CHEM 081901 Chlorothalonil

BRANCH EEB DISC

FORMULATION Technical

FICHE/MASTER ID 00036935

CITATION: Atkins, E.L., E.A. Greywood, and R.L. Macdonald. 1975. Toxicity of pesticides and other agricultural chemicals to honey bees. Laboratory studies. Univ. of Calif., Div. Agric. Sci. Leaflet 2287. 38 pp.

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REVIEWED BY: Allen W. Vaughan
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APPROVED BY:
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SIGNATURE: DATE:

1. CHEMICAL: Multiple chemicals. See tables

2. FORMULATION: Technical

3. CITATION: Atkins, E.L., E.A. Greywood, and R.L. MacDonald. 1975. Toxicity of pesticides and other agricultural chemicals to honey bees. Laboratory studies. Univ. of Calif., Div. Agric. Sci. Leaflet 2287. 38 pp.
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4. REVIEWER: Allen W. Vaughan
Entomologist
EEB/HED

5. DATE REVIEWED: December 2, 1981

6. TEST TYPE: Toxicity to honey bee

A. Test Species: Honey bee (Apis mellifera)

7. REPORTED RESULTS: Chlorothalonil (#362) was determined to be relatively non-toxic to honey bees in a laboratory acute contact toxicity test. When test bees were exposed to direct treatment at 181.29 micrograms per bee, mortality was 14.28%. For data on other pesticides, see tables.

8. REVIEWER'S CONCLUSIONS: This study is scientifically sound, and shows chlorothalonil to be relatively non-toxic to honey bees.

Materials and Methods

Test Procedures

A bell-jar vacuum duster is used to apply the pesticide, mixed with a pyrolite dust diluent, to the test bees. Dosages of dust are weighed, bees are aspirated into dusting cages and treated, and bees are then transferred into holding cages. Observations are recorded at 12, 24, 48, 72, and 96 hours.

Statistical Analysis

Analysis of the data was performed to enable the authors to determine LD50 values of pesticides from either dosage-mortality curves or from LC50 values. The slope value was also obtained from the dosage-mortality curve.

Discussion/Results

See tables for LD50 values, slope values, and toxicity categories.

Reviewer's Evaluation

A. Test Procedure

Procedures were sound.

B. Statistical Analysis

Analysis as performed by the authors was assumed to be valid. No validation was performed by EEB.

C. Discussion/Results

This study is scientifically sound.

by the other factors (0.5, 0.75, 1.25 and 1.5) to obtain the proper range of field dosages in pounds per acre. Then, using the slope value closest to the known slope value for the particular pesticide, the anticipated percent mortalities will be valid for that chemical.

We wish to emphasize that there are a few exceptions to the above rule of thumb method--those pesticides which are less hazardous as well as more hazardous than one can anticipate from the laboratory data.

It is our desire that, by presenting this data and these methods, decisions can be made (to select a pesticide, determine the dosage, and apply the chemical in the safest way and at the most appropriate time of day) maximizing the control of pest species while minimizing the adverse effects upon beneficial species in the treated area.

A list of the LD_{50} and slope values determined at 48 hours after treatment at 80F (26.7C) and 65 percent relative humidity in the laboratory is given for 203 pesticides in table 1. A list of pesticides not toxic in the laboratory at dosages below 11 µg per honey bee is given for 196 pesticides in table 2. Other commonly used pesticide names or name designations appear together in tables 1 and 2. The pesticide names or other designations appearing in table 1 or 2 are arranged in alphabetical order in table 3 preceded with a numerical reference to their position in table 1 or 2 and giving the chemical definition.

*LC50 is the lethal concentration of a chemical giving a bee mortality of 50 percent; LD50 is the lethal dosage in micrograms per bee of a chemical giving 50 percent mortality.

TABLE 1. LD_{50} and Slope Values Showing the Comparative Toxicity to Honey Bees in the Laboratory at 48 Hours at 80°F (26.7°C) and 65-Percent Relative Humidity.

Reference No.	Pesticide	LD_{50} in µg/Bee	Slope Value
Group I - Highly Toxic to Honey Bees			
1	tepp	0.001	0.64
2	thionazin; Zinophos®; Nemaphos®; AC-18133; ENT 25580	0.042	9.08
3	chlorpyrifos; Dursban®; Dowco 179	0.114	7.80
4	dieldrin	0.139	4.65
5	carbofuran; Furadan®; NIA-10242; ENT 27164	0.160	4.31
6	parathion	0.175	7.66
7	GC-6506	0.178	8.19
8	dimethoate; Cygon®; DE-FEND®; ENT 24650	0.188	5.94
9	methidathion; Supracide®; GS-13005; ENT 27197	0.236	9.06
10	EPN; EPN-300	0.245	5.08
11	HOE-2960; ENT 27764	0.268	9.39
12	C-2307; ENT 27625	0.283	6.11
13	aldicarb; Temik®; UC-21149; ENT 27093	0.285	5.64
14	methyl parathion	0.291	6.24
15	dicrotophos; Bidrin®; SD-3562; ENT 24482	0.300	16.50
16	phoxim; Valexon®; Baythion®; BAY-77488; ENT 27448	0.305	6.80
17	phenthoate; CIDIAL®; Papthion®; BAY-33051; ENT 27386	0.306	4.95
18	fenthion; Baytex®; BAY-29493; ENT 25540	0.308	7.20
19	Zectran®; Dowco 139®; ENT 25766; mexicarbamate	0.308	4.92
20	monocrptophos; Azodrin®; SD-9129; ENT 27129	0.350	7.77
21	fensulfothion; Dasanit®; BAY-25141; ENT 24945	0.350	5.46
22	aldrin	0.353	4.98
23	mevinphos; Phosdrin®; OS-2046; ENT 22374	0.360	7.96
24	diazinon; DIAZINON®; G-24480	0.372	8.97
25	Hesurol®; BAY-9026; BAY-37344; ENT 25726	0.375	3.20
26	Methyl Duraban; Dowco 214	0.383	10.23
27	fenitrothion; Accothion®; Folithion®; Sumithion®; BAY-41831; CP-47114; ENT 25715	0.383	4.94
28	NIA-10586	0.408	4.26
29	famphur; Famophos®; CL-38023	0.417	4.85
30	Mobam®; MC-A-600; ENT 27041	0.423	8.69
31	azinphosmethyl; Guthion®; BAY-17147	0.423	6.84
32	Isolan®; G-23611	0.471	8.70
33	naled; Dibrom®; RE-4355	0.480	18.18

34	dichlorvos; Vapona®; DDVP	0.495	8.97
35	BAY-93820; ENT 27659	0.519	12.80
36	heptachlor; Velsicol 104®; Heptamul®; Drinox® H-34	0.526	5.16
37	GS-12968	0.550	8.91
38	lindane; gamma BHC	0.562	5.07
39	Hercules 18526	0.574	8.40
40	Hercules 17413; ENT 27615	0.581	3.90
41	NIA-11637	0.609	3.53
42	pirimiphos-ethyl; PP-211	0.614	15.11
43	NIA-10559	0.624	4.50
44	UC-8305	0.628	2.68
45	pirimiphos-methyl; PP-511	0.639	13.89
46	malathion; Cythion®	0.709	8.04
47	Bomyl®; GC-3707	0.743	9.09
48	Hercules 13462; ENT 27405	0.829	3.90
49	UC-30045; ENT 27393	0.880	4.02
50	Hercules 5727; UC-10854	0.937	4.34
51	Methyl Iso-Systox	0.937	3.48
52	azinphosethyl; Ethyl Guthion®; BAY-16259; ENT 22014	0.981	7.32
53	Sevin 4-011	1.02	4.37
54	C-9473; ENT 27564	1.04	8.76
55	Imidan®; Prolate®; R-1504	1.06	4.77
56	RP-11783	1.08	7.11
57	Carbamult®; promecarb; Schering 34615; EP-316; SN-316	1.13	2.22
58	Matacil®; BAY-44646; ENT 25784	1.16	3.72
59	Orthene®; Ortho 12420; ENT 27822	1.20	8.26
60	carbaryl; Sevin®; Compd. 7744	1.34	2.45
61	Sevin 80S	1.34	4.22
62	propoxur; aprocarb; Baygon®; Unden®; BAY-39007; OMS-33; ENT 25671	1.35	3.30
63	monitor; Tamaron®; BAY-71628; RE-9006	1.37	10.32
64	Gardona®; Rabon®; SD-8447	1.37	21.45
65	AC-12008	1.38	3.60
66	phosphamidon; Dimecron®	1.46	14.28
67	Methyl Trithion®	1.46	6.64
68	C-8874; ENT 27409	1.46	3.93
69	Iso-Systox	1.49	1.45
70	methomyl; Lannate®; IN-1179; Nudrin®	1.51	3.03
71	Abate®; Biothion®; AC-52160; EI-52160; ENT 27165	1.55	2.85
72	isodrin; Compd. 711	1.61	2.63
73	ER-6624; ENT 27760	1.66	16.86
74	BUX®; Ortho 5353; RE-5353; ENT 27127	1.66	5.12
75	Hercules 9007; ENT 27334	1.66	3.30
76	Dow ET-15	1.83	6.12
77	Nemacur P®; BAY-68138	1.87	5.25
78	Sevimol® 4	1.88	3.82
79	I-1642	1.90	3.00

Group II - Moderately Toxic to Honey Bees

80	endrin; Compd. 269	2.02	4.20
81	RE-5030	2.08	5.28
82	leptophos; Abar®; PHOSVEL®; VCS-506; ENT 27378	2.19	5.80
83	Elocron®; dioxacarb; C-8353	2.21	2.98
84	Hercules 3895 G	2.25	2.84
85	Ciodrin®; SD-4294; crotoxyphos	2.26	17.10
86	AC-12009	2.28	3.48
87	trichloronate; Agritox®; BAY-37289; ENT 25712	2.33	3.26
88	Banol®; SOK®; U-12927; carbanolate	2.36	5.91
89	N-4543	2.48	2.76
90	Ortho 11775; PP-9; RE-11	2.51	4.55
91	demeton; Systox®; BAY-8169	2.60	1.85
92	EI-43064	2.62	4.55
93	AKTON®; SD-9098	2.66	4.07
94	G-30494	2.70	4.06
95	Pyramat®; G-23330	2.95	4.07
96	oxydemetonmethyl; Meta Systox-R®; BAY-21097	3.00	2.32
97	C-10015; ENT 27410	3.14	2.70
98	chlordane, α & γ isomers; HCS-3260	3.14	2.45
99	Cytrolane®; EI-47470	3.51	6.28
100	TD-72	3.58	4.32
101	BAY-38156; ENT 25713	3.60	2.10
102	BAY-30911; ENT 25635	3.75	3.68
103	GS-10128	3.84	6.21
104	UC-6812	3.94	3.75
105	iodofenphos; Alfacron®; C-9491; ENT 27408	3.99	3.12
106	GC-9160; ENT 27134	4.09	3.98
107	GC-10284	4.19	3.21
108	Cyolane®; EI-47031	4.23	7.32
109	TD-73	4.29	5.64
110	carbophenothion; Trithion®; R-1303	4.47	8.39
111	Perthane®; Q-137	4.47	4.05
112	GC-9879	4.90	4.14
113	SD-7438	5.08	6.09
114	Hissol®; MHFA	5.14	3.87
115	disulfoton; Di-Syston®; BAY-19639	5.14	1.14
116	chlordane	5.23	3.24
117	UC-27074S; UC-34096; ENT 27473	5.35	2.75
118	DDT, p,p' isomer	5.36	4.43
119	SD-8448	5.74	8.72
120	ronnel; Korlan®; Trolene®; Dow ET-14; Dow ET-57	5.74	2.10
121	Banomite®; U-27415; ENT 27646	5.75	4.13
122	GC-10101	5.78	8.58
123	dimetilan; Dimetilan®; GS-13332	5.84	4.08
124	DDT; ENT 1506	5.95	4.89
125	isopropyl parathion; OXY-2168	6.41	6.86

126	fenozaflor; fenoflurazole; Lovozal®; HC-5016; ENT 27438	7.10	5.12
127	DDT	7.12	4.43
128	mirex; GC-1283	7.15	3.23
129	GC-3583; SD-8210	7.74	3.57
130	endosulfan (ex WP50); Thiodan®	7.81	3.15
131	endothion; NIA-5767; AC-18737	8.00	7.02
132	Tranid®; UC-20047A; ENT 25962	8.10	3.27
133	chlordane	8.80	2.34
134	phosalone; Zolone®; RP-11974	8.94	3.83
135	HRS-1422	9.55	3.20
136	phorate; Thimet®; AC-3911	10.07	1.34
137	Vydate®; IH-1410	10.32	6.43
138	chlordecone; Kepone®; Compd. 1189	10.39	4.83

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Group III - Relatively Nontoxic to Honey Bees

139	CP-10502	11.00	3.62
140	menazon; Saphos®; PP-175	11.06	2.03
141	binapacryl; Morocide®; NIA-9044	11.60	9.97
142	SD-17250	12.00	5.71
143	sabadilla	12.33	6.20
144	formetanate; Carzol SP®; EP-332; ENT 27566	14.27	3.97
145	CP-10516	14.50	3.20
146	endosulfan (ex.tech.);	16.14	2.34
147	fluenethyl; Lambrol®; Mytrol®; M-2060; TH-367-I	16.62	3.60
148	α endosulfan	17.42	3.02
149	ASFON®; NPD	17.43	3.79
150	pirimicarb; Pirimor®; PP-062	18.72	2.88
151	ethion; Nialate®	20.55	0.95
152	diozathion; Delnav®; Hercules AC-528; ENT 22897	21.27	5.05
153	β endosulfan	21.79	3.31
154	methoxychlor; Marlate®; DMDT	23.57	1.55
155	Bandane®	25.68	4.00
156	BAY-39731	26.59	1.27
157	dinocap; Karathane®; ENT 27727	33.39	2.87
158	Torak®; Hercules 14503; ENT 27320; dialifor	34.45	1.30
159	dinoseb; Sinox® PE; DNBP, alkanolamine salt	36.26	4.93

160	Plictran®; Dowco 213; ENT 27395; M-3180	38.19	4.92
161	Dilan®; CS-708	40.49	1.70
162	R-23233	40.59	4.23
163	ziram; Zerlate®	46.65	2.12
164	EP-334-HCl	46.75	1.98
165	dinobuton; Acrex®; Dessin®; UC-19786; ENT 27244	48.42	5.90
166	toxaphene	50.40	1.67
167	EP-417	51.46	3.18
168	EP-418	52.82	3.46
169	trichlorfon; Dylox®; Dipterex®; ENT 19763	59.83	2.81
170	GC-3582	60.43	4.92
171	GC-10435	62.80	9.45
172	FPG-124	65.87	2.40
173	oxythioquinox; Morestan®; BAY-36205; ENT 25606	66.47	1.36
174	SYLOID® 244 - Grade 68; SG-68	67.08	2.18
175	thiram; Arasan®; Tersan® 75; Thylate®	73.72	1.18
176	calcium arsenate	78.56	4.10
177	Dri-Die®; SYLOID® 255-Grade 255; SG-67	96.69	4.40
178	GC-8993; ENT 25207	96.69	1.37
179	RH-2300	97.89	1.90
180	GC-9832; 4FK	98.00	2.68
181	SYLOID® 378-Grade 78; SG-78	108	3.18

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182	monuron; CMU; Telvar®	110	0.78
183	Kradex®; BAY-30686; chinothionat	121	1.14
184	dicofol; Kelthane®; FW-293	145	1.52
185	Rhothane®; DDD; TDE; ENT 4225	161	0.98
186	SYLOID® 308-Grade 77; SG-77	163	2.65
187	Q-128	179	0.75
188	BAY-38733; ENT 27323	198	2.18
189	nitrofen; TOK®; FW-925	275	3.08
190	propachlor; Ramrod®; CP-31393	311	2.81
191	Polyram®; ENT 26711	437	1.53
192	fenson; Murvesco®; TriFenson®; GC-928	483	0.07
193	molasses (feed grade)	494	4.79
194	propham; Chem-Hoe®; IPC	604	0.96
195	Hi-Sil® 233	616	2.47
196	SYLOID® 74-Grade 74; SG-74	880	0.99
197	ryania	977	1.26
198	sulfur	1,051	1.38
199	chlorobenzilate; Acaraben®; Geigy 338; G-23992	1,849	1.01
200	dinitrocyclohexylphenol; Dinex®; DN-111; DNOCHP	2,175	0.45
201	SYLOID® 63-Grade 63; SG-63	3,625	0.91
202	SD-14114; Vendex® Miticide; ENT 27738	3,982	0.57
203	GC-6936	10,031	0.63

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TABLE 2. Pesticides Not Toxic at 11 Micrograms per Honey Bee (or highest dosage tested) in the Laboratory at 48 Hours at 80°F (26.7°C) and 65 Percent Relative Humidity. Group III - Relatively Nontoxic to Honey Bees

Reference No.	Pesticide	% Mortality	µg/bee
204	allethrin; pyrethrins, synthetic; ENT 17510	6.00	0.314
205	Bacticin®	6.79	0.336 0.338
206	pyrethrum	11.00	0.63
207	rotenone; cube; derris	12.00	2.42
208	parinol; Parmon®	2.90	2.42
209	paraquat	2.74	6.04
210	dichlone; Phygon®	7.04	7.25
211	nicotine	3.00	8.70
212	dichlofluanid; Euparen®; BAY-47531	3.91	9.06
213	Alamine 21, primary amine; AL-21	2.38	9.06
214	Armeen L-15; ARL-15	2.38	9.06
215	Alamine 11, primary amine; AL-11	0	9.06
216	Alamine 15, primary amine; AL-15; Tall oil	0	9.06
217	Alequat 221, tertiary amine; ALQ-221	0	9.06
218	Duomeen L-15; DL-15	0	9.06
219	methyl chlorobenzilate	1.09	9.67
220	Aramite®	26.00	12.00
221	ferbem; Fermate®	10.61	12.09
222	Vegadex®; CDEC	10.03	12.09
223	folpet; Phaltan®	8.97	12.09
224	DDT antiresistant; WARF antiresistant for DDT; GC-6768	7.79	12.09
225	ethephon; Ethrel®; Compd. 68-240	7.00	12.09
226	merphos; Folex®	6.14	12.09
227	Eptam®; EPTC	5.91	12.09
228	TD-71	5.85	12.09
229	nabam; Parzate®	5.71	12.09
230	glyodin; Glyoxide®	5.08	12.09
231	Randox®; CDAA	4.73	12.09
232	Triton X-100®	4.51	12.09
233	Benzac®; Trysben®; 2,3,6-TBA	4.36	12.09
234	amitrole; Weedazol®; Cytrol®; ATA	4.10	12.09
235	cuprous oxide	3.52	12.09
236	maneb; Manzate®	2.98	12.09
237	Triton B-1956	2.80	12.09
238	dodine; Cyprex®	2.45	12.09
239	BIO-908; Compd. 908A; WIA-908	2.17	12.09
240	picloram; Tordon® 22K	7.40	14.50
241	benefin; Balan®	7.10	14.50
242	copper oxychloride sulfate; C-O-C-S	7.00	14.50
243	BAY-28589	6.83	14.50
244	barban; Carbyne®	5.60	14.50
245	2,4-DB (dimethylamine salt); Butyrac®-118; 4-(2,4-DB)	3.97	14.50
246	cypromid; Clobber®; S-6000	2.90	14.50
247	amiben (ammonium salt); Amiben®; chloramben	2.80	14.50
248	benzadox; Topcide®; S-6173	2.40	14.50
249	bromoxynil; Brominil®; Buctril®	2.00	14.50
250	D-6	3.33	16.92
251	erbon; Baron®; Novon®	6.60	18.13
252	2,4-D (low volatile oil soluble form); Dacamine®	6.44	18.13
253	AC-94556	6.20	18.13
254	chlorbenside; Chloroparacide®; Mitox®; ENT 20696	2.00	18.13
255	Omite®; Comite®; DO-14; ENT 27226	1.85	18.13
256	mecoprop; MCPP; CMPP; 2-MCPP	1.67	18.13
257	D-048 (analogue of Aramite®)	0	18.13
258	U-36059; ENT 27967	9.94	21.15
259	RP-2929	1.28	21.70
260	oxadiazon; Ronstar®; RP-17623	1.28	21.70
261	Acarol®; GS-19851; ENT 27552	5.50	24.00
262	Dimite®; DMC; chlorfenethol	4.95	24.03
263	GC-2066	22.87	24.17
264	GC-2131	13.66	24.17
265	trifluralin; Treflan®	12.85	24.17
266	sesasin; Sesin®; 2,4-DEB	7.46	24.17
267	Mylone®; DMTT	6.25	24.17
268	Ansar® 170; Daconate®; MSMA	6.17	24.17
269	dalapon; Dowpon®; Radapon®	4.58	24.17
270	2,4-D (sodium salt)	3.70	24.17
271	Indopol® Polybutene H-300	3.70	24.17
272	propanil; DPA; Rogue®; Stam® F-34; BAY 30130	3.69	24.17
273	Weedar®; MCPA; Dow MCP amine weed killer	3.62	24.17
274	DEF®	2.99	24.17
275	sesone; Sesone®; SES	2.00	24.17
276	2,4,5-T	1.93	24.17
277	C-940; UNI-C940	1.62	24.17
278	bensulide; Betasan®; Prefar®; R-4461	1.60	24.17
279	chloropropylate; Acaralate®; G-24163; ENT 26999	1.60	24.17
280	Glytac®	0.85	24.17
281	GS-13798	0.79	24.17
282	silikil	0	24.17
283	butylate; Sutan®; R-1910	14.95	26.01
284	DDE, p,p' isomer	16.81	26.59
285	DDT, o,p' isomer	16.43	26.59
286	DDE, o,p' isomer	15.00	26.59
287	pebulate; PEBC; Tillam®; R-2061	13.18	29.01
288	WIA-10656	11.97	29.01
289	vernolate; Vernam®; R-1607	10.89	29.01
290	molinate; Ordram®; R-4572	10.32	29.01
291	cycloate; Ro-Neet®; R-2063	7.04	29.01
292	UC-21426	8.58	30.22
293	UC-21427	5.70	30.22
294	Aroclor® 1221	2.50	30.22
295	Aroclor® 1248; ENT 8078	1.24	30.22
296	Aroclor® 1254	1.24	30.22
297	Aroclor® 1260	1.20	30.22
298	Aroclor® 1232	0	30.22
299	Aroclor® 1242	0	30.22
300	IPC + PPC - 124 @ 4:1	11.30	32.26 9.10

301	chlorpropham; CIPC; Chloro IPC; FURLOE®	4.90	36.26
302	CIPC + FPG - 124 @ 4:1	4.50	36.26 9.10
303	maleic hydrazide; MH-30®	4.32	36.26
304	HCCPD	2.59	36.26
305	dimethyl sulfoxide; DMSO	2.47	36.26
306	metham; SMDC; VPM®; Vapam®	2.40	36.26
307	Kuron®; 2(2,4,5-TP); silvex acid, PGBE ester	2.10	36.26
308	diallate; Avadex®; DATC; CP-15366	2.00	36.26
309	Pipron®	2.00	36.26
310	triallate; Avadex BW®; DATC-BW	1.82	36.26
311	asulam; Asulox® 60; M&B 9057	1.28	36.26
312	Polysorbate 80®; Tween 80®	0.86	36.26
313	alachlor; Lasso®; CP-50144	0.41	36.26
314	UHI-K840	2.56	45.30
315	SN-38107; EP-475	9.68	48.34
316	FLIT® MLO; BPRL-3855-2	9.52	48.34
317	MBC	8.34	48.34
318	BPRL-5337-2	7.61	48.34
319	polyisobutylene	7.34	48.34
320	polyisobutylene; Polytrap®	5.60	48.34
321	TCA, acid	4.18	48.34
322	pentachlorophenol, PCP: Dowcide® 7 Flake tech	2.55	48.34
	Dowcide® G sodium salt	2.16	48.34
323	WIA-10637	0.85	48.34
324	dichloropropene; Telone®	6.58	60.43
325	BAY-78175	6.04	60.43
326	naphtha; Espesol 300®; Herbitox®	4.53	60.43
327	HaTCA (inhibited); Sodium TCA	3.70	60.43
328	ethyl formate	2.59	60.43
329	Ammate® X; AMS	2.90	60.43
330	Frucote®; Tutane®	2.50	60.43
331	Sencor®; BAY-94337	2.82	60.00
332	dicamba; Banvel D®	2.58	90.65
333	prometryne; Caporal®; G-34161	10.36	96.69
334	captafol; folcid; Difolatan®; EE-5865	8.91	96.69
335	simazine; Princep®	6.52	96.69
336	ametryne; atrametryne; Ametryne®; Evik® GS-34162	6.49	96.69
337	atrazine; AAtrex®; Atratol®; G-30027	4.79	96.69
338	SUMITOL®; GS-14254	4.53	96.69
339	norea; Herban®	3.09	96.69
340	propazine; Milogard®	2.47	96.69
341	Hemagon®; Fumazone®	13.00	100.00
342	Demon®; BAY-22555	40.46	102.00
343	naptalam; Alanap®; NPA	0.41	113.20
344	fentin hydroxide; TPTH; DuTer®	12.70	114.82
345	chlordimeform; chlorphenamidine; Fundal®; Galecron®; EMT 27567; EMT 27335; EP-333; C-8514	8.49	114.82
346	FREZ®; UC-20299	3.80	114.82
347	Dyrene®; Kemate®; B-622	4.27	117.23
348	benomyl; Benlate®; F-1991	8.16	120.86
349	Maloran®; C-6313	7.25	120.86
350	linuron; Lorox®	6.47	120.86

351	metobromuron; Patoran®; C-3126	5.59	120.86
352	fluorodifen; Preforan®; C-6989	5.40	120.86
353	siduron; Tupersan®	5.30	120.86
354	GC-10379	4.58	120.86
355	chloroxuron; Tenoran®	4.50	120.86
356	ovex; Ovatran®; K-6451	3.17	120.86
357	dichlobenil; Casaron®	3.09	120.86
358	Trefmid® (=trifluralin, 50% + diphenamid, 3.1%)	2.70	120.86
359	diuron; Karmex®	2.77	145.03
360	cacodylic acid; Phytar® 138	5.60	157.12
361	Dikar® (=Dithane® M-45, 74% + Karathane®, 6%)	14.59	178.87 14.50
362	chlorothalonil; Daconil® 2787; Bravo®	14.28	181.29
363	nitralin; Planavin®; SD-11831	6.80	181.29
364	Plantvax®; P-461	5.90	181.29
365	dicloran; Botran®; DCNA; ditranil; Allisan®	5.52	181.29
366	Kerb®; RH-315	4.90	181.29
367	methazole; Probe®; VCS-438	3.79	181.29
368	dithianon; Thynon®; Delan®	3.09	181.29
369	carboxin; Vitavax®; D-735	2.00	181.29
370	karbutilate; Tandex®; WIA-11092	8.50	193.38
371	fluometuron; Cotoran®	3.80	193.38
372	Dithane® M-45	3.70	193.38
373	pyrazon; Pyramin®; PCA	3.30	193.38
374	terbacil; Sinbar®	2.40	193.38
375	cyanazine; Bladex®; SD-15418	2.11	193.38
376	terbutol; AZAK®; Hercules 9573	1.66	193.38
377	bromacil; Hyvar®X	1.20	193.38
378	Alar®	5.80	205.46
379	captan; Merpan®; Orthocide® 406; EMT 26538	9.86	215.00
380	methar; DSMA; Ansar® 184	9.80	217.55
381	tetradifon; Tedion®	4.33	217.55
382	cryolite	1.45	217.55
383	Dacthal®-T; DAC 893; DCPA	3.18	229.63
384	GS-16068; Sancap®	6.20	235.68
385	terbutryn; Igran®; GS-14260	2.90	236.40
386	Can-Trol®; Thistrol®; MCPB (sodium salt)	4.00	237.37
387	diatomaceous earth	18.33	241.72
388	Prisnite M3X	12.11	241.72
389	calcium carbonate	8.22	241.72
390	diphenamid; Dymid®; Enide®	7.29	241.72
391	phenmedipham; Betanal®; EP-452; S-4075	2.95	241.72
392	olancha clay	2.02	241.72
393	VIRON/H®; Heliothis virus	0.58	241.72
394	silikil (heavy)	0.49	241.72
395	Attaclay®	0.43	241.72
396	fenoprop; silvex acid(tech.); 2(2,4,5-TP)	0.41	241.72
397	cycloheximide; ACTI-AID®; Actidione®	0	241.72
398	pyrophyllite, Pyrol®	1.28	362.60
399	Bacillus thuringiensis Berliner; Thuricide®; Biotrol®	non-toxic @ 726,000 spores/bee	