

Appendix I. Timeline of insecticide use and resistance development across pest species

S.No.	Insecticide Name	Introduction Year	First resistance year	Insecticide MOA	Insect
1	methomyl	1968	2013	Carbamates	<i>Brevicoryne brassicae</i>
2	emamectin benzoate	1997	2013	Milbemycins	<i>Brevicoryne brassicae</i>
3	imidacloprid	1991	2013	Neonicotinoids	<i>Brevicoryne brassicae</i>
4	acetamiprid	1995	2013	Neonicotinoids	<i>Brevicoryne brassicae</i>
5	thiamethoxam	1998	2013	Neonicotinoids	<i>Brevicoryne brassicae</i>
6	profenofos	1975	2013	Organophosphates	<i>Brevicoryne brassicae</i>
7	deltamethrin	1974	2013	Pyrethroids	<i>Brevicoryne brassicae</i>
8	cypermethrin	1975	2013	Pyrethroids	<i>Brevicoryne brassicae</i>
9	bifenthrin	1984	2013	Pyrethroids	<i>Brevicoryne brassicae</i>
10	cyhalothrin-lambda	1984	2013	Pyrethroids	<i>Brevicoryne brassicae</i>
11	carbaryl	1957	1974	Carbamates	<i>Bucculatrix thurberiella</i>
12	toxaphene	1947	1960	Cyclodiene organochlorines	<i>Bucculatrix thurberiella</i>
13	parathion	1950	1965	Organophosphates	<i>Bucculatrix thurberiella</i>
14	parathion-methyl	1950	1968	Organophosphates	<i>Bucculatrix thurberiella</i>
15	carbophenothion-methyl	1955	1969	Organophosphates	<i>Bucculatrix thurberiella</i>
16	azinphos-methyl	1955	1974	Organophosphates	<i>Bucculatrix thurberiella</i>
17	trichlorfon	1957	1969	Organophosphates	<i>Bucculatrix thurberiella</i>
18	phosmet	1962	1969	Organophosphates	<i>Bucculatrix thurberiella</i>
19	dicrotophos	1965	1969	Organophosphates	<i>Bucculatrix thurberiella</i>
20	monocrotophos	1965	1969	Organophosphates	<i>Bucculatrix thurberiella</i>
21	tetrachlorvinphos Z-isomer	1967	1969	Organophosphates	<i>Bucculatrix thurberiella</i>
22	methamidophos	1972	1981	Organophosphates	<i>Bucculatrix thurberiella</i>
23	DDT	1944	1969	Pyrethroids	<i>Bucculatrix thurberiella</i>
24	ethylan	1957	1965	Pyrethroids	<i>Bucculatrix thurberiella</i>
25	methomyl	1968	1990	Carbamates	<i>Chrysodeixis includens</i>
26	thiodicarb	1980	1997	Carbamates	<i>Chrysodeixis includens</i>
27	BHC	1945	1974	Cyclodiene organochlorines	<i>Chrysodeixis includens</i>
28	parathion-methyl	1950	1974	Organophosphates	<i>Chrysodeixis includens</i>
29	acephate	1970	1990	Organophosphates	<i>Chrysodeixis includens</i>
30	DDT	1944	1974	Pyrethroids	<i>Chrysodeixis includens</i>
31	permethrin	1973	1990	Pyrethroids	<i>Chrysodeixis includens</i>
32	deltamethrin	1974	1996	Pyrethroids	<i>Chrysodeixis includens</i>
33	cypermethrin	1975	1990	Pyrethroids	<i>Chrysodeixis includens</i>
34	fenvalerate	1976	1990	Pyrethroids	<i>Chrysodeixis includens</i>
35	tefluthrin	1986	1996	Pyrethroids	<i>Chrysodeixis includens</i>
36	dieldrin	1949	1965	Cyclodiene organochlorines	<i>Epitrix cucumeris</i>
37	aldrin	1950	1965	Cyclodiene organochlorines	<i>Epitrix cucumeris</i>

38	DDT	1944	1954	Pyrethroids	<i>Epitrix cucumeris</i>
39	methomyl	1968	1992	Carbamates	<i>Frankliniella occidentalis</i>
40	formetanate	1969	2005	Carbamates	<i>Frankliniella occidentalis</i>
41	bendiocarb	1971	1995	Carbamates	<i>Frankliniella occidentalis</i>
42	methiocarb	1972	1994	Carbamates	<i>Frankliniella occidentalis</i>
43	toxaphene	1947	1965	Cyclodiene organochlorines	<i>Frankliniella occidentalis</i>
44	endosulfan	1956	1994	Cyclodiene organochlorines	<i>Frankliniella occidentalis</i>
45	cyantraniliprole	2008	2016	Diamides	<i>Frankliniella occidentalis</i>
46	emamectin benzoate	1997	2022	Milbemycins	<i>Frankliniella occidentalis</i>
47	imidacloprid	1990	2016	Neonicotinoids	<i>Frankliniella occidentalis</i>
48	acetamiprid	1995	2013	Neonicotinoids	<i>Frankliniella occidentalis</i>
49	thiamethoxam	1997	2014	Neonicotinoids	<i>Frankliniella occidentalis</i>
50	dinotefuran	2002	2023	Neonicotinoids	<i>Frankliniella occidentalis</i>
51	malathion	1952	2005	Organophosphates	<i>Frankliniella occidentalis</i>
52	diazinon	1953	1995	Organophosphates	<i>Frankliniella occidentalis</i>
53	dichlorvos	1959	2005	Organophosphates	<i>Frankliniella occidentalis</i>
54	chlorpyrifos	1965	1992	Organophosphates	<i>Frankliniella occidentalis</i>
55	acephate	1970	1994	Organophosphates	<i>Frankliniella occidentalis</i>
56	methamidophos	1972	2005	Organophosphates	<i>Frankliniella occidentalis</i>
57	fipronil	1987	2005	Phenylpyrazoles	<i>Frankliniella occidentalis</i>
58	permethrin	1973	1992	Pyrethroids	<i>Frankliniella occidentalis</i>
59	deltamethrin	1974	2005	Pyrethroids	<i>Frankliniella occidentalis</i>
60	cypermethrin	1975	1995	Pyrethroids	<i>Frankliniella occidentalis</i>
61	esfenvalerate	1979	2008	Pyrethroids	<i>Frankliniella occidentalis</i>
62	cypermethrin-alpha	1983	2008	Pyrethroids	<i>Frankliniella occidentalis</i>
63	bifenthrin	1984	1992	Pyrethroids	<i>Frankliniella occidentalis</i>
64	tau-fluvalinate	1985	2008	Pyrethroids	<i>Frankliniella occidentalis</i>
65	acrinathrin	1990	2005	Pyrethroids	<i>Frankliniella occidentalis</i>
66	pyriproxyfen	1995	2016	Pyriproxyfen	<i>Frankliniella occidentalis</i>
67	spinosad	1997	2007	Spinosyns	<i>Frankliniella occidentalis</i>
68	spinetoram	2007	2016	Spinosyns	<i>Frankliniella occidentalis</i>
69	carbaryl	1957	1974	Carbamates	<i>Helicoverpa armigera</i>
70	methomyl	1968	1992	Carbamates	<i>Helicoverpa armigera</i>
71	thiodicarb	1980	1995	Carbamates	<i>Helicoverpa armigera</i>
72	toxaphene	1947	1974	Cyclodiene organochlorines	<i>Helicoverpa armigera</i>
73	endrin	1950	1969	Cyclodiene organochlorines	<i>Helicoverpa armigera</i>
74	endosulfan	1956	1974	Cyclodiene organochlorines	<i>Helicoverpa armigera</i>
75	methoxyfenozide	1998	2021	Diacylhydrazines	<i>Helicoverpa armigera</i>
76	chlorantraniliprole	2007	2020	Diamides	<i>Helicoverpa armigera</i>
77	indoxacarb	2000	2012	Indoxacarb	<i>Helicoverpa armigera</i>

78	metaflumizone	2008	2021	Metaflumizone	<i>Helicoverpa armigera</i>
79	abamectin	1997	2012	Milbemycins	<i>Helicoverpa armigera</i>
80	emamectin benzoate	1997	2015	Milbemycins	<i>Helicoverpa armigera</i>
81	thiocyclam	1975	2019	Nereistoxin	<i>Helicoverpa armigera</i>
82	malathion	1952	1974	Organophosphates	<i>Helicoverpa armigera</i>
83	azinphos-methyl	1955	1974	Organophosphates	<i>Helicoverpa armigera</i>
84	chlorpyrifos	1965	1995	Organophosphates	<i>Helicoverpa armigera</i>
85	monocrotophos	1965	1995	Organophosphates	<i>Helicoverpa armigera</i>
86	quinalphos	1970	1992	Organophosphates	<i>Helicoverpa armigera</i>
87	phoxim	1970	1997	Organophosphates	<i>Helicoverpa armigera</i>
88	isoxathion	1972	2002	Organophosphates	<i>Helicoverpa armigera</i>
89	profenofos	1975	1995	Organophosphates	<i>Helicoverpa armigera</i>
90	DDT	1944	1973	Pyrethroids	<i>Helicoverpa armigera</i>
91	tetramethrin	1964	2007	Pyrethroids	<i>Helicoverpa armigera</i>
92	permethrin	1973	1984	Pyrethroids	<i>Helicoverpa armigera</i>
93	deltamethrin	1974	1984	Pyrethroids	<i>Helicoverpa armigera</i>
94	cypermethrin	1975	1984	Pyrethroids	<i>Helicoverpa armigera</i>
95	fenvalerate	1976	1984	Pyrethroids	<i>Helicoverpa armigera</i>
96	esfenvalerate	1979	2007	Pyrethroids	<i>Helicoverpa armigera</i>
97	cyhalothrin	1982	1992	Pyrethroids	<i>Helicoverpa armigera</i>
98	flucythrinate	1982	2007	Pyrethroids	<i>Helicoverpa armigera</i>
99	cyfluthrin	1983	1986	Pyrethroids	<i>Helicoverpa armigera</i>
100	cypermethrin-alpha	1983	1997	Pyrethroids	<i>Helicoverpa armigera</i>
101	bifenthrin	1984	1997	Pyrethroids	<i>Helicoverpa armigera</i>
102	cyhalothrin-lambda	1984	2002	Pyrethroids	<i>Helicoverpa armigera</i>
103	cypermethrin-zeta	1984	2007	Pyrethroids	<i>Helicoverpa armigera</i>
104	tau-fluvalinate	1985	2007	Pyrethroids	<i>Helicoverpa armigera</i>
105	tefluthrin	1986	2007	Pyrethroids	<i>Helicoverpa armigera</i>
106	etofenprox	1987	2005	Pyrethroids	<i>Helicoverpa armigera</i>
107	cypermethrin-beta	1989	2017	Pyrethroids	<i>Helicoverpa armigera</i>
108	cyhalothrin-gamma	1990	2001	Pyrethroids	<i>Helicoverpa armigera</i>
109	cyfluthrin-beta	1993	2002	Pyrethroids	<i>Helicoverpa armigera</i>
110	spinosad	1997	2009	Spinosyns	<i>Helicoverpa armigera</i>
111	carbaryl	1957	1993	Carbamates	<i>Helicoverpa zea</i>
112	TDE	1944	1964	Cyclodiene organochlorines	<i>Helicoverpa zea</i>
113	BHC	1946	1965	Cyclodiene organochlorines	<i>Helicoverpa zea</i>
114	parathion-methyl	1950	1993	Organophosphates	<i>Helicoverpa zea</i>
115	chlorpyrifos	1965	2000	Organophosphates	<i>Helicoverpa zea</i>
116	DDT	1944	1963	Pyrethroids	<i>Helicoverpa zea</i>
117	methoxychlor	1948	1968	Pyrethroids	<i>Helicoverpa zea</i>
118	permethrin	1973	1991	Pyrethroids	<i>Helicoverpa zea</i>
119	deltamethrin	1974	2000	Pyrethroids	<i>Helicoverpa zea</i>

120	cypermethrin	1975	1993	Pyrethroids	<i>Helicoverpa zea</i>
121	fenvalerate	1976	1993	Pyrethroids	<i>Helicoverpa zea</i>
122	bifenthrin	1984	2009	Pyrethroids	<i>Helicoverpa zea</i>
123	diflubenzuron	1972	1988	Benzoylureas	<i>Plutella xylostella</i>
124	triflumuron	1980	1988	Benzoylureas	<i>Plutella xylostella</i>
125	chlorfluazuron	1982	1988	Benzoylureas	<i>Plutella xylostella</i>
126	teflubenzuron	1983	1988	Benzoylureas	<i>Plutella xylostella</i>
127	lufenuron	1989	2011	Benzoylureas	<i>Plutella xylostella</i>
128	novaluron	2001	2021	Benzoylureas	<i>Plutella xylostella</i>
129	flupyradifurone	2012	2021	Butenolides	<i>Plutella xylostella</i>
130	carbaryl	1957	1967	Carbamates	<i>Plutella xylostella</i>
131	propoxur	1959	1981	Carbamates	<i>Plutella xylostella</i>
132	carbofuran	1965	1992	Carbamates	<i>Plutella xylostella</i>
133	isoprocarb	1967	1981	Carbamates	<i>Plutella xylostella</i>
134	methomyl	1968	1974	Carbamates	<i>Plutella xylostella</i>
135	lindane	1945	1957	Cyclodiene organochlorines	<i>Plutella xylostella</i>
136	BHC	1945	1968	Cyclodiene organochlorines	<i>Plutella xylostella</i>
137	dieldrin	1949	1967	Cyclodiene organochlorines	<i>Plutella xylostella</i>
138	aldrin	1950	1967	Cyclodiene organochlorines	<i>Plutella xylostella</i>
139	endosulfan	1956	1965	Cyclodiene organochlorines	<i>Plutella xylostella</i>
140	isobenzan	1958	1974	Cyclodiene organochlorines	<i>Plutella xylostella</i>
141	tebufenozide	1994	2006	Diacylhydrazines	<i>Plutella xylostella</i>
142	fufenozide	1994	2010	Diacylhydrazines	<i>Plutella xylostella</i>
143	flubendiamide	1979	2012	Diamides	<i>Plutella xylostella</i>
144	chlorantraniliprole	2007	2012	Diamides	<i>Plutella xylostella</i>
145	chlorantraniliprole	2007	2024	Diamides	<i>Plutella xylostella</i>
146	cyantraniliprole	2008	2015	Diamides	<i>Plutella xylostella</i>
147	tetraniliprole	2021	2024	Diamides	<i>Plutella xylostella</i>
148	indoxacarb	1996	2007	Indoxacarb	<i>Plutella xylostella</i>
149	metaflumizone	2008	2015	Metaflumizone	<i>Plutella xylostella</i>
150	avermectin	1985	2020	Milbemycins	<i>Plutella xylostella</i>
151	tervecmectin A	1990	2021	Milbemycins	<i>Plutella xylostella</i>
152	tenvermectin B	1990	2024	Milbemycins	<i>Plutella xylostella</i>
153	emamectin benzoate	1997	2010	Milbemycins	<i>Plutella xylostella</i>
154	acetamiprid	1995	2004	Neonicotinoids	<i>Plutella xylostella</i>
155	cartap	1967	1978	Nereistoxin	<i>Plutella xylostella</i>
156	monosultap	1970	2011	Nereistoxin	<i>Plutella xylostella</i>
157	thiocyclam	1975	2000	Nereistoxin	<i>Plutella xylostella</i>
158	parathion	1950	1965	Organophosphates	<i>Plutella xylostella</i>

159	parathion-methyl	1950	1974	Organophosphates	<i>Plutella xylostella</i>
160	dimethoate	1951	1974	Organophosphates	<i>Plutella xylostella</i>
161	malathion	1952	1965	Organophosphates	<i>Plutella xylostella</i>
162	diazinon	1953	1967	Organophosphates	<i>Plutella xylostella</i>
163	mevinphos	1955	1957	Organophosphates	<i>Plutella xylostella</i>
164	naled	1956	1974	Organophosphates	<i>Plutella xylostella</i>
165	trichlorfon	1957	1974	Organophosphates	<i>Plutella xylostella</i>
166	dichlorvos	1959	1974	Organophosphates	<i>Plutella xylostella</i>
167	fenitrothion	1960	1974	Organophosphates	<i>Plutella xylostella</i>
168	phosphamidon	1960	1974	Organophosphates	<i>Plutella xylostella</i>
169	cyanofenphos	1960	1983	Organophosphates	<i>Plutella xylostella</i>
170	dioxabenzofos	1962	1983	Organophosphates	<i>Plutella xylostella</i>
171	EPN	1965	1974	Organophosphates	<i>Plutella xylostella</i>
172	monocrotophos	1965	1974	Organophosphates	<i>Plutella xylostella</i>
173	chlorpyrifos	1965	2007	Organophosphates	<i>Plutella xylostella</i>
174	chlorpyrifos-methyl	1966	1978	Organophosphates	<i>Plutella xylostella</i>
175	cyanophos	1966	1983	Organophosphates	<i>Plutella xylostella</i>
176	dialifos	1967	1983	Organophosphates	<i>Plutella xylostella</i>
177	methidathion	1968	1983	Organophosphates	<i>Plutella xylostella</i>
178	leptophos	1969	1974	Organophosphates	<i>Plutella xylostella</i>
179	acephate	1970	1974	Organophosphates	<i>Plutella xylostella</i>
180	isoxathion	1970	1983	Organophosphates	<i>Plutella xylostella</i>
181	quinalphos	1970	1985	Organophosphates	<i>Plutella xylostella</i>
182	mephosfolan	1970	1986	Organophosphates	<i>Plutella xylostella</i>
183	phoxim	1970	2011	Organophosphates	<i>Plutella xylostella</i>
184	methamidophos	1972	1978	Organophosphates	<i>Plutella xylostella</i>
185	pirimiphos-methyl	1973	1983	Organophosphates	<i>Plutella xylostella</i>
186	triazophos	1973	2007	Organophosphates	<i>Plutella xylostella</i>
187	profenofos	1975	1985	Organophosphates	<i>Plutella xylostella</i>
188	prothiofos	1976	1982	Organophosphates	<i>Plutella xylostella</i>
189	phenthoate	1980	2000	Organophosphates	<i>Plutella xylostella</i>
190	abamectin	1997	2008	Organophosphates	<i>Plutella xylostella</i>
191	fipronil	1987	2011	Phenylpyrazoles	<i>Plutella xylostella</i>
192	DDT	1944	1953	Pyrethroids	<i>Plutella xylostella</i>
193	resmethrin	1967	1978	Pyrethroids	<i>Plutella xylostella</i>
194	permethrin	1973	1981	Pyrethroids	<i>Plutella xylostella</i>
195	deltamethrin	1974	1981	Pyrethroids	<i>Plutella xylostella</i>
196	cypermethrin	1975	1981	Pyrethroids	<i>Plutella xylostella</i>
197	Pyrethroids	1976	1980	Pyrethroids	<i>Plutella xylostella</i>
198	fenvalerate	1976	1981	Pyrethroids	<i>Plutella xylostella</i>
199	esfenvalerate	1979	2008	Pyrethroids	<i>Plutella xylostella</i>
200	flucythrinate	1982	1988	Pyrethroids	<i>Plutella xylostella</i>
201	cyhalothrin	1982	1992	Pyrethroids	<i>Plutella xylostella</i>

202	bifenthrin	1984	2007	Pyrethroids	<i>Plutella xylostella</i>
203	cyhalothrin-lambda	1984	2007	Pyrethroids	<i>Plutella xylostella</i>
204	tau-fluvalinate	1985	1992	Pyrethroids	<i>Plutella xylostella</i>
205	cypermethrin-beta	1989	2011	Pyrethroids	<i>Plutella xylostella</i>
206	deltamethrin + DEF	1990	2008	Pyrethroids	<i>Plutella xylostella</i>
207	spinosad	1997	2002	Spinosyns	<i>Plutella xylostella</i>
208	Spinetoram	2007	2021	Spinosyns	<i>Plutella xylostella</i>
209	chlorfenapyr	1996	2015	Sulfluramid	<i>Plutella xylostella</i>
210	deltamethrin + PBO	1990	2008	Undetermined MOA	<i>Plutella xylostella</i>
211	pyridalyl	2002	2019	Undetermined MOA	<i>Plutella xylostella</i>
212	cyhalothrin-lambda	1984	2013	Pyrethroids	<i>Psylliodes chrysocephala</i>
213	bifenthrin	1984	2014	Pyrethroids	<i>Psylliodes chrysocephala</i>
214	tau-fluvalinate	1985	2014	Pyrethroids	<i>Psylliodes chrysocephala</i>
215	etofenprox	1987	2014	Pyrethroids	<i>Psylliodes chrysocephala</i>
216	abamectin	1997	2019	Milbemycins	<i>Sitobion avenae</i>
217	imidacloprid	1990	2019	Neonicotinoids	<i>Sitobion avenae</i>
218	thiamethoxam	1991	2021	Neonicotinoids	<i>Sitobion avenae</i>
219	acetamiprid	1995	2019	Neonicotinoids	<i>Sitobion avenae</i>
220	chlorpyrifos	1965	2019	Organophosphates	<i>Sitobion avenae</i>
221	cyhalothrin-lambda	1984	2014	Pyrethroids	<i>Sitobion avenae</i>
222	bifenthrin	1984	2021	Pyrethroids	<i>Sitobion avenae</i>
223	cypermethrin-beta	1989	2021	Pyrethroids	<i>Sitobion avenae</i>
224	chlorfluazuron	1982	2012	Benzoylureas	<i>Spodoptera exigua</i>
225	lufenuron	1989	2011	Benzoylureas	<i>Spodoptera exigua</i>
226	methomyl	1968	1987	Carbamates	<i>Spodoptera exigua</i>
227	BHC	1945	1967	Cyclodiene organochlorines	<i>Spodoptera exigua</i>
228	endosulfan	1956	2010	Cyclodiene organochlorines	<i>Spodoptera exigua</i>
229	tebufenozide	1994	2012	Diacylhydrazines	<i>Spodoptera exigua</i>
230	methoxyfenozide	1996	2008	Diacylhydrazines	<i>Spodoptera exigua</i>
231	flubendiamide	1979	2014	Diamides	<i>Spodoptera exigua</i>
232	chlorantraniliprole	2007	2011	Diamides	<i>Spodoptera exigua</i>
233	cyantraniliprole	2008	2019	Diamides	<i>Spodoptera exigua</i>
234	indoxacarb	1996	2011	Indoxacarb	<i>Spodoptera exigua</i>
235	metaflumizone	2008	2014	Metaflumizone	<i>Spodoptera exigua</i>
236	abamectin	1997	2011	Milbemycins	<i>Spodoptera exigua</i>
237	emamectin benzoate	1997	2012	Milbemycins	<i>Spodoptera exigua</i>
238	parathion-methyl	1950	1974	Organophosphates	<i>Spodoptera exigua</i>
239	chlorpyrifos	1965	2010	Organophosphates	<i>Spodoptera exigua</i>
240	quinalphos	1970	2010	Organophosphates	<i>Spodoptera exigua</i>
241	profenofos	1975	2011	Organophosphates	<i>Spodoptera exigua</i>
242	chlorpyrifos + DEM	1985	2019	Organophosphates	<i>Spodoptera exigua</i>
243	DDT	1944	1960	Pyrethroids	<i>Spodoptera exigua</i>

244	permethrin	1973	1989	Pyrethroids	<i>Spodoptera exigua</i>
245	deltamethrin	1974	1986	Pyrethroids	<i>Spodoptera exigua</i>
246	cypermethrin	1975	2010	Pyrethroids	<i>Spodoptera exigua</i>
247	Pyrethroids	1976	1980	Pyrethroids	<i>Spodoptera exigua</i>
248	fenvalerate	1976	1989	Pyrethroids	<i>Spodoptera exigua</i>
249	fenpropathrin	1981	2010	Pyrethroids	<i>Spodoptera exigua</i>
250	bifenthrin	1984	2010	Pyrethroids	<i>Spodoptera exigua</i>
251	cyhalothrin-lambda	1984	2014	Pyrethroids	<i>Spodoptera exigua</i>
252	cypermethrin-beta	1989	2015	Pyrethroids	<i>Spodoptera exigua</i>
253	spinosad	1997	2008	Spinosyns	<i>Spodoptera exigua</i>
254	chlorfenapyr	1996	2018	Sulfluramid	<i>Spodoptera exigua</i>
255	pyridalyl	2002	2014	Undetermined MOA	<i>Spodoptera exigua</i>
256	triflumuron	1980	2018	Benzoylureas	<i>Spodoptera frugierda</i>
257	lufenuron	1989	2015	Benzoylureas	<i>Spodoptera frugierda</i>
258	carbaryl	1957	1979	Carbamates	<i>Spodoptera frugierda</i>
259	methomyl	1968	1991	Carbamates	<i>Spodoptera frugierda</i>
260	thiodicarb	1980	1992	Carbamates	<i>Spodoptera frugierda</i>
261	lindane	1945	1965	Cyclodiene organochlorines	<i>Spodoptera frugierda</i>
262	dieldrin	1949	1968	Cyclodiene organochlorines	<i>Spodoptera frugierda</i>
263	aldrin	1950	1968	Cyclodiene organochlorines	<i>Spodoptera frugierda</i>
264	flubendiamide	1979	2018	Diamides	<i>Spodoptera frugierda</i>
265	chlorantraniliprole	2007	2018	Diamides	<i>Spodoptera frugierda</i>
266	chlorantraniliprole	2007	2022	Diamides	<i>Spodoptera frugierda</i>
267	cyantraniliprole	2008	2022	Diamides	<i>Spodoptera frugierda</i>
268	indoxacarb	1996	2022	Indoxacarb	<i>Spodoptera frugierda</i>
269	emamectin benzoate	1997	2021	Milbemycins	<i>Spodoptera frugierda</i>
270	parathion-methyl	1950	1981	Organophosphates	<i>Spodoptera frugierda</i>
271	malathion	1952	1991	Organophosphates	<i>Spodoptera frugierda</i>
272	diazinon	1953	1991	Organophosphates	<i>Spodoptera frugierda</i>
273	trichlorfon	1957	1981	Organophosphates	<i>Spodoptera frugierda</i>
274	dichlorvos	1959	1991	Organophosphates	<i>Spodoptera frugierda</i>
275	chlorpyrifos	1965	1991	Organophosphates	<i>Spodoptera frugierda</i>
276	chlorpyrifos + DEM	1965	2021	Organophosphates	<i>Spodoptera frugierda</i>
277	chlorpyrifos + PBO	1965	2021	Organophosphates	<i>Spodoptera frugierda</i>
278	acephate	1970	2014	Organophosphates	<i>Spodoptera frugierda</i>
279	phoxim	1970	2023	Organophosphates	<i>Spodoptera frugierda</i>
280	sulprofos	1978	1991	Organophosphates	<i>Spodoptera frugierda</i>
281	DDT	1944	1965	Pyrethroids	<i>Spodoptera frugierda</i>
282	permethrin	1973	1981	Pyrethroids	<i>Spodoptera frugierda</i>
283	deltamethrin	1974	2012	Pyrethroids	<i>Spodoptera frugierda</i>
284	cypermethrin	1975	1992	Pyrethroids	<i>Spodoptera frugierda</i>

285	fenvalerate	1976	1992	Pyrethroids	<i>Spodoptera frugierda</i>
286	fluvalinate	1980	1991	Pyrethroids	<i>Spodoptera frugierda</i>
287	cyhalothrin	1982	1991	Pyrethroids	<i>Spodoptera frugierda</i>
288	cyfluthrin	1983	2021	Pyrethroids	<i>Spodoptera frugierda</i>
289	bifenthrin	1984	1991	Pyrethroids	<i>Spodoptera frugierda</i>
290	cyhalothrin-lambda	1984	2001	Pyrethroids	<i>Spodoptera frugierda</i>
291	cypermethrin-zeta	1984	2018	Pyrethroids	<i>Spodoptera frugierda</i>
292	tralomethrin	1985	1991	Pyrethroids	<i>Spodoptera frugierda</i>
293	tau-fluvalinate	1985	1992	Pyrethroids	<i>Spodoptera frugierda</i>
294	spinosad	1997	2017	Spinosyns	<i>Spodoptera frugierda</i>
295	Spinetoram	2007	2018	Spinosyns	<i>Spodoptera frugierda</i>
296	diflubenzuron	1972	1997	Benzoylureas	<i>Spodoptera littoralis</i>
297	teflubenzuron	1983	1990	Benzoylureas	<i>Spodoptera littoralis</i>
298	carbaryl	1957	1967	Carbamates	<i>Spodoptera littoralis</i>
299	methomyl	1968	1985	Carbamates	<i>Spodoptera littoralis</i>
300	toxaphene	1947	1962	Cyclodiene organochlorines	<i>Spodoptera littoralis</i>
301	endrin	1950	1962	Cyclodiene organochlorines	<i>Spodoptera littoralis</i>
302	tebufenozide	1994	1997	Diacylhydrazines	<i>Spodoptera littoralis</i>
303	methoxyfenozide	1996	2022	Diacylhydrazines	<i>Spodoptera littoralis</i>
304	chlorantraniliprole	2007	2022	Diamides	<i>Spodoptera littoralis</i>
305	indoxacarb	1996	2018	Indoxacarb	<i>Spodoptera littoralis</i>
306	emamectin benzoate	1997	2022	Milbemycins	<i>Spodoptera littoralis</i>
307	parathion	1950	1968	Organophosphates	<i>Spodoptera littoralis</i>
308	parathion-methyl	1950	1973	Organophosphates	<i>Spodoptera littoralis</i>
309	azinphos-methyl	1955	1981	Organophosphates	<i>Spodoptera littoralis</i>
310	trichlorfon	1957	1970	Organophosphates	<i>Spodoptera littoralis</i>
311	fenitrothion	1960	1981	Organophosphates	<i>Spodoptera littoralis</i>
312	monocrotophos	1965	1973	Organophosphates	<i>Spodoptera littoralis</i>
313	chlorpyrifos	1965	1981	Organophosphates	<i>Spodoptera littoralis</i>
314	methidathion	1968	1997	Organophosphates	<i>Spodoptera littoralis</i>
315	leptophos	1969	1973	Organophosphates	<i>Spodoptera littoralis</i>
316	acephate	1970	1981	Organophosphates	<i>Spodoptera littoralis</i>
317	methamidophos	1972	1981	Organophosphates	<i>Spodoptera littoralis</i>
318	triazophos	1973	1986	Organophosphates	<i>Spodoptera littoralis</i>
319	profenofos	1975	1981	Organophosphates	<i>Spodoptera littoralis</i>
320	sulprofos	1978	1981	Organophosphates	<i>Spodoptera littoralis</i>
321	DDT	1944	1971	Pyrethroids	<i>Spodoptera littoralis</i>
322	permethrin	1973	1974	Pyrethroids	<i>Spodoptera littoralis</i>
323	deltamethrin	1974	1982	Pyrethroids	<i>Spodoptera littoralis</i>
324	cypermethrin	1975	1985	Pyrethroids	<i>Spodoptera littoralis</i>
325	pyrethroids	1976	1979	Pyrethroids	<i>Spodoptera littoralis</i>
326	fenvalerate	1976	1984	Pyrethroids	<i>Spodoptera littoralis</i>

327	flucythrinate	1982	1984	Pyrethroids	<i>Spodoptera littoralis</i>
328	spinosad	1997	2022	Spinosyns	<i>Spodoptera littoralis</i>
329	spinetoram	2007	2022	Spinosyns	<i>Spodoptera littoralis</i>
330	lufenuron	1989	2016	Benzoylureas	<i>Spodoptera litura</i>
331	carbaryl	1957	1975	Carbamates	<i>Spodoptera litura</i>
332	methomyl	1968	1997	Carbamates	<i>Spodoptera litura</i>
333	thiodicarb	1980	2007	Carbamates	<i>Spodoptera litura</i>
334	lindane	1945	1965	Cyclodiene organochlorines	<i>Spodoptera litura</i>
335	endosulfan	1956	1984	Cyclodiene organochlorines	<i>Spodoptera litura</i>
336	tebufenozide	1994	2019	Diacylhydrazines	<i>Spodoptera litura</i>
337	methoxyfenozide	1996	2012	Diacylhydrazines	<i>Spodoptera litura</i>
338	chromafenozide	1999	2022	Diacylhydrazines	<i>Spodoptera litura</i>
339	flubendiamide	1979	2023	Diamides	<i>Spodoptera litura</i>
340	chlorantraniliprole	2007	2012	Diamides	<i>Spodoptera litura</i>
341	cyantraniliprole	2008	2022	Diamides	<i>Spodoptera litura</i>
342	tetraniliprole	2021	2024	Diamides	<i>Spodoptera litura</i>
343	indoxacarb	1996	2013	Indoxacarb	<i>Spodoptera litura</i>
344	metaflumizone	2008	2019	Metaflumizone	<i>Spodoptera litura</i>
345	abamectin	1997	2008	Milbemycins	<i>Spodoptera litura</i>
346	emamectin benzoate	1997	2008	Milbemycins	<i>Spodoptera litura</i>
347	acetamiprid	1995	2009	Neonicotinoids	<i>Spodoptera litura</i>
348	malathion	1952	1984	Organophosphates	<i>Spodoptera litura</i>
349	diazinon	1953	1975	Organophosphates	<i>Spodoptera litura</i>
350	trichlorfon	1957	1975	Organophosphates	<i>Spodoptera litura</i>
351	dichlorvos	1959	1975	Organophosphates	<i>Spodoptera litura</i>
352	chlorfenvinphos	1962	1975	Organophosphates	<i>Spodoptera litura</i>
353	monocrotophos	1965	1997	Organophosphates	<i>Spodoptera litura</i>
354	chlorpyrifos	1965	2002	Organophosphates	<i>Spodoptera litura</i>
355	quinalphos	1970	1997	Organophosphates	<i>Spodoptera litura</i>
356	phoxim	1970	2007	Organophosphates	<i>Spodoptera litura</i>
357	triazophos	1973	2007	Organophosphates	<i>Spodoptera litura</i>
358	profenofos	1975	2007	Organophosphates	<i>Spodoptera litura</i>
359	fipronil	1987	2008	Phenylpyrazoles	<i>Spodoptera litura</i>
360	DDT	1944	1965	Pyrethroids	<i>Spodoptera litura</i>
361	deltamethrin	1974	2007	Pyrethroids	<i>Spodoptera litura</i>
362	cypermethrin	1975	1997	Pyrethroids	<i>Spodoptera litura</i>
363	fenvalerate	1976	1997	Pyrethroids	<i>Spodoptera litura</i>
364	esfenvalerate	1979	2012	Pyrethroids	<i>Spodoptera litura</i>
365	fenpropathrin	1981	2012	Pyrethroids	<i>Spodoptera litura</i>
366	cyhalothrin	1982	2007	Pyrethroids	<i>Spodoptera litura</i>
367	cyfluthrin	1983	2007	Pyrethroids	<i>Spodoptera litura</i>
368	bifenthrin	1984	2007	Pyrethroids	<i>Spodoptera litura</i>

369	cyhalothrin-lambda	1984	2012	Pyrethroids	<i>Spodoptera litura</i>
370	cypermethrin-beta	1989	2018	Pyrethroids	<i>Spodoptera litura</i>
371	deltamethrin + DEF	1990	2007	Pyrethroids	<i>Spodoptera litura</i>
372	cyfluthrin-beta	1993	2012	Pyrethroids	<i>Spodoptera litura</i>
373	spinosad	1997	2008	Spinosyns	<i>Spodoptera litura</i>
374	chlorfenapyr	1996	2013	Sulfluramid	<i>Spodoptera litura</i>
375	pyridalyl	2002	2022	Undetermined MOA	<i>Spodoptera litura</i>
376	methomyl	1968	2003	Carbamates	<i>Thrips tabaci</i>
377	oxamyl	1974	2020	Carbamates	<i>Thrips tabaci</i>
378	carbosulfan	1982	2013	Carbamates	<i>Thrips tabaci</i>
379	dieldrin	1949	1965	Cyclodiene organochlorines	<i>Thrips tabaci</i>
380	aldrin	1950	1965	Cyclodiene organochlorines	<i>Thrips tabaci</i>
381	endosulfan	1956	2003	Cyclodiene organochlorines	<i>Thrips tabaci</i>
382	emamectin benzoate	1997	2013	Milbemycins	<i>Thrips tabaci</i>
383	abamectin	1997	2023	Milbemycins	<i>Thrips tabaci</i>
384	imidacloprid	1990	2011	Neonicotinoids	<i>Thrips tabaci</i>
385	acetamiprid	1995	2023	Neonicotinoids	<i>Thrips tabaci</i>
386	dimethoate	1951	2011	Organophosphates	<i>Thrips tabaci</i>
387	diazinon	1953	2003	Organophosphates	<i>Thrips tabaci</i>
388	dichlorvos	1959	2003	Organophosphates	<i>Thrips tabaci</i>
389	methidathion	1968	2011	Organophosphates	<i>Thrips tabaci</i>
390	profenofos	1975	2015	Organophosphates	<i>Thrips tabaci</i>
391	DDT	1944	1960	Pyrethroids	<i>Thrips tabaci</i>
392	permethrin	1973	2015	Pyrethroids	<i>Thrips tabaci</i>
393	deltamethrin	1974	2003	Pyrethroids	<i>Thrips tabaci</i>
394	cypermethrin	1975	2003	Pyrethroids	<i>Thrips tabaci</i>
395	cypermethrin-alpha	1983	2008	Pyrethroids	<i>Thrips tabaci</i>
396	cyhalothrin-lambda	1984	2005	Pyrethroids	<i>Thrips tabaci</i>
397	spinosad	1997	2013	Spinosyns	<i>Thrips tabaci</i>
398	carbaryl	1957	1971	Carbamates	<i>Trichoplusia ni</i>
399	methomyl	1968	1974	Carbamates	<i>Trichoplusia ni</i>
400	BHC	1945	1965	Cyclodiene organochlorines	<i>Trichoplusia ni</i>
401	toxaphene	1947	1957	Cyclodiene organochlorines	<i>Trichoplusia ni</i>
402	dieldrin	1949	1974	Cyclodiene organochlorines	<i>Trichoplusia ni</i>
403	endrin	1950	1964	Cyclodiene organochlorines	<i>Trichoplusia ni</i>
404	aldrin	1950	1974	Cyclodiene organochlorines	<i>Trichoplusia ni</i>
405	endosulfan	1956	1970	Cyclodiene organochlorines	<i>Trichoplusia ni</i>

406	parathion	1950	1957	Organophosphates	<i>Trichoplusia ni</i>
407	parathion-methyl	1950	1974	Organophosphates	<i>Trichoplusia ni</i>
408	malathion	1952	1969	Organophosphates	<i>Trichoplusia ni</i>
409	mevinphos	1955	1965	Organophosphates	<i>Trichoplusia ni</i>
410	organophosphates	1956	1965	Organophosphates	<i>Trichoplusia ni</i>
411	monocrotophos	1965	1970	Organophosphates	<i>Trichoplusia ni</i>
412	DDT	1944	1954	Pyrethroids	<i>Trichoplusia ni</i>