	-	-	-	-	4,928	<b>15,029</b>	4,895	2,078	27,156
Total	2,533	355	0	0	0	0	0	2,322	75,233	<b>130,693</b>	65,668	10,094	286,898

**Monterey**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	6,244	4,403	<b>15,888</b>	6,504	6,407	8,631	9,758	11,465	1,620	1,716	8,786	11,316	92,738
2005	4,105	4,859	<b>14,591</b>	7,258	5,699	6,606	7,626	7,124	1,436	1,668	5,377	3,662	70,013
2006	4,497	5,807	<b>11,282</b>	7,209	5,121	7,690	9,995	9,869	1,228	1,421	4,812	5,160	74,092
2007	5,726	7,776	<b>13,615</b>	6,149	5,743	8,511	8,788	6,886	1,148	1,254	5,071	5,218	75,886
2008	2,916	5,733	<b>10,492</b>	6,365	6,431	6,418	8,525	8,424	1,801	1,629	4,388	4,086	67,208
2009	5,812	4,912	<b>13,225</b>	8,632	4,113	5,100	6,492	4,700	688	633	1,959	1,749	58,014
Total	29,300	33,491	<b>79,092</b>	42,117	33,514	42,957	51,185	48,469	7,921	8,320	30,392	31,191	437,950

**Riverside**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	90	-	-	248	-	-	-	683	<b>4,001</b>	2,885	1,604	339	9,850
2005	-	53	-	263	32	25	32	902	<b>4,026</b>	2,083	1,522	187	9,123
2006	122	546	212	221	176	180	333	3,340	<b>10,414</b>	5,081	2,663	753	24,040
2007	98	212	209	72	121	48	3,379	4,057	<b>4,195</b>	4,141	2,252	447	19,230
2008	199	238	-	216	96	137	2,196	1,902	<b>3,947</b>	3,658	2,663	784	16,036
2009	115	-	-	61	-	-	348	510	-	-	-	-	1,034
Total	625	1,049	421	1,079	424	390	6,288	11,394	<b>26,582</b>	17,848	10,704	2,509	79,313

**Santa Barbara**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	1,182	648	1,128	1,426	1,857	1,916	1,798	1,566	1,006	682	<b>2,058</b>	509	15,775
2005	1,307	1,414	<b>2,413</b>	816	1,160	1,001	914	819	808	463	231	841	12,188
2006	1,110	398	<b>1,482</b>	853	1,102	1,320	886	738	572	534	559	713	10,266
2007	553	467	514	652	670	751	<b>929</b>	285	734	626	615	406	7,202
2008	428	563	600	435	549	936	1,338	<b>1,357</b>	629	781	215	775	8,607
2009	349	250	557	<b>571</b>	529	511	409	344	468	92	382	338	4,799
Total	4,929	3,741	<b>6,695</b>	4,752	5,866	6,434	6,273	5,109	4,218	3,177	4,062	3,582	58,837

**Ventura**

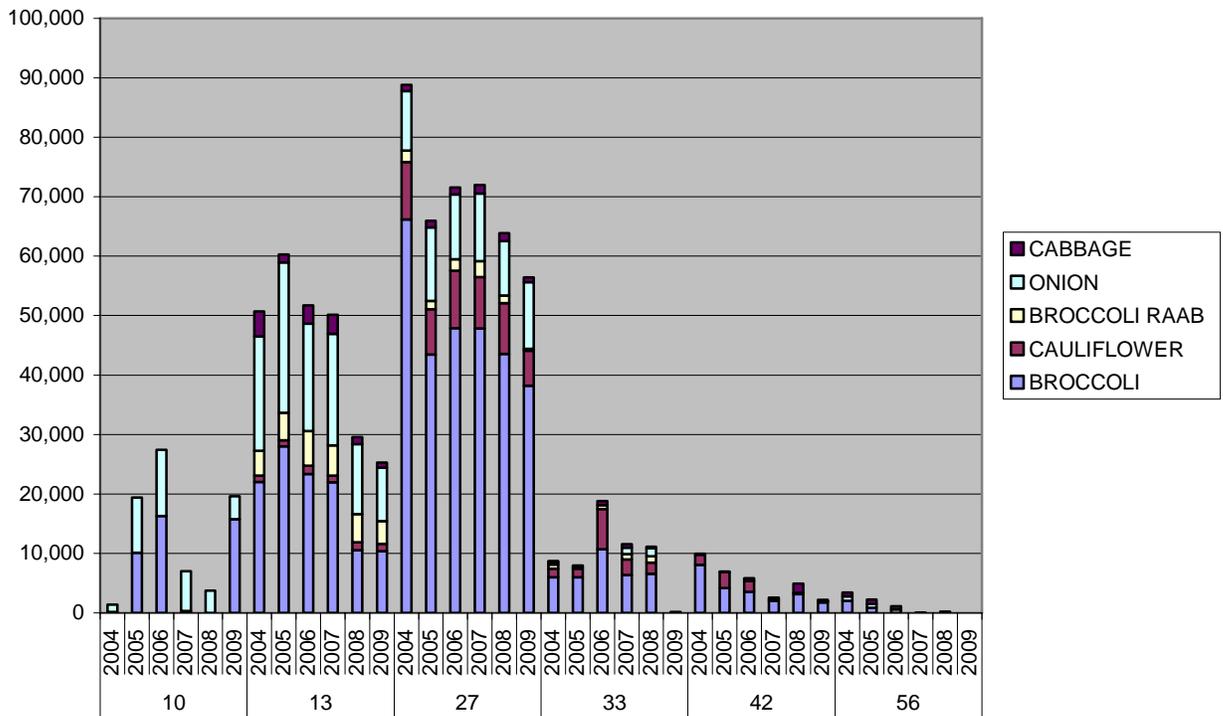
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	1,087	335	<b>3,200</b>	2,587	1,680	1,320	1,557	1,690	797	666	483	1,429	16,828
2005	34	36	1,100	<b>3,307</b>	1,772	629	1,321	1,049	1,823	1,041	552	2,405	15,070
2006	430	555	1,011	<b>2,042</b>	563	1,534	858	548	649	269	385	248	9,090
2007	24	-	12	41	71	281	1,095	1,107	<b>1,208</b>	875	121	150	4,986
2008	104	70	269	469	865	<b>966</b>	962	837	762	601	278	113	6,294
2009	140	83	209	258	548	855	970	1,173	<b>1,284</b>	889	180	18	6,607
Total	1,818	1,078	5,801	<b>8,704</b>	5,500	5,585	6,762	6,402	6,524	4,340	1,998	4,363	58,875

**Table 4. Annual cropland use of DCPA in California (2004-2009)**  
(Pounds Active Ingredient)

<b>Commodity (Use)</b>	<b>Total</b>	<b>% of Total</b>
BROCCOLI	535,010	45.3
ONION (DRY, SPANISH, WHITE, YELLOW, RED, ETC.)	263,329	22.3
CAULIFLOWER	81,545	6.9
CABBAGE	53,715	4.55
BROCCOLI RAAB (RAPA, ITALIAN TURNIP, RAPINI)	41,224	3.49
CHINESE CABBAGE (NAPPA, WON BOK, CELERY CABBAGE)	27,981	2.37
BOK CHOY (WONG BOK)	25,719	2.18
N-OUTDR GRWN CUT FLWRS OR GREENS	20,022	1.70
PEPPERS (FRUITING VEGETABLE), (BELL, CHILI, ETC.)	19,735	1.67
ONIONS (GREEN)	18,395	1.56
RADISH	17,320	1.47
ORNAMENTAL TURF (ALL OR UNSPEC)	15,633	1.32
GAI LON	10,043	0.85
KALE	6,040	0.51
CHINESE GREENS, CHINESE LEAFY VEGETABLES	5,319	0.45
TURNIP, GENERAL	5,218	0.44
MUSTARD, GENERAL	5,183	0.44
GARLIC	4,735	0.40
COLLARDS	4,732	0.40
LEEK	2,756	0.23
BRUSSELS SPROUTS	2,439	0.21
N-OUTDR CONTAINER/FLD GRWN PLANTS	1,886	0.16
LEAFY VEGETABLES (ALL OR UNSPEC)	1,811	0.15
KOHLRABI	1,717	0.15
RAPE (ALL OR UNSPEC)	1,542	0.13
TOMATOES, FOR PROCESSING/CANNING	1,209	0.10
PEPPERS (CHILI TYPE) (FLAVORING AND SPICE CROP)	988	0.08
BEANS, SUCCULENT (OTHER THAN LIMA)	787	0.07
GAI CHOY (LOOSE LEAF)	742	0.06
CHINESE RADISH/DAIKON (LOBOK, JAPANESE RADISH)	558	0.05
STRAWBERRY (ALL OR UNSPEC)	457	0.04
EGGPLANT (ORIENTAL EGGPLANT)	432	0.04
LETTUCE, HEAD (ALL OR UNSPEC)	420	0.04
UNCULTIVATED AGRICULTURAL AREAS (ALL OR UNSPEC)	397	0.03
SHALLOT, ONIONS (SHALLOT)	321	0.03
N-GRNHS GRWN PLANTS IN CONTAINERS	225	0.02
WATERMELONS	181	0.02
SQUASH (ALL OR UNSPEC)	164	0.01
OATS, GENERAL	158	0.01
LETTUCE, LEAF (ALL OR UNSPEC)	145	0.01
COLE CROPS (ALL OR UNSPEC)	115	0.01
CUCUMBER (PICKLING, CHINESE, ETC.)	77	0.01
SOIL APPLICATION, PREPLANT-OUTDOOR (SEEDBEDS, ETC.)	57	0.005
BEANS (ALL OR UNSPEC)	42	0.004
PEAS, GENERAL	37	0.003
MELONS	33	0.003
GRAPES, WINE	30	0.003
YAMS, TRUE (LISBON & WHITE YAM)	30	0.003
CILANTRO (CHINESE PARSLEY, CORIANDER LEAVES)	21	0.002
RIGHTS OF WAY	11	0.001
SQUASH (SUMMER)	8	0.001
CHIVE (SIBERICUM)	8	0.001
MINT (ALL OR UNSPEC)	5	0.0004
N-GRNHS GRWN CUT FLWRS OR GREENS	5	0.0004
BEETS, GENERAL	3	0.0003
RESEARCH COMMODITY	2	0.0002
UNCULTIVATED NON-AG AREAS (ALL OR UNSPEC)	2	0.0002
ENDIVE (ESCAROLE)	1	0.0001
<b>Grand Total</b>	<b>1,180,720</b>	<b>100</b>

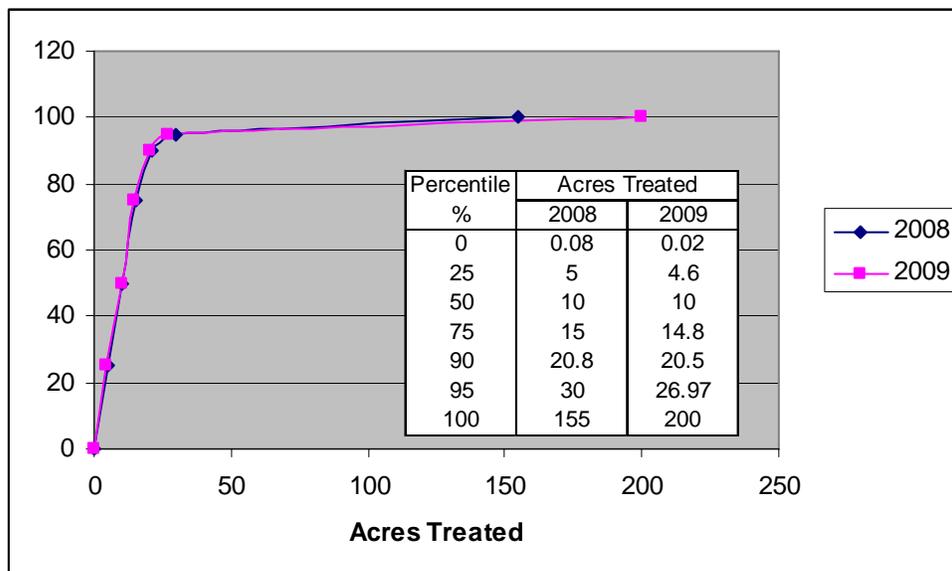
**Table 5. DCPA use by commodity in top six counties (2004-2009)**  
(Pounds Active Ingredient)

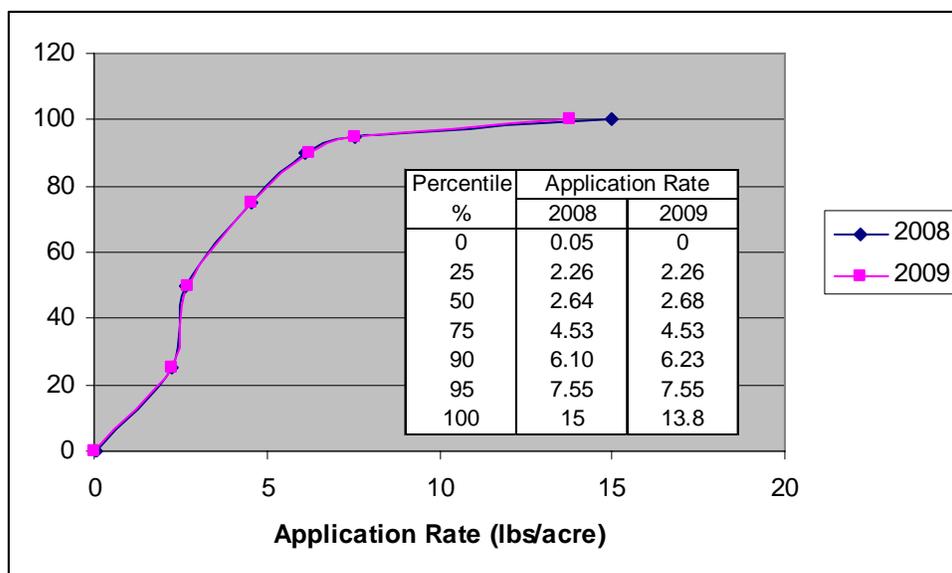
COMMODITY	2004	2005	2006	2007	2008	2009	Total	% Total
<b>MONTEREY</b>								
BROCCOLI	66,180	43,436	47,884	47,862	43,575	38,238	287,176	69
ONION (DRY, SPANISH, WHITE, YELLOW, RED, ETC.)	9,961	12,325	10,878	11,404	9,122	11,183	64,873	15
CAULIFLOWER	9,655	7,680	9,654	8,605	8,561	5,874	50,030	12
BROCCOLI RAAB (RAPA, ITALIAN TURNIP, RAPINI)	1,945	1,388	1,964	2,681	1,268	318	9,565	2
CABBAGE	1,113	1,148	1,196	1,468	1,330	844	7,099	2
Total	88,855	65,978	71,577	72,020	63,857	56,457	418,742	100
<b>IMPERIAL</b>								
BROCCOLI	22,035	28,003	23,371	21,954	10,512	10,374	116,250	43
ONION (DRY, SPANISH, WHITE, YELLOW, RED, ETC.)	19,264	25,308	18,099	18,745	11,772	8,966	102,154	38
CAULIFLOWER	1,076	1,042	1,369	1,126	1,377	1,243	7,234	3
BROCCOLI RAAB (RAPA, ITALIAN TURNIP, RAPINI)	4,141	4,621	5,806	5,076	4,732	3,830	28,206	11
CABBAGE	4,224	1,304	3,088	3,245	1,147	891	13,899	5
Total	50,740	60,279	51,733	50,146	29,541	25,303	267,742	100
<b>FRESNO</b>								
BROCCOLI	184	10,083	16,309	308	-	15,768	42,652	54
ONION (DRY, SPANISH, WHITE, YELLOW, RED, ETC.)	1,187	9,336	11,097	6,691	3,730	3,872	35,912	46
CAULIFLOWER	-	-	-	-	-	-	0	0
BROCCOLI RAAB (RAPA, ITALIAN TURNIP, RAPINI)	-	-	-	-	-	-	0	0
CABBAGE	-	-	-	-	-	-	0	0
Total	1,371	19,419	27,406	6,998	3,730	19,640	78,564	100
<b>RIVERSIDE</b>								
BROCCOLI	5,988	5,975	10,694	6,341	6,591	32	35,620	61
ONION (DRY, SPANISH, WHITE, YELLOW, RED, ETC.)	359	240	-	1,073	1,320	-	2,992	5
CAULIFLOWER	1,457	1,467	6,799	2,624	1,878	-	14,226	24
BROCCOLI RAAB (RAPA, ITALIAN TURNIP, RAPINI)	685	-	611	934	1,070	115	3,416	6
CABBAGE	241	294	721	579	239	-	2,074	4
Total	8,731	7,975	18,825	11,551	11,099	147	58,328	100
<b>VENTURA</b>								
BROCCOLI	2,022	832	-	-	-	-	2,854	40
ONION (DRY, SPANISH, WHITE, YELLOW, RED, ETC.)	737	656	588	75	-	-	2,057	29
CAULIFLOWER	-	-	-	-	-	-	0	0
BROCCOLI RAAB (RAPA, ITALIAN TURNIP, RAPINI)	-	-	-	-	-	-	0	0
CABBAGE	684	776	546	-	231	8	2,244	31
Total	3,443	2,264	1,134	75	231	8	7,155	100
<b>SANTA BARBARA</b>								
BROCCOLI	8,051	4,150	3,538	2,035	3,156	1,786	22,716	70
ONION (DRY, SPANISH, WHITE, YELLOW, RED, ETC.)	-	-	-	-	-	-	0	0
CAULIFLOWER	1,732	2,688	1,795	255	210	211	6,890	21
BROCCOLI RAAB (RAPA, ITALIAN TURNIP, RAPINI)	-	-	-	-	-	23	23	0.1
CABBAGE	179	130	468	251	1,572	160	2,760	9
Total	9,962	6,967	5,801	2,541	4,938	2,180	32,390	100



**Figure 1. Annual cropland use of DCPA (pounds active ingredient) by top six counties (2004-2009).** (County codes: 10= Fresno; 13= Imperial; 27= Monterey; 33= Riverside; 42= Santa Barbara; 56= Ventura)

The primary use of DCPA in each of the top six counties from 2004 to 2009 consisted of broccoli. The three highest use counties also exhibited high DCPA use on onions.





**Figure 2. Cumulative percentile distribution of acres treated and application rate for DCPA in the top five use counties during 2008 and 2009.**

### C. Air Monitoring Recommendations

The CDPR requests that the CARB monitor one application on site for DCPA and its breakdown products, monomethyl tetrachloroterephthalate (MTP) and tetrachloroterephthalic acid (TPA). Herein, CDPR is providing dates and location for monitoring based on recent pesticide use report information.

Based on a preliminary assessment of the toxicology data, CDPR requests the following target quantitation limit:

- DCPA and breakdown products: 0.1 ug/m<sup>3</sup>

### Application Site Monitoring

From 2004 to 2009, 45% of California's DCPA use was on broccoli (Table 4). During this time, the highest use of DCPA was in Monterey County (Figure 2). The highest use months were March for Monterey County, August for Fresno County, September for Riverside County, October for Imperial County, March for Santa Barbara County, and April for Ventura County.

Figure 3 illustrates the cumulative frequency distributions of acres treated and application rates (pounds A.I./acre) for individual applications of DCPA in the top six counties for the years 2008 and 2009. The use patterns did not vary significantly between the two years. From 2004 to 2009, the area of an individual application ranged from 0.02 acres to 320 acres, and averaged 11.2 acres.

CDPR recommends that monitoring should be performed for a ground application of DCPA to a treated field at least 10 acres in size. A treated field of at least 20 acres is preferred. The application rate should be at least 3 pounds/acre. The maximum label rate is 15 pounds/acre.

A minimum of eight samplers should be positioned around the application site, one on each side of the site and one at each corner. A ninth replicate sampler should be co-located at one position. Ideally, samplers should be placed a minimum of 20 m from the application area. CDPR recommends that CARB coordinate with the County Agricultural Commissioner for site selection. If a site is located on private property, permission from the property owner must be obtained before monitoring. Air samples should be taken before, during, and after application and for three daytime/overnight sampling periods. The start and end of the application should occur during daylight hours. The post-application samples should be collected at night since concentrations may be higher due to more stable atmospheric conditions. CDPR staff recommends the following schedule:

<b>Sample Period Begins</b>	<b>Sample Duration Time</b>
Background (pre-application)	Minimum 12-24 hours
Application	Start of application until 1 hour before sunset
1 hour before sunset (post-application)	Overnight until 1 hour after sunrise
1 hour after sunrise	Daytime until 1 hour before sunset
1 hour before sunset	Overnight until 1 hour after sunrise
1 hour after sunrise	Daytime until 1 hour before sunset
1 hour before sunset	Overnight until 1 hour after sunrise
<sup>1</sup> All overnight samples must include the period from one hour before sunset to one hour after sunrise.	

Field spikes and trip blanks should be prepared in the laboratory and run in the field with the samples for quality assurance.

CDPR requests that the monitoring report includes the following information:

- 1) An accurate record of the application site, including topographic features.
- 2) An accurate record of the positions of the monitoring equipment with respect to the application site, including the exact direction and distance of the samplers from the edge of the application site.
- 3) An accurate record of pesticide application, including application dosage or quantity of pesticide applied, application starting and ending time, method and application rate, etc.
- 4) An accurate drawing of the monitoring site showing the precise location of the meteorological equipment, trees, buildings, and other obstacles with respect to North (identified as either true or magnetic North).

- 5) If applicable, meteorological data collected at 5-minute intervals including wind speed and direction, humidity, air temperature and comments regarding degree of cloud cover.

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