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APPENDIX TO SUPPLEMENTUM 7

1968

VERLAG FÜR RECHT UND GESELLSCHAFT AG. BASEL

R. Wyniger

Appendix to

Pests of Crops in Warm Climates and their Control

APPENDIX
TO
PESTS OF CROPS IN WARM CLIMATES AND THEIR CONTROL

V. Control Measures

by

R. WYNIGER

2nd enlarged and revised edition

1968

VERLAG FÜR RECHT UND GESELLSCHAFT AG., BASEL

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V. Control Measures

Contents

V. Control Measures

Preface

1st edition

Present-day insecticides, acaricides, nematocides and other plant protecting substances are mainly organo-synthetic (artificial) compounds, belonging to various chemical groups. They have to a large extent taken the place of vegetable and inorganic products formerly in use and can be manufactured in unlimited quantities whenever desired.

Pesticides are usually marketed under various formulations and names which may differ from one country to another. Almost everywhere government regulations demand that the products on the market be labelled with their chemical composition and type of active ingredient, i.e. with their chemical common or other name. The following table gives the chemical common names of active ingredients, classified according to the group to which they belong; it also states their mode of action, their acute oral toxicity for rats, and their practical use.

2nd edition

Since the publication of the 1st edition of the "Appendix to Pests of Crops in Warm Climates and their Control" in 1962, many new synthetic-organic compounds for general use specialized Pest Control have been developed and marketed.

The "Table of Active Ingredients" in the present edition has been compiled correspondingly and brought up-to-date. Moreover, chemosterilants, activators or synergists, repellents and rodenticides are included.

The Active Ingredients are numbered as in the 1st edition, with some exceptions. The names or synonyms of new compounds are in alphabetical order and given a decimal figure (see also page 38). While the sections "Precautions" and "Mixing Tables" have not been altered, the section "First Aid Measures" has been in parts.

Control methods and methods of application resulting from the rapid development of new substances with new properties have been taken into consideration as far as possible in the main section entitled "Recommendations for Control Measures".

1. Table of Active Ingredients. Classification of Active Ingredients

1. Table of Active Ingredients with their Common Names, Mode of Action, Toxicity and Use

	Common name or chemical name or other name used	Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against
	Botanicals (natural products)			
1	**Bacillus thuringiensis**	St	non-toxic to mammals	caterpillars
1.1	**Derries see Rotenone**			
1.2	**Nicotine sulfate**	C, V	50–60	plant lice
2	**Pyrethrum**	C	1500	sucking and biting insects on ornamental plants
3	**Rotenone**	St, C	132–1500	biting and sucking insects in seed-beds
4	**Ryania**	St	750–1200	boring caterpillars
4.1	**Sabadilla**	C	2000	sucking insects
	Synthetical pyrethrines			
5	**Allethrin**	C	680–1000	sucking and biting insects on ornamental plants
6	**Barthrin**	C, St	very slight	sucking and biting insects on ornamental plants
6.1	**Cyclethrin**	C	very slight	sucking and biting insects on ornamental plants
6.2	**Dimethrin**	C	very slight	sucking and biting insects on ornamental plants
6.3	**Furethrin**	C	very slight	sucking and biting insects on ornamental plants
6.4	**Phthalthrin**	C	very slight	sucking and biting insects on ornamental plants

Explanation of abbreviations:

* St = Feeding or stomach poison
S = Systemic
C = Contact poison
P = Contact poison with local penetration properties
V = Vapour (fumigant)
A = Rodenticide which acts as "anticoagulant". The active ingredient prevents the blood from clotting by stopping Prothrombin-forming which is necessary for clotting.

** The DL 50 (lethal dosis) is the average dosage in milligramme of the compound, i.e. active ingredient per 1 kilogramme animal weight, needed to kill 50 per cent of animals (rats), when treated orally with this active ingredient.

	Common name or chemical name or other name used	Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against
	Synthetic-organic insecticides: Chlorinated hydrocarbons			
7	**Aldrin**	C, St, V	67	pests in soil (grubs, wireworms)
8	**Alodan** (Chlorbicyclen)	C	15000	pests in stored crops and livestock insects
9	**BHC** (Hexachloro-cyclohexane)	C, St, V	600–1250	biting and sucking insects (Note: effect on taste of crops)
9.1	**Bromedan**	C, St	12 900	biting insects
9.2	**Bulan see Dilan**			
10	**Chlordane**	C, St, V	457–590	pests in soil
10.1	**Chlorbicyclen see Alodan**			
10.2	**Chlordecone** (Kepone)	St, C	95–140	ants, flies, cockroaches
10.3	**Decachlorotetracyclo decanone see Chlor-decone**			
11	**DDD** (TDE) (Rothane)	C, St	3400	caterpillars; hornworms on tomato and tobacco
12	**DDT** (Dichloro diphenyl trichloroethane)	C, St	250	most insect pests in agri-culture with the exception of plant-lice, mealybugs, coccids and spider mites
13	**Dieldrin**	C, St	87	see DDT
14	**Dilan** (Bulan) (Prolan)	St, C	475–8073	Mexican bean beetle and salt marsh caterpillar
14.1	**Endosulfan see Thiodan**			
15	**Endrin**	St, C	3–45	biting insects
15.1	**gamma-BHC see Lindane**			
16	**Heptachlor**	C, St	90–130	insects in soil (seed dressing)
16.1	**Hexachlorocyclo-hexane see BHC**			
16.2	**Isobenzan see Telodrin**			

Common name or chemical name or other name used		Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against
16.3	**Isodrin**	C, St	7–17	biting insects
16.4	**Kepone see Chlordecone**			
17	**Lindane** (gamma-BHC)	C, St, V	125	pests in stored crops
18	**Methoxychlor**	C, St	6000	insects on fruits and vegetables (similar to DDT-insecticide)
18.1	**Mirex**	C, St	235–702	biting insects
19	**Perthane**	C, St	6600	biting insects on vegetables (caterpillars) and fruit flies
19.1	**Prolan see Dilan**			
19.2	**Rothane see DDD**			
19.3	**Strobane**	C, St	200–250	biting insects
19.4	**TDE see DDD**			
20	**Telodrin** (Isobenzan)	C, St	7	biting and sucking insects; insects in soil
21	**Thiodan** (Endosulfan)	C, St	30–79	biting and sucking insects on various crops
22	**Toxaphene**	C, St	40–283	biting insects on fruits and vegetables
	Synthetic-organic insecticides: Phosphorous esters			
22.1	**Abate**	C, St	1000–3000	sucking and biting insects
22.2	**Alamos** (Slam)	C, St	> 1500	sucking and biting insects
22.3	**Aphidan**	C, St, S	86 (Mice)	sucking insects
22.4	**Azinphos(ethyl) see Ethyl-Azinphos**			
22.5	**Azinphos(methyl)** (Guthion) (Gusathion)	C, St, P	7–18	sucking and biting insects and spider mites
22.6	**Azodrin see Dimethyl phosphate of 3-hydroxy-N-methyl-cis-crotonamide**			
23	**Baitex** (Entex) (Fenthion) (Lebaycid)	C, St	200–250	fruit flies
23.1	**Bidrin see Dicrotophos**			

Common name or chemical name or other name used		Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against
23.2	**Bomyl**	C	31–33	sucking and biting insects and spider mites
23.3	**Bromophos (ethyl)**	C	3745–6100	
23.4	**Butonate**	C	1050	household insects
23.5	**Carbicron see Dicrotophos**			
23.6	**Carbophenothion see Trithion**			
23.7	**2-Chloro-1-(2,4-dichlorophenyl)vinyl diethyl phosphate**	C, St	12–56	sucking and biting insects
23.8	**2-Chloro-1-(2,4,5-trichlorophenyl)vinyl dimethyl phosphate**	C, St	4000–5000	sucking and biting insects
24	**Chlorthion**	C, St, P	625	sucking insects on vegetables and fruits
24.1	**Cidial** (Phenthoate)	C, St	200–300	biting and sucking insects and spider mites
24.2	**Ciodrin**	C	125	pests on domestic animals
24.3	**Co-Ral see Coumaphos**			
24.4	**Coumaphos** (Co-Ral) (Resitox) (Muscatox)	S	13–963	ectoparasites on livestock
24.5	**Coumithoate** (Dition)	C	67	biting and sucking insects and spider mites
24.6	**Cyanthoate**	C	2–4	sucking and biting insects and spider mites
24.7	**Cyolane see Diethoxy-phosphinothioyl-imine dithiolane**			
24.8	**Cythioate** (Proban)	C, St, S	160	sucking insects and pests on animals
25	**DDVP = Dichlorvos**	C, St, V	56–80	sucking and biting insects and spider mites, hygiene pests
26	**Demeton** (Systox) (Mercaptophos)	S, St, C, V	9	sucking insects, especially plant lice and spider mites
27	**Diazinon**	C, St, P, V	220–270	biting and sucking insects, spider mites on various crops. Pests in soil
27.1	**Dicrotophos** (Bidrin, Carbicron)	C, St, S	27–45	biting and sucking insects

Common name or chemical name or other name used		Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against
28	**Dimethoate** (Rogor)	C, St, S, P, V	155–500	sucking insects and fruit flies, also mining larvae
29	**Dibrom** (Naled)	C	430	caterpillars, leafhoppers, aphids, mites
29.1	**Dicapthon** (Isochlorthion)	C, St, P	330–400	sucking insects on vegetables and fruits
29.2	**Dichlorvos see DDVP**			
29.3	**Diethoxyphosphino-thioylimine dithiolane** (Cyolane)	C, St, S	29	biting and sucking insects and spider mites
29.4	**Diethyl trichloropyridyl thiophosphate** (Dursban)	V, S	135–163	soil pests
29.5	**Dimecron see Phosphamidon**			
30	**Dimefox** (Hanane)	C, St, S	3–5	sucking insects and mites
30.1	**Dimethyl phosphate of 3-hydroxy-N-methyl-cis-crotonamide** (Azodrin) (Nuvacron)	C, St, S	21	biting and sucking insects and spider mites
30.2	**Dimethyl p-(methylthio)phenyl phosphate**	C, St, S	7	sucking and biting insects and spider mites
30.3	**Dipterex see Dylox**			
30.4	**Disulfoton** (Thiosystox) (Disyston S) (Thiodemeton)	C, St, S	4	sucking insects, also mining larvae
	(Solvirex)	C, St, S, P, V	12.5	sucking insects, mites, also mining larvae, as granule application
30.5	**Disyston S see Disulfoton**			
30.6	**Dition see Coumithoate**			
30.7	**DMTP see Baytex**			
30.8	**Dursban see Diethyl trichloropyridyl thiophosphate**			
31	**Dylox** (Trichlorfon) (Dipterex)	C, St, S, P	450–699	caterpillars, houseflies, livestock-pests
31.1	**Endothion**	St, S	23	various sucking insects
31.2	**Entex see Baitex**			

Common name or chemical name or other name used		Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against
32	**EPN** (O-ethyl-O-p-nitrophenyl phenyl-phosphonothioate)	C, St	12–40	biting and sucking insects and mites
33	**Ethion** (Nialate)	C	86–107	aphids, scale insects, mites
33.1	**Ethyl-azinphos**	C, St, P	7–18	biting and sucking insects and mites
33.2	**Famphur** (Famophos)	S	35–62	pests on livestock
33.3	**Fenchlorphos** (Ronnel)	S, C	1000–3000	pests on livestock
33.4	**Fenitrothion** (Folithion) (Sumithion)	C, St, S	250–673	sucking and biting insects (stemborers)
33.5	**Fensulfothion**	C, V	2–11	insects and nematodes
33.6	**Fenthion see Baitex**			
33.7	**2-Fluoroethyl mercaptophenyl-acetate, O,O-diethyl phosphorodithioate**	C	5	sucking and biting insects and spider mites
33.8	**Folithion see Fenitrothion**			
33.9	**Formocarbam**	C, St, S	400	sucking and biting insects and spider mites
33.10	**Formothion(iso)** (Anthio)	C, St, S, P	375–535	sucking insects, fruit flies, mining larvae and mites
33.11	**Fostion see Prothoate**			
33.12	**GS 13005 see Supracid**			
33.13	**Gusathion see Azinphosmethyl**			
34	**Guthion see Azinphosmethyl**			
34.1	**Hanane see Dimefox**			
34.2	**Imidan**	C	147–216	biting and sucking insects and spider mites
34.3	**Isochlorthion see Dicapthon**			
34.4	**Lebaycid see Baitex**			
35	**Malathion** (Mercaptothion)	St, C, V	1400	biting and sucking insects on various crops and pests in stored crops. Ectoparasites on human beings and peds

	Common name or chemical name or other name used	Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against
35.1	**Mecarbam** (Murfotox)	C	15–35	sucking and biting insects and spider mites
35.2	**Menazon**	C	1200–1600	plant lice
35.3	**Mercaptophos see Demeton**			
35.4	**Mercaptothion see Malathion**			
35.5	**Methidathion see Supracide**			
35.6	**Methyl-azinphos see Guthion**			
36	**Methyl-demeton** (Oxydemetonmethyl)	St, S, C, V	138	saw wasps, see also Demeton
37	**Methyl-parathion**	C, St, P, V	9–42	biting and sucking insects on various crops
38	**Methyl-trithion**	C, St	182	biting and sucking insects and spider mites
38.1	**Mevinphos see Phosdrin**			
38.2	**Morphothion(iso)**	C, St, S	200	biting and sucking insects and spider mites
38.3	**Murfotox see Mecarbam**			
38.4	**Muscatox see Coumaphos**			
38.5	**Naled see Dibrom**			
38.6	**Narlese**			
38.7	**Nemacide** (O-2,4-dichlorophenyl O,O-diethyl phosphorothioate)	C, St, V, P	270	insects, spider mites, nematodes
38.8	**Nialate see Ethion**			
38.9	**Nuvacron see Dimethyl phosphate of 3-hydroxy-N-methyl-cis-crotonamide**			
38.10	**O-(2-chloro-1-(2,5-dichlorophenyl)vinyl) O,O,diethyl phosphorothioate**	C, St	146	biting and sucking insects

Common name or chemical name or other name used		Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against
38.11	**O-ethyl-O-p-nitro-phenyl phenyl-phosphonothioate see EPN**			
38.12	**Ompa see Schradan**			
38.13	**O-p-cyanophenyl O,O-dimethyl phosphorothioate**	C, St	18–238	biting and sucking insects
38.14	**Oxydemetonmethyl see Methyl-demeton**			
39	**Parathion**	C, St, P, V	3–30	biting and sucking insects, spider mites on various crops
39.1	**Pestox III see Schradan**			
39.2	**Phenthoate see Cidial**			
40	**Phorate** (Thimet)	C, St, S	4	biting and sucking insects
40.1	**Phosalone**	C, St		biting and sucking insects
41	**Phosdrin** (Mevinphos)	C, St, S, V	13	biting and sucking insects
42	**Phosphamidon** (Dimecron)	C, St, S	17–30	biting and sucking insects, spider mites
43	**Phostex**	C	2500	scale insects, spider mites
44	**Potasan**	C, St, V	19	biting insects (beetles)
44.1	**Proban see Cythioate**			
44.2	**Prolate**			
44.3	**Prothidathion**	C, St		biting and sucking insects
44.4	**Prothoate** (Fostion)	C	14–25	biting and sucking insects
45	**Resitox see Coumaphos**			
45.1	**Rogor see Dimethoate**			
45.2	**Ronnel see Fenchlorphos**			
45.3	**Ruelene**	C, S	950–1000	pests on livestock
46	**Schradan** (Ompa) (Pestox III)	C, St, S	10	sucking insects and spider mites
46.1	**Slam see Alamos**			

Common name or chemical name or other name used		Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against
46.2	**S,S'-benzylidene-(O,O-dimethyl phosphorodithioate)**	C, St	280	biting and sucking insects
46.3	**Sulfotepp**	C	5	aphids and mites on fruits, vegetables and forage crops
46.4	**Sumithion see Fenitrothion**			
46.5	**Supracid** (Ultracid) (GS 13005) (Methidathion)	C, St, P	25–48	biting and sucking insects and spider mites
46.6	**Systox see Demeton**			
47	**Tepp**	C	0.5–2	aphids and mites on fruits, vegetables, forage crops
47.1	**Thimet see Phorate**			
47.2	**Thiocron**	C	600–660	biting and sucking insects
47.3	**Thiodemeton see Disulfoton**			
48	**Thiometon** (Ekatin)	C, St, S	125	sucking insects and spider mites
48.1	**Thionazin see Zinophos**			
48.2	**Thiosystox see Disulfoton**			
48.3	**Trichlorfon see Dylox**			
48.4	**Trichloronate**	C, St	16–35	sucking and biting insects
49	**Trithion** (Carbophenothion)	C, St, P	28–100	biting and sucking insects and spider mites on various crops
49.1	**Ultracid see Supracid**			
49.2	**Vamidothion**	C	64–100	biting and sucking insects
49.3	**Zinophos** (Thionazin)	C	9–16	insects and nematodes
49.4	**Zytron**	C, St, S	270	sucking and biting insects
	Synthetic-organic insecticides: Carbamates			
49.5	**Aminocarb see Matacil**			
49.6	**Arprocarb see Unden**			
49.7	**Baygon see Propoxur**			

Common name or chemical name or other name used		Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against
49.8	**Butacarb**	C		ectoparasites on animals
49.9	**Carbaryl see Sevin**			
49.10	**2,3-Dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate**	C, St, S		sucking and biting insects and nematodes
50	**Dimetan**	C, St	150	plant lice and flies
51	**Dimetilan**	St, C	60–70	plant lice and flies (houseflies)
52	**Isolan**	C, St, S, V	17	plant lice
52.1	**Matacil** (Aminocarb)	St	30–50	biting insects on crops
52.2	**Mercaptodimethur see Mesurol**			
52.3	**Mesurol** (Mercaptodimethur) (Methiocarb)	C, St	87–135	biting and sucking insects and spider mites
52.4	**Methiocarb see Mesurol**			
52.5	**Minacide**	C, St, V	39–247	biting and sucking insects
52.6	**Propoxur** (Baygon)	C, St	100–150	cockroaches and other hygiene pests
53	**Sevin** (Carbaryl)	C, St	500–700	biting and sucking insects
53.1	**5,6,7,8-Tetrahydro-1-naphthyl methylcarbamate**	C, St	470	biting and sucking insects
53.2	**3,4,5-Trimethylphenyl methylcarbamate**	C, St	178	biting and sucking insects
53.3	**Unden** (Arprocarb)	C, St	95–128	biting and sucking insects
54	**Zectran**	C, St, S	15–63	biting and sucking insects
	Synthetic-organic insecticides: Carbazoles			
55	**Tetranitrocarbazol**	St	very slight	caterpillars (selective effect)
	Synthetic-organic insecticides: Phenols			
56	**Dinitro-o-cresol**	C, St	26–65	locusts and as ovicide
56.1	**Dinitrobutylphenol**	C	50	locusts and as ovicide
56.2	**PCP = Pentachlorphenol**	C	125–210	locusts and as ovicide

	Common name or chemical name or other name used	Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against
	Synthetic-organic insecticides: Miscellaneous compounds			
56.3	**Lethane 384**	C	90–250	flies (household-insects)
56.4	**Thanite** (Terpinyl thiocyanoacetate)	C		flies (household-insects)
	Inorganic insecticides			
57	**Calcium arsenate**	St	20	biting insects
58	**Cryolite** (Na-alum-fluoride)	St	200	biting insects
59	**Lead arsenate**	St	100	biting insects
59.1	**Thallium acetate**	St		biting insects
59.2	**Thallium sulfate**	St		biting insects
	Mineral oils			
60	**White oils various types of vaseline-oils:** (dormant spray oil)	C	too high to measure	scale insects

	Common name or chemical name or other name used	Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Acute vapour toxicity in ppm	Use
	**Fumigants* (Vapour effect) Miscellaneous compounds				
60.1	**Bromomethane see Methyl bromide**				
60.2	**Carbon bisulfide**	V		200	as space fumigant
61	**Ethylene dibromide**	V	108–170	200	as soil fumigant
62	**Ethylene dichloride**	V	670–890	1000	as space fumigant
63	**Ethylene oxide**	V		500	as space fumigant
63.1	**Ethyl formate**	V	4290	330	as space fumigant
63.2	**Hydrogen cyanide**	V		40	as soil fumigant and space fumigant
64	**Methyl bromide** (Bromomethane)	V		200	as soil fumigant and space fumigant
64.1	**Methylene chloride**	V		5000	as space fumigant
64.2	**Methyl chloroform**	V		1000	as space fumigant

Common name or chemical name or other name used		Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Acute vapour toxicity in ppm	Use
64.3	**Methyl isothiocyanate** (Methyl mustard oil)	V	100		as soil fumigant
64.4	**Naphthalene**				as space fumigant
65	**Paradichlorobenzene**	V	500–5000	500	as space fumigant
66	**Potassium cyanide**	V	1		as space fumigant
66.1	**Propargyl bromide**	V	53–85	120	as soil fumigant
66.2	**Propylene oxide**	V		3000	as space fumigant
67	**Sulfur dioxide**	V	2–3	40	as space fumigant
67.1	**Sulfuryl fluoride**	V		400	as space fumigant
67.2	**Tetrachloroethene**	V	2200–5000	1000	as space fumigant
67.3	**Tetrachloromethane**	V	5730–9770	300	as space fumigant
67.4	**Tetrachloro-thiophene**	V	780		as soil fumigant

Common name or chemical name or other name used		Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use
	Synthetic-organic acaricides: Chlorinated hydrocarbons			
68	**Chlorobenzilate**	C	4850	as mite-killer
68.1	**Chloropropylate**	C	> 5000	as mite-killer
68.2	**Dicofol see Kelthane**			
69	**Dimite**	C	926–1390	as mite-killer
70	**Kelthane** (Dicofol)	C	575–1330	as mite-killer
	Synthetic-organic acaricides: Phosphorous esters			
71	**Delnav** (Dioxathion)	C	110	as mite-killer
71.1	**Dinobuton**	C	100–155	as mite-killer
71.2	**Dioxathion see Delnav**			
71.3	**Dursban**	C	97–276	as mite-killer
71.4	**Isopropyl mercapto-phenylacetate, O,O-dimethyl phosphorodithioate**	C	400–500	as mite-killer

	Common name or chemical name or other name used	Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use
71.5	**O-ethyl S-phenyl ethylphosphono-dithioate**	C	16	as mite-killer
72	**Phenkapton**	C	182	as mite-killer
	Synthetic-organic acaricides: Carbamates			
72.1	**Temik** (2-Methyl-2-(methylthio) propionaldehyde O-methylcarbamoyl)-oxime	C, St, S	0.93	as mite-killer (also effective against soil insects and nematodes)
72.2	**Tranid** (5-Chlor-6-oxo-2-norbornane-carbonitrile O-(methyl-carbamoyl)-oxime	C, St, S	19–26	as mite-killer (also with insecticidal effect)
	Synthetic-organic acaricides: Sulfur compounds			
72.3	**Animert see Tetrasul**			
73	**Aramite**	C	3900	as mite-killer
73.1	**Chlorbenside** (Chlorocide) (Mitox)	C	2000–10000	as mite-killer
73.2	**Chlorfenson see Ovex**			
73.3	**Chlorocide see Chlorbenside**			
74	**Fenson** (PCPBS) (Trifenson)	C	1000	as mite-killer
74.1	**Fluorbenside**	C		as mite-killer
75	**Genite**	C	1400–1870	as mite-killer
75.1	**Miticide see Ovex**			
75.2	**Mitox see Chlorbenside**			
76	**Ovex** (Chlorfenson) (Miticide) (Ovotran) (Trichlorfenson)	C, P	2000	as mite-killer and ovicide
76.1	**Ovotran see Ovex**			
76.2	**PCPBS see Fenson**			
77	**Sulphenone**	C	1400	as mite-killer
78	**Tedion** (Tetradifon)	C, P	14700	as mite-killer, ovicide

	Common name or chemical name or other name used	Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against
78.1	**Tetradifon see Tedion**			
78.2	**Tetrasul** (Animert)	C	6800–14700	as mite-killer
78.3	**Trichlorfenson see Ovex**			
78.4	**Trifenson see Fenson**			
	Synthetic-organic acaricides: Miscellaneous compounds			
78.5	**Acricid see Binapacril**			
78.6	**Azobenzene**	C		as mite-killer
78.7	**Binapacryl** (Acricid) (Morocide)	C	136–186	as mite-killer
78.8	**Dinitrobutylphenol** (Dinoseb) (DNBP)	C	50	as mite-killer
78.9	**Dinocap see Karathane**			
78.10	**Dinoseb see Dinitro-butylphenol**			
78.11	**DNBP see Dinitro-butylphenol**			
78.12	**Eradex** (Thioquinox)	C	3400	as mite-killer
79	**Karathane** (Dinocap)	C	714	as fungicide with acaricidal effect
79.1	**Morestan** (Oxythioquinox)	C	3000	as mite-killer (Fungicide)
79.2	**Morocide see Binapacryl**			
80	**Neotran**	C	6000	as mite-killer
80.1	**Oxythioquinox see Morestan**			
81	**Thioquinox see Eradex**			
	Inorganic acaricides			
82	**Sulphur** (lime-sulphur, wettable sulphur, dispersible sulphur and others)	C, (V)	too high to measure	as mite-killer (Fungicide)

	Common name or other name used	Mode of action *	Use
	Attractants [1]		
82.1	**Anethol**	V	to attract fruit flies
82.2	**Angelicasamenoel**	V	to attract fruit flies
82.3	**Anisylacetone**	V	to attract fruit flies
83	**Eugenol** (Methyl)	V	to attract fruit flies
83.1	**Geraniol**	V	to attract fruit flies
83.2	**Gyplure**	V	to attract fruit flies
84	**Medlure**	V	to attract fruit flies
84.1	**Que-Lure** (Q-Lure)	V	to attract fruit flies
85	**Siglure**	V	to attract fruit flies
85.1	**Trimedlure**	V	to attract fruit flies
86	**Proteinhydrolysate of yeast**	V	to attract fruit flies

[1] Attractants are compounds which attract the insects by their scent.

	Common name or chemical name or other designation for the chemical	Effective against	Acute oral toxicity ** DL 50 (mg/kg rats)	Application
	Repellents [2]			
87	**BEP see 2-Butyl-2-ethyl-1,3-propanediol**			
88	**Benzylbenzoate**	fleas, ticks, mites (chiggers)	1700	Impregnation of clothing
89	**Butopyronoxyl** (Indalone)	flies, mosquitoes	7400	Apply solution evenly on skin surfaces to be protected
90	**Butoxy poly-propylene glycol** (Crag Fly Repellent)	mosquitoes	9100–11200	Apply solution evenly on skin surfaces to be protected
91	**2-Butyl-2-ethyl-1,3-propanediol** (BEP)	mosquitoes	5040	Apply solution evenly on skin surfaces to be protected

[2] Repellents are compounds which prevent insects from attacking their hosts to suck blood.

	Common name or chemical name or other designation for the chemical	Effective against	Acute oral toxicity ** DL 50 (mg/kg rats)	Application
92	**Deet** (N,N-diethyl-m-toluamide)	horse-flies, mosquitoes, bedbugs, chiggers	1950–2000	Apply solution evenly on skin surfaces to be protected
93	**Dibutyl succinate** (Tabutrex)	flies	8000	Apply solution evenly on skin surfaces to be protected
94	**Diethyltoluamide see Deet**			
95	**Dimethyl carbate**	mosquitoes	1000	Apply solution evenly on skin surfaces to be protected
96	**Dimethyl phthalate** (DMP)	mosquitoes	6900–8200	Apply solution evenly on skin surfaces to be protected
97	**Di-n-butyl phthalate** (DBP)	fleas, ticks, chiggers	12000–> 20000	Impregnation of clothing
98	**Di-n-propyl isocinchomeronate** (Di-n-propyl 2,5-pyridinedicarboxylate) (MGK-Rep. 326)	mosquitoes	5230–7230	Apply solution evenly on skin surfaces to be protected
99	**Ethyl hexanediol** (Rutgers 612)	flies, mosquitoes, fleas, mites	1400–2400	Apply solution evenly on skin surfaces to be protected
100	**1,5a,6,9,9a,9b-Hexahydro-4a(4H)-dibenzofurancarboxaldehyde** (2,3,4,5-bis(2-butylene-tetrahydrofural) (MGK-Rep. 11)	mosquitoes	2500	Apply solution evenly on skin surfaces to be protected
101	**Indalone see Butopyronoxyl**			
102	**N,N-diethyl-m-toluamide see Deet**			
103	**O-chloro-N,N-diethylbenzamide**	mosquitoes, horse-flies, bedbugs, chiggers		Apply solution evenly on skin surfaces to be protected
104	**2-(Octylthio)ethanol** (MGK-Rep. 874)	mosquitoes	8500	Apply solution evenly on skin surfaces to be protected

	Common name or chemical name or other designation for the chemical	Effective against	Acute oral toxicity ** DL 50 (mg/kg rats)	Application
105	**N-butylacetanilide** (BAA)	fleas, ticks	2830	Impregnation of clothing
106	**N,N-diethyl-m-toluamide see Deet**			
107	**N,N-diethyl-o-toluamide** (O-Det) (Detamide)	horse-flies, mosquitoes, bedbugs, chiggers		Apply solution evenly on skin surfaces to be protected
108	**Rutgers 612 see Ethyl hexanediol**			
109	**Tabutrex see Dibutyl succinate**			

	Common name or other name used	Acute oral toxicity ** DL 50 (mg/kg rats)	Use as
	Chemosterilants [3]		
110	**Apholate**	90	Fertility regulator
111	**Aphomide**		Fertility regulator
112	**Aphoxide** (Tepa)	126–252	Fertility regulator
113	**Chlorambucil**		Fertility regulator
114	**5-Fu** (5-Fluorauracil)		Fertility regulator
115	**Hempa**	> 2500	Fertility regulator
116	**Metepa see Metaphoxide**		
117	**Metaphoxide** (Metepa)	93–277	Fertility regulator
118	**TEM see Tretamine**		
119	**Tepa see Aphoxide**		
120	**Tretamine** (TEM)		Fertility regulator

[3] Chemosterilants are compounds which sterilize the insects by contact or feeding.

	Common name or chemical name or other designation for the chemical	Acute oral toxicity ** DL 50 (mg/kg rats)	Remarks
	Synthetic-organic activators[4] or synergists[4] for insecticides		
121	**Butocide see Piperonyl butoxide**		
122	**N,N-di-n-butyl-p-chlorobenzene-sulfonamide** (Warf)	500	Antiresistant for DDT
123	**N-octyl bicycloheptene dicarboximide** (Octacide 264) (MGK 264) (Van Dyke 264)	2800	
124	**Octachloro-dipropylether** (S 421)	2500	
125	**Piperonal bis (2-(2-butoxyethoxy)-ethyl)acetal** (Tropital)	4000	Synergist for pyrethrum
126	**Piperonyl butoxide** (Butocide)	7500	Synergist for pyrethrum
127	**Propyl isome**	15000	Synergist for pyrethrum
128	**Sesamex** (Sesoxane)	2000–2270	
129	**Succinid-acid-di-n-butyl ester**		
130	**Sulfoxide**	2000	
131	**Tropital see Piperonal bis (2-(2-butoxy-ethoxy)ethyl)acetal**		
132	**Warf see N,N-di-n-butyl-p-chlorobenzenesulfonamide**		

[4] Activators or Synergists are not insecticidal compounds, but improve the efficacy of insecticides when added.

	Common name or chemical name or other designation for the chemical	Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against
	Molluscocides: Miscellaneous compounds			
133	**Bayluscid**	C	5000	water snails
134	**Copper**	C		slugs and snails
135	**Lime** (Calcium hydroxide)	C		slugs and snails
136	**Lime** (Calcium oxide)	C		slugs and snails
137	**Metaldehyde**	C	250–600 (Dog)	slugs and snails

	Common name or chemical name or other name used	Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use
	Nematocides: Miscellaneous compounds			
138	**Agren**	V	240 (mice)	as soil fumigant
139	**Allylalcohol**	V		as soil fumigant
140	**Chloropicrin**	V	1–5	as soil fumigant
141	**Chloro-brompropan**	V	9	as soil fumigant
142	**Dazomet see Mylone**			
143	**DD** (1,3-Dichloropropene 1,2-Dichloropropane)	V	250–500	as soil fumigant
144	**Dorlone** (Telone) (EDB)	V		as soil fumigant
145	**EDB see Dorlone**			
146	**Ethylene-dibromide**	V	146	as soil fumigant
147	**Fumazone see Nemagon**			
148	**Metham-Sodium see Vapam**			
149	**Methylbromide**	V	1	as soil fumigant
150	**Mylone** (Dazomet)	V	650	as soil fumigant
151	**Nemacur**	V		as soil fumigant
152	**Nemagon** (Fumazone)	V	300	as soil fumigant

Common name or chemical name or other name used	Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use
153 Sistan see Vapam			
154 Telone see Dorlone			
155 Trapex	V	100 (mice)	as soil fumigant
156 Vapam (Sistan) (Metham-Sodium)	V	820	as soil fumigant

Common name or other name used	Mode of action *	Acute oral toxicity ** DL 50 (mg/kg rats)	Use against rodents as
**Rodenticides*			
157 Aldrin see No. 7	C		field-cover spray or dust
158 Antu	A	5–9	dust on run-ways
159 Arsenic	St		bait in stores etc.
160 Castrix (Chlormethyl-dimethylamino-pyrimidin)	St	1–2	bait in stores etc.
161 Chlorophacinone	A		dust or bait on run-ways
162 Coumachlor	A	1000–1200	dust or bait on run-ways
163 Crimidine	A		dust or bait on run-ways
164 Cumtetralyl	A		dust or bait on run-ways
165 Diphacinon	A		dust or bait on run-ways
166 Endrin see No. 15	C		field-cover spray or dust
167 Fumarin	A	400	dust or bait on run-ways
168 Muritan see Promuriz			
169 Pindone	A		dust or bait on run-ways
170 Pival	A	1	dust or bait on run-ways
171 Promuriz (Muritan)	A		dust or bait on run-ways
172 Shoxin-norbomide	A	5–12	dust or bait on run-ways
173 Toxaphene see No. 22	C		field-cover spray or dust
174 Warfarin	A	60	field-cover spray or dust

2. Precautions

Pesticides are toxic in varying degrees; protective measures must therefore be in accordance with the toxicity of the product. Careful handling of close observation of the precautions recommended on the containers are indispensable. Disregard of the most elementary recommendations may affect human health. When handling insecticidal concentrates direct contact with the skin must be avoided. Mixing and stirring of liquid insecticides should always be done with wooden or metal rods, and never with the hands. Contact with highly toxic substances which penetrate the skin, such as Parathion, can have very serious consequences. Any insecticidal residue accidentally reaching the human skin must immediately be washed off with plenty of warm water and soap.

Sprays and dusts have to be applied down wind, so that the operator is not enveloped by the insecticide. Control measures should not be undertaken during the hot and calm hours of the day.

Drifting of pesticide sprays or dusts on to nearby crops or livestock should be avoided. Poultry, dairy or meat animals should be prevented from consuming plants or water which have been covered by drifting pesticides. When it is necessary to work in contact with plants (transplanting) which have been treated with Endrin, Demeton, Guthion or Parathion less than 5 days previously, the hands should be protected by gloves.

For application of highly toxic substances or treatment of enclosed spaces a face mask with replaceable filter should be worn. Continual handling of cigarettes by the operator can convey toxic substances through the mouth into the body. The same may happen when food is eaten with unwashed hands. After working with insecticides the body and any protecting clothing must be thoroughly washed (bath, shower).

Unused pesticides should not be left open and unsupervised; they are a danger to children and animals. Remainders, empty packing material or other objects covered with insecticides must never be thrown into either running or stagnant water, lest they poison the fish. They must be buried in trenches and well covered with earth.

Danger to bees, fish, birds, and wild and domestic animals

Plants must not be sprayed, when in flower, since the majority of pesticides are toxic for bees. Bees, when collecting nectar on treated flowers, take up some active substance and are killed. They may also carry poisonous substance together with the collected pollen into the hive and thus destroy the young brood and larvae which feed on it. Dusts are particularly dangerous.

Fish are very susceptible to insecticides, particularly to substances

of the organo-chlorine group. Application near fish ponds, lakes, dams or streams must therefore be carried out very carefully. Contaminated vessels and spraying equipment should never be dipped or washed in water containing fish.

Birds and in particular farm poultry are very susceptible to insecticides. Application near poultry runs should be avoided or undertaken when the birds are absent. Care must also be taken that the birds do not feed on poisoned grass or water. The same precautions should be observed with wild and domestic animals.

In case of presumed or obvious symptoms of insecticide poisoning medical help should be sought. The doctor must be informed of the kind of toxic substance involved. If medical help is not available immediately, first aid must be given in the meantime. Information on symptoms of poisoning and adequate treatment is listed below.

3. First-aid Measures* and Suggested Medical Treatment

(Data compiled by Factory Medical Department, J. R. Geigy S.A., Basle)

Chlorinated hydrocarbons

Symptoms	Headache, nausea, vomiting, anxiety, prickling sensation on the tip of the tongue, upper lip and the chin region, stiffness and pain in the jaw, in very severe cases convulsions with exitus.
First aid	Free the clothing, lay the patient on his side and keep him warm and quiet. Remove contaminated articles of clothing and thoroughly wash the body areas underneath with soap and water. When poisoning has been by mouth the stomach should be emptied with gastric lavage. Saline purgatives should also be given, e.g. Carlsbad salt, *but no oily purgatives or milk.*
Suggested medical treatment	If convulsions or tremors occur, barbiturates and possibly calcium should be given, the former preferably as 1 ccm 20% phenobarbitone sodium i.v., or ½-1 2-ccm-ampoule of 10% Dial. Calcium should be given in 10% solution at the rate of 1-2 10-ccm-ampoules per day i.v., or as calcium bromide, which has a sedative and anticonvulsive action, 1-2 10-ccm-ampoules per day i.v. or i.m. *Morphine is contraindicated.*

* Applicable in the main also to domestic animals.

Phosphorous esters and carbamates, esterase-inhibitors

Symptoms

Narrowing of the pupils, slowing of the pulse, increased glandular secretion (sweating), nausea, severe fatigue, vomiting, diarrhoea, bronchospasms, urgency of micturition, sudden cardiac failure (collapse), exitus.

First aid

Free the clothing, lay the patient on his side and keep him warm and quiet. Remove contaminated articles of clothing and thoroughly wash the body areas involved. When poisoning has been by mouth the stomach should be emptied. Gastric lavage should be carried out with saline purgatives, e.g. sodium sulphate.

Suggested medical treatment

Atropine in high dosage should be injected immediately and in severe cases a dose of 1-2 mg should be given parenterally several times daily. If Atropine is not sufficient, further treatment should be given with Toxogonin "Merck".
Dosage: 0.1-0.25 g i.v. every 1.5-2 hours (i.v. injections/2 g per 24 hours).

Calcium and lead arsenates

Symptoms

Acute: Severe headache, nausea, possibly diarrhoea, exitus following severe collapse in a few hours.
Subacute: Gastrointestinal form: severe abdominal pains, vomiting (often uncontrollable), rice-water stools reminiscent of cholera, anuria, cramps in the calves; in slow poisoning, inflammation of the mucosa of the eyes, nose, pharynx, with painful swallowing, tenesmus, lowered temperature, cramps, loss of consciousness and lowered blood pressure.

First aid

Free the clothing, lay the patient on his side and keep him warm and quiet. Give emetics.

Suggested medical treatment

Without loss of time, BAL treatment using 10% solution in oil with 20% benzyl benzoate; dosage (as pure BAL): 3 mg/kg i.m. every 4 hours during the first 2 days, 4 similar injections on the third day and subsequently 2 injections per day for 10 days.

or Gastric lavage with large quantities of warm water, followed by magnesia (suspension 20 : 500) together with charcoal in tablespoon doses. Subsequently raw white of egg, milk, vegetable oils.

Fluorides (sodium fluoride)

Symptoms	Pruritus, nausea, slimy and later bloody vomit, strong salivation, severe abdominal pains, bloody diarrhoea with unquenchable thirst. Pupillary paralysis, ptosis, cramps.
First aid	Lay the patient on his side and keep him quiet and warm. Give emetics.
Suggested medical treatment	Morphine for relief of pain, calcium in high dosage i.v., shock therapy, stimulants. Calcium therapy should be continued until cure is complete. Gastric lavage with magnesium oxide, lime-water, calcium gluconate, medicinal charcoal suspensions.

Nicotine

Symptoms	Nausea, vomiting, anxiety, shivering, cardiac failure, collapse, constipation or diarrhoea, salivation, tremor of the hands, sweating.
First aid	Lay the patient on his side and keep him quiet and warm. Give coffee. Fomentations on the abdomen.
Suggested medical treatment	Caffeine subcutaneously, opiates for relief of abdominal pains, oxygen. Gastric lavage with 2% tannin solution or 1% potassium permanganate or medicinal charcoal. If necessary 0.5 mg DHE i.v. Barbiturates for control of spasms.

Dinitro-orthocresols (DNOC)

Symptoms when ingested	Loss of appetite, coated tongue, nausea, vomiting, occasionally colic and diarrhoea, tenderness over the liver and possibly jaundice. Acute poisoning can be followed rapidly by very severe symptoms: severe fatigue, burning thirst, outbreaks of sweating, painful cramps, oppression in the chest. The patient's face is greyish or cyanotic, his respiration dyspnoeic, particularly on inspiration. Most prominent are excitation and anxiety. Vertigo is sometimes experienced with buzzing in the ears, scintillation before the eyes, grey cataract formation is possible, and the pulse is arrhythmic and tachycardiac. The temperature is noticeably increased, the urine scarce and dark in colour.

Suggested medical treatment Mild cases need no treatment.
Severe cases: gastric lavage with 5% sodium bicarbonate and medicinal charcoal, saline purgatives, diuretics; if there is pulmonary oedema, dextrose injections are better than bleeding and hypertonic solutions, e.g., 20% glucose, oxygen inhalation, if necessary ice packs for fever; in the case of liver injury, protective diet (high in carbohydrates and protein and low in fats).

Metaldehyde

Symptoms when ingested 30 minutes up to a few hours after ingestion, salivation, nausea, vomiting, abdominal pains, flushed face, fever, drowsiness, rigidity of the muscles, convulsive movements, tonic cramps, tetanus, opisthotonos, continuous nystagmus, loss of consciousness and exitus in 5-24 hours. If the patient survives, there is often liver and kidney damage, disorientation, loss of memory, with recovery lasting several weeks.

Suggested medical treatment Diuretics, with analeptics and sedatives as dictated by the patient's condition. Gastric lavage with medicinal charcoal and sodium bicarbonate, enemas and emetics, purging with sodium sulphate.

4. Mixing Tables

The making-up and exact dosage of sprays for various insecticides, wettable powders or emulsion concentrates are shown in the following tables.

I. Mixing Table for dosage of sprays from concentrates of various percentage of active ingredient

Percentage of active ingredient in concentrate (WP or ES)	Dosage (diluted spray)	Percentage of formulated product (concentrate)	Percentage of active ingredient
Decimal system			
20%	5 kg/1000 l water	0.5	0.1
25%	4 kg/1000 l water	0.4	0.1
40%	2.5 kg/1000 l water	0.25	0.1
50%	2 kg/1000 l water	0.2	0.1
75%	1.33 kg/1000 l water	0.13	0.1

(Continued)

I. Mixing Table (Continued)

Percentage of active ingredient in concentrate (WP or ES)	Dosage (diluted spray)	Percentage of formulated product (concentrate)	Percentage of active ingredient
English measures			
20%	10 lbs/200 gals water	0.5	0.1
25%	8 lbs/200 gals water	0.4	0.1
40%	5 lbs/200 gals water	0.25	0.1
50%	4 lbs/200 gals water	0.2	0.1
75%	2.66 lbs/200 gals water	0.13	0.1

II. Mixing Table for making up to 100 litres of diluted spray

Percentage of active ingredient required in diluted spray	Percentage of active ingredient in concentrate					
	75	**50**	**40**	**25**	**20**	
0.1%	133.3	200	250	400	500	grammes of con-
0.075%	100.0	150	187.5	300	375	centrate required
0.05%	66.5	100	125	200	250	per 100 litres of
0.01%	13.3	20	25	40	50	water

Example: If it is desired to make up 100 litres of 0.01% Diazinon-Spray and the Diazinon-concentrate (WP or ES) contains 40% of active ingredient, 25 grammes or 25 cc of concentrate will be required.

*III. Mixing Table for making up to 100 gallons of diluted spray**

Percentage of active ingredient required in diluted spray	Percentage of active ingredient in concentrate					
	75	**50**	**40**	**25**	**20**	
0.1%	$21^1/_3$	32	40	64	80	ounces (fluid or
0.075%	16	24	30	48	60	weight) of con-
0.05%	$10^1/_3$	16	20	32	40	centrate required
0.01%	$2^1/_6$	$3^1/_5$	4	$6^2/_5$	8	per 100 gallons of water

Example: If it is desired to make up 100 gallons of 0.05% DDT-Spray and the DDT-Emulsion concentrate contains 50% of active ingredient, 16 fluid ounces of concentrate will be required.

* From Orchard Spraying Guide of the N.S.W. Dept. of Agriculture.

Some application data (approximative equivalents)

1 kilogramme (kg) per 1000 litres water = 2 pounds (lbs) per 200 gallons (Brit) water.
10 kg per hectare (ha = 10,000 sq.metres) = 9 lbs per acre (4,047 sq.metres).
1000 litres (l) per hectare = 89 gallons per acre.
100 grammes per sq.metre (m^2) = 2.8 ounces (Brit) per sq.yard.
100 cubic centimetres (cm^3, cc, ml) per sq.m. = 2.8 fluid ounces (Brit) per sq.yard.

5. Recommendations for Control Measures

The recommendations for the use of pesticides vary from country to country. It would go beyond the scope of this book to take all the official recommendations for the control of agricultural pests into consideration.

The following recommendations for combating pests are based on information from experimental stations in various countries, on manufacturers' instructions as well as on several years of personal field practice and should serve as a guide to planters.

When recommended substances are unobtainable, they can often be substituted by other products belonging to the same chemical group or having similar effects (see table of active ingredients, page 10). It is obvious that special recommendations concerning local and economic conditions must also be considered.

Control of several pests occurring simultaneously can be undertaken either with the most suitable formulation (dust, granulate, wettable powder, emulsions, solutions) of a pesticide with a wide range of action, or with two or more products of specific effect, united in a so-called "combined spray". Combined sprays are made as tank mixtures by adding the chemical substance to the water immediately before application. Care must be taken to prevent separation or sedimentation, which reduce the sprays' effectiveness. This is particularly necessary when fungicidal and insecticidal sprays are combined. In order to avoid phytotoxic damage on delicate plant parts by combined sprays, a compatibility test must be carried out before the spray is applied generally.

Applications of pesticides in the *concentrations recommended* and at the *time indicated* (see manufacturers' instructions) observe the *tolerance period* (time between the last application and harvest) and the permitted amount of pesticide residue, especially on fruits and food crops. The prescribed "safety restrictions" must also be carefully observed for the consumer's protection (see p. 37).

Phytotoxic injuries are avoided if pre-planting treatment of the soil with nematocides is followed by a safety period of several days or weeks, during which the preparation disintegrates. The safety

period varies greatly from one region to another and depends on the type, structure, temperature, humidity and permeability of the soil, as well as on seasonal and other factors.

The following table gives some approximate minimum time-intervals between last spraying and harvesting of the crops

Product (cf. also table of active ingredients)	Recommended period from last application to harvesting (in days)	Product (cf. also table of active ingredients)	Recommended period from last application to harvesting (in days)
Aldrin	40	Isolan	21
Aramite	5	Karathane	10
Azinphos ethyl	21	Kelthane	10
Azinphos methyl	21	Lead arsenate	30
* BHC	30–60	Lime sulphur	3
Binapacryl	14	* Lindane	30
Calcium arsenate	21	Malathion	7
Carbaryl	5–10	Menazon	21
Carbophenothion	21	Methoxychlor	14
Chlorbenside	7	Mevinphos	2
Chlordane	30	Neotran	8
Chlorfenson	30	Nicotine sulfate	7
Chlorobenzilate	5–10	Oil sprays	1
Chloropropylate	5–10	Parathion	21
Chlorthion	10	Parathion methyl	21
Cryolite	21	Phenkapton	10
DDD	21	Phosdrin	7
* DDT	30	Phosphamidon	21
Demeton	30	Phostex	8
Demeton methyl	21	Pyrethrum	1–2
Derris (Rotenone)	3	Rotenone (Derris)	3
Diazinon	7–10	Schradan	21–28
Dibrom	5–7	Sulphenone	7
Dichlorvos (DDVP)	14	Sulphur	3
* Dieldrin	40	Tetradifon	3
Dimethoate	10–14	Thiodan	30
Disulfoton (Solvirex)	42	Thiometon	21
* Endrin	40	Thioquinox	21
Ethion	21	* Toxaphene	30–40
Fenson	14	Trichlorphon	14
Fenthion	14	Vamidothion	40
Formothion	7–21		

* (= When applied on feed crops for dairy animals, somewhat longer intervals should be allowed)

The data given in this table are based on the recommendations of the agricultural authorities of a large number of countries. These recommendations do not apply necessarily to tropical and subtropical zones and are intended only to give guidance for the products listed. There is no doubt that decomposition and metabolism of pesticide residues generally proceed faster in warm climates than in temperate zones. The time intervals depend of course on the dosage of the pesticide and to a large extent on the weather, climatic conditions and time of year, all factors which affect the ripening process.

Explanation of the recommendations

In the tables below the *pests of crops* follow the same order as in chapter III. The numbers printed in *bold* in the second column *(product)* refer to those of the table of active ingredients.

Example:

7 = Aldrin, 12 = DDT, 22 = Toxaphene,
24.4 = Coumaphos, 33.5 = Fensulfothion, 35 = Malathion,
49.9 = Carbaryl, 78.1 = Tetradifon, etc.

Formulation and dosage of the products are given, separated by a colon, in the third column. *Formulation* and *percentage of active ingredient (AS)* are printed in *bold*. The following abbreviations are used:

D = Dust
G = Granulate
WP = Wettable powder
ES = Emulsifiable solution
S = Solution
L = Liquid (to be used tel quel).

Dosage refers to weight or volume per given quantity of water or per area or tree to be treated.

The abbreviations mean:

g = grammes
kg = kilogramme
cc = cubic centimetre
l = litre
sq.m = square metre
ha = hectare (10,000 sq.m).

Commercial products (concentrates) with a different percentage of active ingredient from the one recommended in the tables have to be adjusted to the corresponding percentages or concentrations respectively (cf. Mixing tables p. 34).

In most cases **ES** can replace the recommended **WP**. Choice of the adequate formulation depends largely on the mode of application (spraying machinery, high-, medium- or low-volume method).

When not otherwise stated, dosage refers to the high-volume method. For the medium- or low-volume method (see chapter IV, p. 484) only the amount of water must be diminished. In this case the amount of active ingredient per hectare will be the same.

In the fourth column instructions are given as to the *time of treatment*. Preventive measures which must be undertaken as soon as injurious stages of pests (e.g. fruit flies, stem borers) appear, need

careful supervision and exact field observations (see also chapter II, p. 42). Whenever possible, enquiries as to the application of pesticides should be made from local experimental stations.

Examples:

Pest	Product	Formulation and Dosage	Where and when to apply
10 Anthores leuconotus	**13** ↓ Dieldrin	**ES 20%:** 2.5 l/100 l water ↓ ES 20% = commercial product containing 20% active ingredient: 2.5 l of the commercial product dispersed in 100 l of water	. . . . .
54 Adoretus hirtellus	**10** ↓ Chlordane	**G 10%:** 100 kg/ha ↓ G 10% = commercial granulate containing 10% active ingredient: 100 kg of the commercial product distributed on the soil surface of one hectare	. . . . .
54 Adoretus hirtellus	**10** ↓ Chlordane	**WP 50%:** 20 kg/1000 l water/ha ↓ WP 50% = commercial product containing 50% active ingredient: 20 kg of the commercial product dispersed in 1000 l of water and distributed on the soil surface of one hectare	. . . . .

BEVERAGES

Coffee

Cocoa

Tea

Kola-nut

Coffee *(Coffea spp.)*

Pest	Product	Formulation and Dosage	Where and when to apply
1 *Meloidogyne* sp.	**143, 146, 152**	**L:** Injection at the rate of 70-90 cc/sq.m	Seedbed-treatment before planting
2 *Radopholus similis*	**143**	**L:** 675 l/ha	Injection at a depth of 20-30 cm before planting or replanting
3 *Pratylenchus coffeae*	**143**	**L:** 300-350 l/ha	do.
4 *Xiphinema insigne*	**146** see Meloidogyne (No. 1)		do.
5 *Colasposoma coffeae*	**7**	**G** or **D 5%:** 10 g/sq.m	To soil surface, work into top 10-15 cm
6 *Pachnaeus azurescens*	**7**	**G 5%:** 50 g/tree	To soil surface, work into top
	16	**ES 20%:** 20 cc/10 l water/tree	
7 *Gryllotalpa africana*	**7, 16**	**Bait = D 10%:** 800 g + bran 40 kg (mixture) 40 kg/ha	Broadcast on the soil surface
8 *Gonocephalum simplex*	**12, 13**	**D 5%:** 500 g/100 sq.m	On soil surface when pests appear
9 *Scotia (Euxoa, Agrotis) segetum*	**9**	**D 5%:** 1-2 g/tree	Around the stem-base when pests appear
		Bait = D 10%: 800 g+ bran 40 kg (mixture) 40 kg/ha	Broadcast on the area
	13	**ES 20%:** 400 cc/20 l water	Treat the lower, 10 cm of seedlings Repeat 4-6 monthly intervals until trees no longer susceptible to damage
10 *Anthores leuconotus*	**13**	**ES 20%:** 6.25 l/250 l water **WP 50%:** 2.5 kg/250 l water (+ 250 g Methylene blue) (The marker, methylene blue, is included in the spray mixture to warn operators of the presence of Dieldrin on skin and clothing and to improve spraying efficiency.)	Treat the lower part (40 cm) of each stem with ca. 200 cc of the emulsion before the onset of the rains (Sept. to November) 2nd treatment: One year later. Repeat every second year

11 *Bixadus sierricola*	see Anthores (No. 10)		
12 *Chreostes obesus*	**13**	**ES 20%:** 2.5 l/100 l water	On trunk, when beetles are on the wing and lay their eggs; two applications a year
	9	**ES 20%:** 100 cc/2 l water	Apply several cc/g into bore hole and close it with loam
	66	pure form	
13 *Dirphya usambica*	see Chreostes (No. 12)		
14 *Apate monachus*	see Chreostes (No. 12)		
15 *Xylotrechus quadripes*	**13**	**ES 20%:** 1 l/100 l water	Apply to stems and branches twice a year when beetles are on the wing
	see also Chreostes (No. 12)		
16 *Xyleborus coffeae*	**12**	**ES** or **WP 20%:** 1 kg/100 l water	Periodical treatments of the trunks, branches and twigs, 3 times a year
	13	**ES** or **WP 20%:** 500 g/100 l water	
	15	**ES** or **WP 20%:** 300 g/100 l water	
	21	**ES** or **WP 20%:** 500-1000 g/100 l water	
17 *Zeuzera coffeae*	**12**	**WP 50%:** 1 kg/100 l water	Apply to stems and branches, twice a year
	13, 15	**ES 20%:** 1 l/100 l water	
	42	**ES 50%:** 600-1000 cc/1000 l water/ha	
18 *Lawana candida*	**27, 29, 33, 39**	**ES 20%:** 100-150 cc/100 l water	When nymphs appear; repeat after a week if necessary
19 *Planococcus kenyae*	**24, 27, 33, 39, 43, 46, 49**	**ES 20%:** 2 l/1000 l water	As soon as insects appear on plants; repeat twice at 2-3 weekly intervals Control ants first, with 5 l Dieldrin ES 20% per 100 l of water. Apply the emulsion on the lower part of the trunk
	35	**ES 50%:** 2.5 l/1000 l water	
20 *Coccus viridis*	**27, 34, 39**	**WP** or **ES 25%:** 4 l/1000 l water	Apply as a full cover spray. Destroy attendant ants first (see also No. 19)
	35	**WP** or **ES 50%:** 2.5-3 l/1000 l water	
21 *Saissetia coffeae*	see Saissetia (No. 455)		
22 *Asterolecanium coffeae*	see Saissetia (No. 455)		

Pest	Product	Formulation and Dosage	Where and when to apply
23 *Diaspis boisduvalii*	see Vinsonia (No. 596)		
24 *Sympiezomias frater*	**12**	**WP 50%:** 2 kg/1000 l water/ha	When the weevils cause damage
	58	**WP 40%:** 2-3 kg/1000 l water/ha	
	see also Chreostes (No. 12)		
25 *Leucoptera meyricki (coffeella)*	**27**	**ES 60%:** 1 l/1000 l water/ha	On foliage when the moths appear in large numbers or when first signs of leaf miner damage is observed Repeat 2 to 3 weeks later as new generation of eggs hatch
	27.1	**ES 40%:** 1.25 l/1000 l water/ha	
	28	**ES 50%:** 1 l/1000 l water/ha	
	33.4	**ES 50%:** 1.75 l/1000 l water/ha	
	33.6	**ES 55%:** 1.75 l/1000 l water/ha	
	39	**ES 55%:** 0.75 l/1000 l water/ha	
	42	**ES 50%:** 1.5-2 l/1000 l water/ha	
26 *Leucoptera coffeina*	see Leucoptera (No. 25)		
27 *Homona coffearia*	**39**	**WP 20%:** 1 kg/1000 l water/ha	At first appearance of young caterpillars
	see also Homona (No. 123)		
28 *Leucoplema dohertyi*	**15**	**ES 20%:** 1 l/1000 l water	When pests appear
	39	**ES 20%:** 1-1.5 l/1000 l water	
	58	**WP 40%:** 2 kg/1000 l water	
29 *Parasa vivida*	see Leucoplema (No. 28)		
30 *Niphadolepis* sp.	see Leucoplema (No. 28)		
31 *Dichocrocis crocodora*	**27, 34, 39, 49**	**ES** or **WP 20%:** 1-1.5 kg/1000 l water	When pests appear
32 *Cephonodes hylas*	**11, 12**	**WP 50%:** 2-3 kg/1000 l water/ha	When the young caterpillars appear
	13, 15, 27, 34, 39	**ES 20%:** 2 l/1000 l water/ha	
33 *Epicampoptera marantica*	**12**	**WP 50%:** 2 kg/1000 l water	When pests appear
	27	**WP 25%:** 1 kg/1000 l water	
	see also Thliptoceras (No. 49)		

34 *Orgyia postica*	see Cephonodes (No. 32)		
35 *Zonocerus elegans*	**12**	**WP 50%:** 3 kg/1000 l water	On foliage when pests appear
	13	**WP 50%:** 1 kg/1000 l water	
36 *Oecophylla smaragdina*	**12, 13, 35**	**D 2-5%**	On foliage, when new nest colonies are found
	12	**WP 50%:** 200 g/100 l water	
	13, 27, 39	**WP 20%:** 150 g/100 l water	
37 *Diarthrothrips coffeae*	**12**	**WP 50%:** 2 kg/1000 l water/ha	On foliage when first signs of damage are visible
	28	**ES 50%:** 1 l/1000 l water/ha	
	33.4, 33.10, 48	**ES 25%:** 2 l/1000 l water/ha	
	35	**ES 50%:** 1.5 l/1000 l water/ha	
	39	**ES** or **WP 25%:** 1.5 l/1000 l water/ha	
38 *Habrochila placida*	**35**	**ES 20%:** 4 l/1000 l water/ha	do.
	39, 33.4	**WP 20%:** 2 kg/1000 l water/ha	
39 *Lycidocoris mimeticus*	see Habrochila (No. 38)		do.
40 *Ormenis* sp.	**27, 39**	**WP** or **ES 20%:** 1-1.5 kg/1000 l water	On foliage when first signs of damage are visible
41 *Toxoptera aurantii*	**1**	**S 40%:** 2 l/1000 l water/ha	When aphids appear; repeat after 2 weeks if necessary
	52	**S 6%:** 1 l/1000 l water/ha	
	39, 47	**WP 20%:** 1 kg/1000 l water/ha	
42 *Ischnaspis longirostris*	**27, 33, 39, 43**	**ES 20%:** 1.5-2 l/1000 l water/ha	When pests appear. Two repeats at fortnightly intervals
	60	**ES:** 5-10 l/1000 l water/ha	
43 *Oligonychus coffeae*	**27, 28, 29, 30, 32, 33, 33.4, 33.10, 38, 39, 42, 43, 46, 47, 48, 68-81**	**ES** or **WP 20%:** 2 kg/1000 l water/ha	When first damage is visible; repeat after 10 days
	82	**WP 80%:** 1 kg/1000 l water/ha	
44 *Lygus coffeae*	**23.1**	**ES 40%:** 250 cc/1000 l water/ha	When the flower buds are developing and the population of capsid Bugs exceeds an average of 4 per tree
	39	**ES 50%:** 375 cc/1000 l water/ha	
	42	**ES 50%:** 400 cc/1000 l water/ha	
45 *Volumnus obscurus*	see Creontiades (No. 797)		When pests appear

Pest	Product	Formulation and Dosage	Where and when to apply
46 *Antestia lineaticollis*	**23.1** **39**	**ES 40%:** 250-500 cc/1000 l water/ha **ES 50%:** 375-500 cc/1000 l water/ha	Routine spraying on foliage and berries: November to January (after harvest and just before or after flowering), or when number of Antestia exceeds the average of 1 per tree. A second spray is recommended in heavy infestations 2 weeks later
47 *Lachnopus coffeae*	see Stephanoderes (No. 48)		
48 *Stephanoderes hampei*	**13** **15** **21** **27.1**	**ES 20%:** 3.5-4 l/1000 l water/ha **ES 20%:** 2.5-3 l/1000 l water/ha **ES 20%:** 10 l/1000 l water/ha **ES 50%:** 1-2 l/1000 l water/ha	On berries. First treatment should be made as soon as the main crop is off the tree or when about 5% of the berries are attacked. 2 to 3 applications at 14-day intervals
49 *Thliptoceras octoguttale (Prophantis smaragdina)*	**25** **27** **35** **39**	**ES 50%:** 1.5 l/1000 l water/ha **ES 60%:** 1.5 l/1000 l water/ha **ES 50%:** 2.5 l/1000 l water/ha **WP 20%:** 2 kg/1000 l water/ha	After first main flowering when petals have fallen. Repeat after 4 and 8 weeks
50 *Virachola bimaculata*	see Thliptoceras (No. 49)		First application in August-September, when the moth is on the wing
51 *Trirhithrum inscripta*	**12, 18**	**WP 50%:** 2 kg/1000 l water/ha	On foliage and berries before the latter are attacked
	27, 34, 39 **28**	**ES 25%:** 1 l/1000 l water/ha **ES 40%:** 1 l/1000 l water/ha	Spray berries if attacked on ripening

52 *Meloidogyne* sp.		see Meloidogyne (No. 1)		
53 *Pratylenchus coffeae*		see Pratylenchus (No. 3)		
54 *Adoretus hirtellus*	**10**		**G 10%:** 100 kg/ha **WP 50%:** 20 kg/1000 l water/ha	To soil surface and work into top 7.5-10 cm
55 *Camenta westermanni*	**7, 9**		**ES 20%:** 100-200 cc/100 l water	0.5-1 l per sapling, when first damage appears
56 *Chrysochroa bicolor*	**13**		**ES 20%:** 2 l/100 l water	Treat the lower part (30-50 cm) of each stem
57 *Mallodon downesi*	**9**	see also Anthores (No. 10) and Chrysochroa (No. 56)	**WP 20%:** 100 g/2 l water	Attacked plant: apply several cc in bore hole and close it with loam
58 *Steirastoma breve*	**13, 15**		**ES** or **WP 25%:** 1.5-2 kg/100 l water	Treat the trunk and branches; 2-3 applications a year
59 *Glenea novemguttata*		see Anthores (No. 10) and Steirastoma (No. 58)		Treat in April (during the flight period of adults)
60 *Monochamus ruspator*		see Chrysochroa (No. 56)		Treat the trunk twice a year
61 *Apate monachus*		see Chreostes (No. 12)		
62 *Sphenophorus striatus*		see Anthores (No. 10)		
63 *Gryllulus gracilipes*	**7, 9** **9, 13, 15, 53**		**D 5%:** 5 g/sq.m **ES 50%:** 200 cc/100 l water	Broadcast at the base of the saplings Treat the lower part of saplings

Pest	Product	Formulation and Dosage	Where and when to apply
64 *Brachytrypus membranaceus*	see Gryllulus (No. 63) and Brachytrypus (No. 150)		
65 *Tragocephala nobilis*	see Steirastoma (No. 58)		
66 *Pantorhytes plutus*	**13**	**ES 20%:** 100 cc/10 l water	Treat the twigs and the young shoots, as soon as the first signs of damage are visible; 2-3 applications a year
67 *Xyleborus morstatti*	see Xyleborus (No. 16)		Periodical treatments of the trunks, branches and twigs
68 *Eulophonotus myrmeleon*	see Zeuzera (No. 17)		
69 *Zeuzera coffeae*	see Zeuzera (No. 17)		
70 *Alcides Leeuweni*	**13, 15**	**ES 20%:** 250-400 cc/100 l water	As a preventive measure apply the insecticide to the twigs, when first signs of damage appear. Repeat after 2 or 3 weeks
71 *Parabryocoropsis typicus*	**9** **34**	**WP 50%:** 2 kg/1000 l water **ES 20%:** 1-2 l/1000 l water	As the saplings and shoots are damaged
72 *Ferrisia virgata*	**27, 39, 47** **35**	**ES 25%:** 2 l/1000 l water **ES 50%:** 2.5 l/1000 l water	On foliage and shoots, when pests are detected on trees. Repeat after 2 weeks if necessary
73 *Pseudococcus njalensis*	see Ferrisia (No. 72). Ant-control may be a necessary measure (see indirect injurious ants; p. 138)		

74 *Pseudococcus bukobensis*	see Ferrisia (No. 72)		
75 *Coccus viridis*	see Saissetia (No. 455)		
76 *Howardia biclavis*	**27, 33, 39, 43**	**ES 25%:** 1.5-2 l/1000 l water	When pests appear. 2 repeats at fortnightly intervals
77 *Pseudaonidia trilobitiformis*	see Howardia (No. 76)		
78 *Syllepta prorogata*	see Dichocrocis (No. 31)		
79 *Parasa lepida*	**12**	**WP 50%:** 400 g/100 l water (see also No. 28)	As soon as young caterpillars appear on the leaves
80 *Earias biplaga*	**13, 15, 53** see also Earias (No. 827)	**WP 50%:** 1-1.5 kg/1000 l water	As soon as young caterpillars appear
81 *Zonocerus variegatus*	see Zonocerus (No. 35)		
82 *Azteca chartifex*	**9** **12** **13**	**WP 20%:** 300-500 g/100 l water **WP 50%:** 300-500 g/100 l water **WP 50%:** 200-300 g/100 l water	Apply the insecticide on the whole tree and into the nest
83 *Atta sexdens*	see Chapter III, p. 469 and Chapter V, p. 136		
84 *Oecophylla longinoda*	see Oecophylla (No. 36)		
85 *Selenothrips rubrocinctus*	**13** **27, 34, 39, 33.10** **35**	**WP 20%:** 1 kg/1000 l water **ES 20%:** 1 l/1000 l water **ES 20%:** 2 l/1000 l water	With the first signs of infestation. Repeat after a week if necessary
86 *Mesohomotoma tessmanni*	**27, 29, 39**	**ES 20%:** 1.25-1.5 l/1000 l water	On foliage, when insects appear

Pest	Product	Formulation and Dosage	Where and when to apply
87 *Toxoptera rotundiventris*	**28, 29, 33, 34, 36, 37, 38, 39, 42, 47, 49**	**ES 20%:** 500-1000 cc/1000 l water	When pests appear
	52	**S 6%:** 1 l/1000 l water	
88 *Hilipus claripes*	**12, 17**	**D 5%** **WP 50%:** 250-500 g/100 l water	Treat the pods when weevils appear or when first signs of damage are visible
89 *Acrocercops cramerella*	**12**	**WP 50%:** 3-4 kg/1000 l water	When the moths are on the wing or as soon as the first signs of damage appear. Repeat after 2-3 weeks
	13, 15, 53	**WP 50%:** 1-2 kg/1000 l water	
90 *Characoma stictigrapta*	see Acrocercops (No. 89)		
91 *Mussidia nigrivenella*	see Acrocercops (No. 89)		
92 *Ceratitis punctata*	**12, 18**	**WP 50%:** 2-3 kg/1000 l water	As a preventive measure: on foliage and pods when flies appear
	see also Ceratitis (No. 523)		
93 *Distantiella theobroma*	**7**	**ES 25%:** 750 cc/ha	On pods and foliage. Low-or high-volume sprays: Double applications at 4 weekly intervals: June and July/November and December
	17	**ES 25%:** 500 cc/ha (High volume	
	22	**ES 25%:** 1000-1250 cc/ha 500 l/ha)	
	53	**WP 50%:** 750 g/ha	
	42	**ES 50%:** 800 cc/ha	
	25	**ES 50%:** 1000-1500 cc/ha	
94 *Sahlbergella singularis*	see Distantiella (No. 93)		
95 *Bryocoropsis laticollis*	see Distantiella (No. 93)		
96 *Helopeltis antonii*	see Distantiella (No. 93)		

97	*Monalonion atratum*	see Distantiella (No. 93)		
98	*Stictococcus sjöstedti*	**27, 33, 39, 43** **35**	**ES 25%:** 1.5-3 l/1000 l water **ES 25%:** 4 l/1000 l water	When scales are seen on pods. Repeat after 2 and 4 weeks. Soaking spray needed
99	*Stictococcus aliberti*	see Stictococcus (No. 98)		
100	*Planococcus citri*	**27, 39, 46** **35** **25**	**ES 25%:** 1-2 l/1000 l water **ES 25%:** 3 l/1000 l water **ES 50%:** 1.5 l/1000 l water	When pests appear; repeat after 2 weeks if necessary

Tea *(Camellia sp.)*

Pest	Product	Formulation and Dosage	Where and when to apply
101 *Meloidogyne* sp.	**143**	**L:** 300-350 l/ha	Fumigation in nurseries (pre-plant treatment) : Application by means of injector gun or drip into trenches 12-15 cm deep
	152	**L, ES:** 50-100 l/ha	By injector or as an emulsion to established plants or as a pre-plant treatment
102 *Radopholus similis*	**27**	**ES 25%:** 1.2 l/1000 l water	To established plants
	152	**ES:** 100 l/ha	Injection at a depth of 20-25 cm before planting or replanting
	see also Meloidogyne (No. 101)		
103 *Pratylenchus coffeae*	see Radopholus (No. 102)		
104 *Exopholis hypoleuca*	**7**	**D 2.5%:** 100 kg/ha	Work into the soil to a depth of 15-18 cm
		ES or **WP 25%:** 7.5kg/1000 l water/ha	Before the onset of the rains
105 *Neotermes militaris*	**13**	**ES 20%:** 250 cc/100 l water	Apply the spray into the galleries. 0.5-1 l for each bush
106 *Agrilus* sp.	**12**	**WP 50%:** 1.25 kg/100 l water	When dry season begins Strip bark, and brush with suspension After 10-18 days paint with bitumen or weak tar
	see also Xyleborus (No. 110)		
107 *Aeolesthes induta*	see Xyleborus (No. 110)		
108 *Scotia (Euxoa, Agrotis) segetum*	see Scotia (No. 9)		

109 *Pseudococcus* sp	**27, 39**	**ES 25%:** 1-2 l/1000 l water	At first appearance of pests. Repeat after 2 weeks if necessary
110 *Xyleborus fornicatus*	**13**	**ES 20%:** 8.75-9 l/1000-1200 l water/ha	Post-pruning application on shoots
111 *Casmara patrona*	**12**	**WP 50%:** 3 kg/1000 l water see also Xyleborus (No. 110)	When the moths are on the wing, i.e. at the first appearance of damage
112 *Phytoscaphus dissimilis*	**12**	**WP 50%:** 3-4 kg/1000 l water see also Xyleborus (No. 110)	At the first appearance of weevils
113 *Ferrisia virgata*	see Ferisia (No. 72)		At the first appearance of pests
114 *Pulvinaria psidii*	**27, 39**	**ES 25%:** 150-200 cc/100 l water	When pests appear: direct spray under surface of leaves and to shoots; repeat after 10 days
	60	**ES:** 1-2 l/100 l water	Apply to the affected stems or leaves. Repeat after 2-3 weeks
115 *Coccus viridis*	see Saissetia (No. 455)		
116 *Pseudaulacaspis pentagona*	see Pulvinaria (No. 114)		
117 *Anomala superflua*	**12**	**WP 50%:** 2.25-2.5 kg/750 l water/ha	When pests are detected on bushes
118 *Dicasticus mlanjensis*	see Anomala (No. 117)		
119 *Hypomeces squamosus*	see Anomala (No. 117)		
120 *Acanthopsyche Snelleni*	**13**	**ES 20%:** 500-1000 cc/500 l water see also Anomala (No. 117)	Spray on leaves
121 *Caloptilia theivora*	**12**	**D 5%**	On foliage: as a preventive measure
	27, 39	**ES 25%:** 1 l/1000 l water	As a curative measure

Pest	Product	Formulation and Dosage	Where and when to apply
122 *Sparganothis pilleriana*		see Homona (No. 123)	
123 *Homona coffearia*	**12**	**ES 20%:** 7.5 l/750 l water/ha see also Homona (No. 27)	Spray the foliage when pests appear. Cover the main foliage thoroughly
124 *Laspeyresia leucostoma*	**12**	**WP 50%:** 2 kg/750 l water/ha	At first appearance of young caterpillars
	27	**ES 20%:** 1.5 l/750 l water/ha see also Caloptilia (No. 121)	
125 *Setora nitens*	**12**	**WP 50%:** 2-4 kg/750 l water see also Heterusia (No. 129)	When pests are detected on tea bushes
126 *Natada nararia*		see Setora (No. 125)	
127 *Thosea cervina*		see Setora (No. 125)	
128 *Chalcocelides albiguttata*		see Setora (No. 125)	
129 *Heterusia cingala*	**12** **15**	**WP 50%:** 3-4 kg/750 l water/ha **D 1%:** 25 kg/ha **ES 20%:** 1.5-2 l/750 l water/ha	When pests are detected on tea bushes
130 *Andraca bipunctata*		see Heterusia (No. 129)	
131 *Attacus atlas*		see Heterusia (No. 129)	
132 *Prodenia litura*	**12**	**ES 20%:** 8-10 l/800 l water/ha	When pests are seen on bushes

133 *Boarmia bhurmitra*	**12**	**ES 20%:** 6 l/600-750 l water/ha **D 10%:** 25 kg/ha	do.
134 *Orgyia postica*	see Heterusia (No. 129)		
135 *Valanga nigricornis*	**12** **13**	**D 5%:** 25-30 kg/ha **D 2%:** 25-30 kg/ha	When pests are seen on bushes
136 *Taeniothrips setiventris*	**12** **27**	**D 5%:** 20-25 kg/ha **WP 50%:** 2.5 kg/750 l water/ha **D 2%:** 20-25 kg/ha	When first signs of damage are seen Applications at weekly intervals, 2 or 3 in all
137 *Helopeltis theivora*	**12** **13** **25** **42**	**D 5%:** 20-25 kg/ha **WP 50%:** 2.5 kg/750 l water/ha **ES 20%:** 2 l/1000 l water/ha **ES 50%:** 1000 cc/1000 l water/ha **ES 50%:** 500 cc/1000 l water/ha	When "dark particles" appear in shoots and leaves
138 *Lygus viridanus*	see Helopeltis (No. 137)		
139 *Callicratides rama*	see Helopeltis (No. 137)		
140 *Empoasca flavescens*	see Empoasca (No. 636)		When the young leaves become wrinkled
141 *Toxoptera aurantii*	**27, 39, 33.10** **35**	**ES 20%:** 1 l/750 l water/ha **ES 50%:** 1.5-2 l/750 l water/ha	Direct spray to under-surface of leaves. at first appearance of pests
142 *Coccus hesperidum*	**39**	**ES 20%:** 2 l/1000 l water/ha	When scales appear. Repeat after 10-14 days
143 *Eriophyes theae*	**68** **82** (lime sulphur)	**ES 25%:** 2.4 l/1200 l water/ha 22-26% polysulphide at 1:39 parts of water (on mature tea) and 1:44 parts of water (on young tea)	At first appearance of mite damage. Repeat after 8-10 days
144 *Calacarus carinatus*	**68**	**D 2%:** 25-30 kg/ha **ES 25%:** 2.4 l/1200 l water/ha	On first signs of damage. Repeat after 8-10 days

Pest	Product	Formulation and Dosage	Where and when to apply
145 *Tenuipalpus obovatus*	see Eriophyes (No. 143)		
146 *Oligonychus coffeae*	**68, 68.1, 71, 72, 73** see also Oligonychus (No. 43)	**ES** or **WP 20%:** 2 kg/1000 l water/ha	When first symptoms of damage appear. Repeat after 8-10 days
147 *Hemitarsonemus lata*	**27** **68, 68.1** **70**	**ES 25%:** 3 l/1000 l/ha **ES 25%:** 2 l/1000 l water/ha **ES 20%:** 2.5 l/1000 l water/ha	On foliage when signs of damage appear. Repeat after 10 days
148 *Poecilocoris latus*	**28**	**ES 40%:** 3 l/600 l water/ha	When bugs and symptoms of damage appear
149 *Adrama determinata*	Good coverage of the seeds **7, 9**	**D 5%:** 200 g/100 sq.m	Broadcast on soil surface before seeds germinate

150 *Brachytrypus membranaceus*		see Gryllotalpa (No. 7) and Gryllulus (No. 63)		Broadcast on soil between the young trees
151 *Apate monachus*		see Chreostes (No. 12)		
152 *Phosphorus gabonator*		see Chreostes (No. 12)		Treat the shoots and branches when beetles are on the wing (July)
153 *Saissetia nigra*		see Saissetia (No. 455)		
154 *Zyrcosa brunnea*	**13, 15**		**WP** or **ES 20%:** 2.5 kg/1000 l water	On foliage when pests appear
155 *Syllepta retractalis*	**12**		**WP 50%:** 2 kg/1000 l water	On foliage when first signs of damage are visible
156 *Anaphe venata*	**9, 12**		**WP 50%:** 2 kg/1000 l water	On foliage when young caterpillars appear
157 *Zonocerus variegatus*		see Zonocerus (No. 35)		
158 *Selenothrips rubrocinctus*		see Selenothrips (No. 85)		
159 *Toxoptera aurantii*		see Toxoptera (No. 141)		
160 *Pseudococcus njalensis*		see Ferrisia (No. 72)		
161 *Characoma stictigrapta*	**15**		**WP** or **ES 50%:** 1-2 kg/1000 l water	As soon as young caterpillars are found feeding on leaves and boring into pods. Repeat at 10-14 day intervals
162 *Ceratitis colae*		see Ceratitis (No. 92)		

Pest	Product	Formulation and Dosage	Where and when to apply
163 *Helopeltis bergrothi*	see Helopeltis (No. 96)		On foliage and pods
164 *Sahlbergella singularis*	see Distantiella (No. 93)		
165 *Stictococcus sjöstedti*	see Stictococcus (No. 98)		
166 *Balanogastris kolae*	Keep area clear of fallen ripe or unripe nuts		
	12	**WP 50%:** 3 kg/1000 l water	On foliage and pods. Repeat at 15 day intervals
	15, 34	**WP** or **ES 50%:** 1.5-2 kg/1000 l water	
	13	**WP 50%:** 1 kg/100 l water } 100 cc/sq.m	Treatment of the walls of storehouses
	17	**WP 20%:** 3 kg/100 l water }	
	64	**L:** 2.5 l/30 cubic meter	
167 *Paremydica insperata*	see Balanogastris (No. 166)		

FOOD CROPS

Maize

Sorghum

Rice

Sugar cane

Beans

Cassava

Sweet Potato

Maize *(Corn) (Zea Mays)*

Pest	Product	Formulation and Dosage	Where and when to apply
168 *Pratylenchus zeae*	Crop rotation		
169 *Melanotus communis*	**7**	**G 5%:** 60 kg/ha **D 5%:** 60kg/ha	Broadcast to soil surface before planting and work into top 10-15 cm
	16	**G 5%:** 40 kg/ha **D 5%:** 40 kg/ha	
170 *Hodotermes mossambicus*	**7**	**G 5%:** 100 kg/ha **D 5%:** 80 kg/ha **WP 25%:** 16 kg/ha	Broadcast on soil at least 2 weeks before planting. If possible, work the insecticide 10-20 cm deep into the soil
	16	**G 5%:** 100 kg/ha **D 5%:** 80 kg/ha **WP 25%:** 12 kg/ha	
171 *Astylus atromaculatus*	**12**	**D 5%:** 30 kg/ha **WP 50%:** 2 kg/500 l water/ha	On foliage when adults appear
	13	**WP 50%:** 1 kg/500 l water/ha	Against larvae
	see also Diabrotica (No. 172)		
172 *Diabrotica 12-punctata*	**7, 16**	**G 10%:** 20 kg/ha	Row- or broadcast-treatment to soil surface before planting and work into top 10-15 cm
	27	**G 10%:** 10 kg/ha	
	40	**G 10%:** 10 kg/ha	
173 *Heteronychus licas* (also species of Nematocerus)	**9**	**Bait = D 10%:** 1 kg + cracked maize 100 kg (mixture) 30-40 kg/ha	Broadcast over the area before the crop germinates
	12	**WP 50%:** 3 kg/500 l water/ha	Spray on seedlings when beetles appear
	13	**ES 20%:** 1 kg/500 l water/ha	

174 *Ditylenchus dipsaci*	**39**	**ES 50%:** 750 cc/1000 l/ha	On foliage and stalks of seedlings when first damage is visible
175 *Calandra callosa*	**7**	**G 5%:** 80 kg/ha	To soil surface when weevils appear
176 *Gryllulus domesticus*	**10**	**D 5%:** 30 kg/ha	Broadcast over the area when damage is visible
	16	**Bait = D 5%:** 500 g + bran 25 kg (mixture) 25 kg/ha	
177 *Mythimna (Cirphis) unipuncta*	**12**	**D 5%:** 30-40 kg/ha	Broadcast before planting and work into top 5-10 cm
	13	**ES 25%:** 2-2.5 l/500 l water/ha	When central leaves are eaten and young caterpillars are found
	22	**ES 25%:** 5 l/500 l water/ha	
	31	**Bait = WP 50%:** 100 g + bran 20 kg (mixture) 20 kg/ha	Broadcast on the area
178 *Diatraea crambidoides*	**12**	**D 5%:** 30kg/ha	When second or third generation borers are first observed, 3 times, 10-14 days apart
	15	**WP 25%:** 1.5 kg/500 l water/ha	
	22	**WP 25%:** 5 kg/500 l water or **D 5%:** 30 kg/ha	
	37 + 12	**WP 25%:** 1 kg + **WP 50%:** 5 kg/500 l water/ha (mixture)	
179 *Chilo suppressalis*		see Chilo (No. 215) and Diatraea (No. 178)	
180 *Chilotraea infuscatella*		see Scirpophaga (No. 275)	
181 *Elasmopalpus lignosellus*		see Elasmopalpus (No. 311) and Pyrausta (No. 183)	
182 *Dichocrocis punctiferalis*		see Diatraea (No. 178) and Dichocrocis (No. 640)	

Pest	Product	Formulation and Dosage	Where and when to apply
183 *Ostrinia (Pyrausta) nubilalis*	**32**	**WP 25%:** 1 kg/750 l water/ha	When first damage is visible (granules are placed by hand or machine in the leaf sheaths). Repeat after 10 days
	12	**D 5%:** 40 kg/ha	
		G 5%: 20 kg/ha	
		ES 50%: 4 l/750 l water/ha	
	15	**ES 25%:** 1.5 l/750 l water/ha	
	53	**WP 50%:** 3 kg/750 l water/ha	
	30.1	**ES 60%:** 1 l/750 l water/ha	
184 *Chilo zonellus*	**12**	**D 5%:** 30 kg/ha	On foliage and stalks when plants start showing dead hearts. Repeat after two weeks
	see also Ostrinia (No. 183) and Busseola (No. 185)		
185 *Busseola fusca*	**12**	**G 5%:** 30-40 kg/ha	On stalks and leaf sheaths the first when the first signs of damage appear. Repeat in 2 weeks. The insecticide must be applied into the open funnel of the young plant, before the larvae have penetrated into the succulent portion of the stalks
	31	**G 2.5%:** 7.5 kg/ha	
	15	**D 2%:** 20 kg/ha	
		ES or **WP 25%:** 1.5-2 kg/750 l water/ha	
	21	**WP 25%:** 1.5-2 kg/750 l water/ha	
	see also Pyrausta (No. 183)		
186 *Sesamia vuteria*	see Busseola (No. 185) and Emmalocera (No. 278)		
187 *Epilachna similis*	**12**	**D 5%:** 25-30 kg/ha	On foliage when beetles appear
	53	**WP 50%:** 1 kg/500 l water/ha	
188 *Cnaphalocrocis medinalis*	**12**	**D 5%:** 25-30 kg/ha	On foliage when pests appear
	see also Epilachna (No. 187)		
189 *Blissus leucopterus*	**22**	**ES 25%:** 10 kg/500 l water/ha	To base of plants, where bugs congregate

190 *Peregrinus maidis*	**9** **40** **27, 28, 30, 33, 34, 37, 39, 42, 47, 48** **35**	**D 5%:** 20-30 kg/ha **WP 25%:** 1 kg/500 l water/ha **ES 25%:** 1 l/500 l water/ha **ES 40%:** 1 l/500 l water/ha	On foliage when insects appear in great numbers
191 *Cicadulina mbila*	see Peregrinus (No. 190)		
192 *Baldulus maidis*	see Peregrinus (No. 190)		
193 *Rhopalosiphon maidis*	**9** **27** **28** **35.2** **39, 42, 48, 33.10** **52**	**D 10%:** 20 kg/ha **ES 60%:** 500 g/500 l water/ha **ES 40%:** 500-750 cc/500 l water/ha **WP 70%:** 400 g/500 l water/ha **ES 20%:** 750-1000 cc/500 l water/ha **S 6%:** 500 cc/500 l water/ha	When aphid colonies are found on folded leaves in centre of plant. Repeat after 2 weeks
194 *Prodenia (Spodoptera) litura*	**12** **13** **22** **39** **53**	**WP 50%:** 2.5 kg/750 l water/ha **D 10%:** 15-20 kg/ha **G 5%:** 15 kg/ha **ES 20%:** 1.5 kg/750 l water/ha **D 5%:** 40 kg/ha **ES 25%:** 1 kg/750 l water/ha **WP 50%:** 2.5 kg/750 l water/ha	Direct spraying or dusting into whorls from above (against larvae in whorls) or direct on ear zone (against young larvae). Repeat fortnightly as long as necessary
195 *Laphygma exigua*	see Heliothis (No. 197)		
196 *Poecilophila maculatissima*	see Heliothis (No. 197)		
197 *Heliothis obsoleta*	**12, 22** **53**	**ES 25%:** 8-10 l/500 l water **D 5%:** 30 kg/ha	Directed at ear zone when young larvae appear. Repeat after 1-2 weeks

Sorghum, Kaffir-corn, Juar, Guinea corn *(Sorghum guineense and S. bicolor)* See also Pests of Maize

Pest	Product	Formulation and Dosage	Where and when to apply
198 *Chrotogonus trachypterus*	**9**	**D 10%:** 20-25 kg/ha	When hoppers appear in large numbers
199 *Proceras argyrolepidus*	see also Gryllulus (No. 176)		
200 *Saccharicoccus sacchari*	see Pyrausta (No. 183) and Chilo (No. 184)		When plants show dead hearts
201 *Chilo zonellus or other species*	**33, 34, 39, 49**	**ES 25%:** 1-1.5 l/750 l water	When colonies appear on stalks
202 *Diatraea crambidoides*	see Pyrausta (No. 183) and Chilo (No. 184)		
203 *Sesamia cretica* (*Spodoptera* spp.)	see Diatraea (No. 178)		
	see Busseola (No. 185) or Prodenia (No. 194)		Spray on leaves and stalks when first signs of damage are visible
204 *Anatrichus erinaceus*	**39**	**ES 50%:** 500 cc/750 l water/ha	On first signs of damage
205 *Atherigona soccata*	**27, 39**	**WP** or **ES 25%:** 1-1.5 kg/750 l water	Spray on leaves and stalks when first signs of attack are visible. Repeat after 10 days
206 *Chaetocnema* sp.	**12**	**D 5%:** 20-25 kg/ha	When leaves show feeding marks
207 *Hieroglyphus nigrorepletus*	**9** **13**	**D 10%:** 25-30 kg/ha **ES 20%:** 1.2 l/600 l water	On foliage when young hoppers appear
208 *Schizaphis graminum*	**9** **26, 33, 39, 42, 47, 48** **52**	**D 10%:** 25-30 kg/ha **ES 20%:** 500-1000 cc/500 l water **S 6%:** 500-1000 cc/500 l water	Spray on leaves when aphids appear

209 *Paratetranychus indicus*	**33, 33.10, 39, 43, 72**	**ES 20%:** 1 l/750 l water	Spray on leaves at the first signs of damage. Repeat after 1 week
210 *Celama sorghiella*	**29**	**ES 25%:** 6 l/500 l water/ha	On first signs of damage
	41	**ES 25%:** 2 l/500 l water/ha	
211 *Contarinia sorghicola*	**12**	**D 5%:** 30 kg/ha	One application on flowering, one on full flower. 2nd. application at fortnightly intervals
	27	**ES 50%:** 1.2 l/300 l water/ha	Apply on heads when 90% of them have emerged from the boot. Repeat application within 4 days. Do not feed treated forage to livestock for 14 days following last application

Rice *(Oryza sativa and O. glaberrina)*

Pest	Product	Formulation and Dosage	Where and when to apply
212 *Sesarma africanum* *Paratelphusa convexa*	**9**	**G 5%:** 40-50 kg/ha	Broadcast over the area when first signs of damage are observed
213 *Radopholus oryzae*	Crop rotation		
214 *Chilo auricilia*	see Chilo (No. 215)		
215 *Chilo suppressalis* *(Maliarpha* *separatella,* *Diopsis thoracica)*	**9** **15, 27** **39** **27.1, 42** **9** **27**	**WP 50%:** 7.5 kg/750 l water/ha **ES 25%:** 750-900 cc/750 l water/ha **D 1.5%:** 50 kg/ha **ES 50%:** 375-400 cc/750 l water/ha **ES 50%:** 250-500 cc/750 l water/ha **G 6%:** 45-50 kg/ha **G 10%:** 20 kg/ha	On leaves and stalks when infestation occurs, 2-3 sprays at fortnightly intervals Over plants broadcast
216 *Scirpophaga innotata*	see Chilo (No. 215)		
217 *Schoenobius* *bipunctifer*	see Chilo (No. 215)		
218 *Proceras polychrysa*	see Chilo (No. 215)		
219 *Elasmopalpus* *lignosellus*	see Chilo (No. 215) and Pyrausta (No. 183)		
220 *Sesamia inferens*	**15** see also Busseola (No. 185)	**ES 20%:** 1-2 l/750 l water/ha	When infestation occurs or when moths are on the wing. Repeat at fortnightly intervals
221 *Calligypona marginata*	**27, 39**	**D 1%:** 20-25 kg/ha **ES 20%:** 750-1000 cc/750 l water/ha	When plant hoppers appear in large numbers

222 *Hispa armigera* (*Trichispa sericea*)	**12** **9** **27.1, 42**	**WP 50%:** 2.25 kg/750 l water **WP 50%:** 750 g/750 l water **ES 50%:** 0.9-1.2 l/750 l water/ha	When leaves show first mines. Repeat at fortnightly intervals
223 *Leptispa pygmaea*	see Hispa (No. 222)		When leaves begin to curl up
224 *Lema oryzae*	see Hispa (No. 222)		
225 *Cnaphalocrocis medinalis*	**9**	**D 10%:** 20-25 kg/ha	When caterpillars are seen on the underside of leaves
226 *Nymphula depunctalis*	**12**	**WP 50%:** 2.25 kg/750 l water	When pests appear
227 *Sesamia cretica*	**27**	**G 10%:** 20-25 kg/ha	Over plants broadcast when infestation occurs
228 *Mocis repanda*	see Mythimna (No. 177)		
229 *Laphygma frugiperda*	see Mythimna (No. 177) and Laphygma (No. 287)		
230 *Mythimna (Cirphis) unipuncta*	**9** **12** **39** **25**	**D 10%:** 20-25 kg/ha **WP 50%:** 2.25 kg/750 l water/ha **D 1%:** 20-25 kg/ha **ES 50%:** 1000 cc/750 l water/ha	On foliage, when caterpillars appear
231 *Spodoptera mauritia*	see Mythimna (No. 230)		As soon as young caterpillars are seen on seedlings in nursery or on standing crop
232 *Parnara guttata*	see Mythimna (No. 230)		
233 *Chlorops oryzae*	**27** **28** **27.1, 33.10, 39, 42**	**ES 25%:** 800-1000 cc/1000 l water **ES 40%:** 500-800 cc/1000 l water **ES 50%:** 500 cc/1000 l water	When the flies appear or when first signs of damage appear
234 *Agromyza oryzae*	see Chlorops (No. 233)		
235 *Atherigona exigua*	**39, 42**	**ES 50%:** 500 cc/1000 l water	On foliage when first signs of damage appear

Pest	Product	Formulation and Dosage	Where and when to apply
236 *Thrips oryzae*	**27, 39** **27.1, 42**	**D 1%:** 15-20 kg/ha **ES 50%:** 0.4-0.6 l/750 l water/ha	When leaves start to curl up and turn yellow
237 *Nilaparvata lugens*	**9** **12** **27** **27.1, 39, 42**	**D 5-10%:** 20-25 kg/ha **D 5%:** 20-25 kg/ha **D 1%:** 20-25 kg/ha **G 10%:** 20 kg/ha **ES 50%:** 500 cc/1000 l water/ha	When pests appear. Repeat after 15 days if necessary
238 *Calligypona furcifera*	see Nilaparvata (No. 237)		On first signs of damage
239 *Nisia atrovenosa*	see Nilaparvata (No. 237)		When pests appear
240 *Tettigella spectra*	**9** see also Nilaparvata (No. 237)	**D 10%:** 25-30 kg/ha	When jassids appear on stems
241 *Nephotettix bipunctatus*	see Chilo (No. 215)		When jassids appear
242 *Snazuma dorsalis*	see Nilaparvata (No. 237)		
243 *Aphelenchoides besseyi*	**39**	**ES 20%:** 1-1.5 l/1000 l water	As soon as leaves show brown patches
244 *Epicauta* sp.	**12**	**D 5%:** 20-25 kg/ha	On grains when beetles appear
245 *Hieroglyphus banian*	**9**	**D 5%:** 20-25 kg/ha	On breeding grounds against hoppers
246 *Pachydiplosis oryzae*	**39, 42**	**ES 50%:** 500-1000 cc/750 l water/ha	When the first signs of damage are visible
247 *Hydrellia griseola*	**27**	**ES 25%:** 1 l/750 l water/ha	When initial infestation occurs and leaves start withering

248 *Scotinophora lurida*	**9** **27, 28, 39**	**D 10%:** 20-25 kg/ha **ES 25%:** 1-1.5 l/750 l water/ha	When large numbers of the bugs appear on the stem and shoots
249 *Solubea poecila*	see Scotinophora (No. 248)		
250 *Nezara viridula*	see Scotinophora (No. 248)		
251 *Cletus trigonis*	see Leptocorisa (No. 252)		
252 *Leptocorisa varicornis*	**7**	**D 5%:** 20 kg/ha	Application on the ear heads; when ear-heads are in milk stage and the bugs appear in large numbers
	27, 39	**D 1%:** 20 kg/ha	
	9	**D 10%:** 20 kg/ha	
	30.2	**D 5%:** 20 kg/ha	
	35	**ES 50%:** 1000 cc/250 l water/ha	
	37	**ES 50%:** 500 cc/250 l water/ha	
	42	**ES 50%:** 500 cc/250 l water/ha	
	53	**D 5%:** 20 kg/ha	
	53	**WP 50%:** 2 kg/250 l water/ha	
253 *Lagynotomus assimulans*	see Leptocorisa (No. 252)		

Sugar cane *(Saccharum officinarum)*

Pest	Product	Formulation and Dosage	Where and when to apply
254 *Meloidogyne* sp.	Crop rotation **143**	**L:** 175 l/ha	Pre-plant treatment (see also Tea: No. 101)
255 *Radopholus similis*	Crop rotation see Meloidogyne (No. 254)		
256 *Hoplolaimus coronatus*	Crop rotation see Meloidogyne (No. 254)		
257 *Odontotermes obesus*	**7**	**D 2.5%:** 30 kg/ha	At two foot intervals in furrows over the cane setts at the time of planting
	9	**D 5%:** 40 kg/ha	
	7	**WP 50%:** 500 g/100 l water	Dip the setts
	9	**WP 50%:** 750 g/100 l water	do.
	13	**WP 50%:** 250 g/100 l water	do.
258 Wireworms, various species: *Lacon variabilis* *Lacon humilis* *Heteroderes laurenti* *Melanotus Tamsuyensis*	**7**	**G 5%:** 60 kg/ha	Place insecticide in a narrow strip immediately above the setts
		D 5%: 60 kg/ha	
	9	**D 10%:** 30 kg/ha	
	10	**ES 20%:** 1 l/100 l water	On seed pieces in open furrows at time of planting
	see also Melanotus (No. 169)		
259 *Phytalus smithi*	see Lepidiota (No. 260)		
260 *Lepidiota frenchi*	**10**	**D 20%:** 80-100 kg/ha	Apply dust above the setts at planting time
261 *Dermolepida albohirtum*	see Lepidiota (No. 260)		

262 *Tomaspis varia*	see Tomaspis (No. 263)		
263 *Tomaspis saccharina*	**26, 28** **27, 39**	**ES 20%:** 400 cc/100 l water **D 1-2%:** 50 kg/ha	Dip the setts Apply on cane seed pieces in open furrows at time of planting
264 *Heteronychus licas*	**7, 9, 13** see also Heteronychus (No. 173)	**WP 50%:** 400 g/100 l water	Treat the young shoots when pests appear (apply to rows)
265 *Heteronychus plebejus*	**9** see also Heteronychus (No. 264)	**G 10%:** 50 kg/ha	To soil surface
266 *Euetheola rugiceps*	**7** **9** see also Heteronychus (No. 264)	**G 5%:** 60 kg/ha **D 10%:** 50 kg/ha	To soil surface and work in Treat the young shoots, especially the lower parts
267 *Anacentrinus subnudus*	see Rhabdocnemis (No. 268)		
268 *Rhabdocnemis obscura*	**13**	**WP 50%:** 250-300 g/100 l water	Treat the stalks, especially the lower parts
269 *Ereunetis flavistriata*	**13** **39**	**ES 20%:** 300 cc/100 l water **ES 50%:** 50 cc/100 l water	Apply to stems when first signs of damage are visible. Repeat after 2-3 weeks
270 *Acheta bimaculata*	**13** see also Gryllulus (No. 176)	**ES 20%:** 400 cc/100 l water	Apply on the lower part of stems
271 *Saccharicoccus sacchari*	**39, 48**	**ES 20%:** 1.5-2 l/1000 l water	Apply to stems and leaves
272 *Castnia licus*	**15** **39**	**ES 20%:** 1000 cc/750 l water/ha **ES 50%:** 500-750 cc/750 l water/ha	On stems and leaves when first signs of damage are visible

Pest	Product	Formulation and Dosage	Where and when to apply
273 *Diatraea saccharalis*	**15**	**G 2%:** 15-20 kg/ha	Broadcast the insecticides over cane fields at 3-weekly intervals as soon after joints begin to form or when 1-2% of stalks are infested with young larvae
	21	**G 5%:** 15-20 kg/ha	
	22.5	**G 5%:** 20 kg/ha	
	53	**G 10%:** 20-30 kg/ha	
	34	**G 7%:** 20-25 kg/ha	
274 *Metamasius hemipterus*	**13**	**ES 20%:** 5 l/500-750 l water	Apply to stems when pests appear
275 *Scirpophaga nivella*	**12**	**WP 50%:** 6 kg/750 l water/ha	Preventive measure: on seedlings as soon as mining of midribs is seen (apply 8 times at weekly intervals)
	15, 22	**ES** or **WP 20%:** 1-1.5 kg/750 l water/ha	
	9, 22	**D 10%:** 50 kg/ha	
	see also Diatraea (No. 273)		
	30.1	**ES 60%:** 0.5-1.5 l/1000 l water/ha	
	42	**ES 50%:** 0.8-2 l/1000 l water/ha	
276 *Chilotraea infuscatella*	see Scirpophaga (No. 275)		
277 *Proceras sacchariphagus*	see Scirpophaga (No. 275)		
278 *Emmalocera depressella*	**12**	**WP 50%:** 7.5 kg/1000 l water	Apply to stems at fortnightly intervals starting from seedling stage to node formation stage
	22	**WP** or **ES 20%:** 5 kg/1000 l water	
	15	**ES 20%:** 1.5-2 l/1000 l water	
279 *Eucosma schistaceana*	see Emmalocera (No. 278)		
280 *Elasmopalpus lignosellus*	see Chilo (No. 215) and Pyrausta (No. 183)		
281 *Phragmitiphila truncata*	see Emmalocera (No. 278)		

282 *Sesamia vuteria*	see Emmalocera (No. 278)		On first signs of damage. Apply 4 times at fortnightly intervals
283 *Xyleborus perforans*	**12**	**WP 50%:** 4 kg/1000 l water	On stems when pests appear
	13	**WP 50%:** 2 kg/1000 l water	
284 *Diaprepes abbreviatus*	**13, 15**	**WP 20%:** 2 kg/1000 l water	On foliage when weevils appear
285 *Hispa wakkeri*	**39**	**ES 20%:** 1 l/1000 l water	On foliage when beetles appear
	see also Hispa (No. 222)		
286 *Omiodes accepta*	see Hispa (No. 285)		
287 *Laphygma frugiperda*	**12**	**WP 50%:** 3 kg/1000 l water	On leaves when young caterpillars appear
	53	**WP 50%:** 2 kg/1000 l water	
288 *Mythimna (Cirphis) unipuncta*	see Mythimna (No. 230) and Laphygma (No. 287)		
289 *Macropes excavatus*	**9**	**WP 20%:** 1.5 kg/600 l water/ha	When first signs of damage are visible. Spray nozzle has to be carefully directed towards the central leaves
	see also Peregrinus (No. 190)		
290 *Perkinsiella saccharicida*	**9**	**D 5%:** 30-60 kg/ha	When pests appear or when leaves and buds start to turn yellow
	27, 28, 30, 39	**ES 20%:** 1-1.5 l/1000 l water	
291 *Saccharosydne saccharivora*	see Perkinsiella (No. 290)		
292 *Proutista moesta*	see Perkinsiella (No. 290)		
293 *Pyrilla perpusilla*	**9**	**D 5%:** 30-60 kg/ha	When leaf margins start yellowing and larvae are seen
	15	**ES 20%:** 1.5 l/1000 l water	
	26	**ES 20%:** 1-1.5 l/1000 l water	
	39	**ES 50%:** 200-300 cc/1000 l water	

Pest	Product	Formulation and Dosage	Where and when to apply
294 *Cicadulina mbila*	see Peregrinus (No. 190)		
295 *Aleurolobus barodensis*	**27, 33, 33.10, 34, 39, 43**	**ES 20%:** 1-1.5 l/1000 l water	When leaves start wilting and withering
296 *Sipha flava*	**26, 27, 28, 35, 39, 42, 46, 47, 48, 49**	**ES 20%:** 1-1.5 l/1000 l water	When aphids appear and when leaves start wilting
	52	**S 6%:** 1-1.5 l/1000 l water	
297 *Rhopalosiphon sacchari*	see Sipha (No. 296)		
298 *Rhopalosiphon maidis*	see Sipha (No. 296) and Rhopalosiphon (No. 193)		
299 *Hysteroneura setariae*	see Sipha (No. 296)		
300 *Oregma lanigera*	**39**	**ES 50%:** 500-750 cc/1000 l water	At first appearance of pests
301 *Pulvinaria iceryi*	**39**	**ES 50%:** 500-750 cc/1000 l water	When pests appear; repeat fortnightly
302 *Tarsonemus Bancrofti*	**26**	**ES 20%:** 1-1.5 l/1000 l water	When first signs of damage are visible; repeat at weekly intervals
	27	**ES 25%:** 1.2 l/1000 l water	
303 *Paratetranychus exsiccator*	**26, 33, 39, 42, 72**	**ES 20%:** 1-1.5 l/1000 l water	At first appearance of pests and when leaves start wilting; repeat at weekly/ fortnightly intervals

304 *Meloidogyne* sp.	Crop rotation		Application 2-3 weeks before planting.
	152	**G 10%:** 250-350 kg/ha	Broadcast on soil surface and work in
		G 10%: 175 kg/ha	Row-treatment
	143, 146	**L:** 70-90 cc/sq.m	Injection at a depth of 25-30 cm
305 *Pagria signata*	**7**	**G 5%:** 40-50 kg/ha	To soil surface and work in before planting
		WP 40%: 750-1000 g/500 l water/ha	On soil where plants are set
306 *Colaspis flavida*	see Pagria (No. 305)		
307 *Hodotermes mossambicus*	see Hodotermes (No. 170)		
308 *Agromyza phaseoli*	**7**	**WP 40%:** 50 g/100 kg seed	Dress the seed before planting
	13	**WP 50%:** 40 g/100 kg seed	
	27, 28, 33.10, 39	**ES 20%:** 500 cc/500 l water	On foliage, when leaf-miners are visible
309 *Phytonomus nigrirostris*	**35**	**D 5%:** 35-40 kg/ha	On foliage and stems when first signs
	39	**D 1%:** 35-40 kg/ha	of damage are seen
310 *Alcides leucogramma*	see Phytonomus (No. 309)		
311 *Elasmopalpus lignosellus*	**7**	**ES 20%:** 5 l/500 l water	Apply the emulsion as 10-15 cm wide
	13	**G 5%:** 15-20 kg/ha	strip over plants when in 2-leaf stage
	27	**G 10%:** 7.5-10 kg/ha	On foliage and stems when first signs
	31	**ES 20%:** 500-750 cc/500 l water	of damage are visible
	39	**ES 25%:** 500-750 cc/500 l water	As curative measure: apply on stems
312 *Nezara viridula*	see Physomerus (No. 313) and Nezara (No. 691)		

Pest	Product	Formulation and Dosage	Where and when to apply
313 *Physomerus grossipes*	**35**	**D 4%:** 30-35 kg/ha	When pests appear
314 *Aphis fabae*	**2**	**ES 6%:** 1 kg/500 l water/ha	On foliage when aphids appear. Repeat after 10 days
	26, 27, 28, 39, 41, 42, 48	**ES 20%:** 0.5 kg/500 l water/ha	
	29, 35	**ES 20%:** 1.5 kg/500 l water/ha	
	29	**D 5%:** 25 kg/ha	
	35.2	**WP 70%:** 0.5 kg/500 l water/ha	
	39, 41	**D 2%:** 25 kg/ha	
	52	**S 6%:** 0.5 kg/500 l water/ha	
315 *Epicauta vittata*	**12**	**D 5%:** 30-40 kg/ha	On foliage when pests appear
316 *Epilachna varivestis*	**18**	**WP 25%:** 6 kg/500 l water/ha	
	23.5	**D 5%:** 35 kg/ha	
	27	**ES 25%:** 2 kg/500 l water/ha	
	30.3	**ES 25%:** 2 kg/500 l water/ha	Apply the granule just below seed at planting time
		G 5%: 20 kg/ha	
	35	**ES 50%:** 2-2.5 kg/500 l water/ha	
	53	**WP 50%:** 2 kg/500 l water/ha	On foliage when beetles appear
317 *Cerotoma ruficornis*	see Epilachna (No. 316) and Epilachna (No. 187)		
318 *Thosea sinensis*	**12**	**WP 50%:** 1-2 kg/500 l water	On leaves when caterpillars appear
	27, 34, 37, 39	**ES 20%:** 500-750 cc/500 l water	
319 *Acherontia styx*	**11**	**D 5%:** 35-40 kg/ha	On leaves when caterpillars appear
		WP 50%: 2 kg/500 l water	
	27, 39	**ES 20%:** 750-1000 cc/500 l water	
	see also Thosea (No. 318)		
320 *Diacrisia obliqua*	see Thosea (No. 318)		
321 *Prodenia litura*	see Thosea (No. 318) and Prodenia (No. 837)		

322 *Valanga nigricornis*	**13**	**ES 20%:** 1 l/500 l water	When grasshoppers appear
323 *Hercothrips fasciatus*	**26, 27, 28, 39, 42**	**ES 20%:** 750 cc/750 l water	On first signs of damage
324 *Corythucha gossypii*	**24, 27, 29, 34, 37, 39, 40**	**ES 20%:** 500 cc/500 l water	As leaves start to curl downwards
325 *Empoasca fabalis*	**12** **39**	**WP 50%:** 1.5 kg/500 l water **ES 50%:** 250 cc/500 l water	As soon as leaves show necrotic patches
326 *Erythroneura (Typhlocyba)* sp.	see Empoasca (No. 325)		
327 *Tetranychus urticae*	**26, 32, 38, 39, 42, 47, 48, 71, 72** **49** **68.2**	**ES 20%:** 500-750 cc/500 l water **D 5%:** 25-30 kg/ha **ES 20%:** 3.5 kg/750 l water/ha	When leaves appear mottled; repeat after 1 week
	see also Tetranychus (No. 820)		
328 *Fundella cistipennis*	**12** **53**	**D 5%:** 30-35 kg/ha **WP 50%:** 3-4 kg/1000 l water **WP 50%:** 1.5 kg/1000 l water	On foliage, as soon as first signs of damage are seen or before young caterpillars penetrate the pods. Repeat after 2 weeks if necessary
329 *Lamprosema indicata*	see Fundella (No. 328)		
330 *Laspeyresia glycinivorella*	see Fundella (No. 328)		On foliage and pods as soon as young caterpillars are found
331 *Maruca testulalis*	see Fundella (No. 328)		As soon as first signs of damage are seen
332 *Etiella zinckenella*	see Fundella (No. 328)		On foliage and pods as soon as pods show first signs of damage
333 *Ecpantheria albicornis*	see Fundella (No. 328)		On foliage and pods when young caterpillars are found

Pest	Product	Formulation and Dosage	Where and when to apply
334 *Peridroma (Lycophotia) saucia*	**12** **22** **53**	**WP 50%:** 3-4 kg/1000 l water **WP 50%:** 4 kg/1000 l water **WP 50%:** 2 kg/1000 l water	On foliage and pods when first signs of damage are seen
335 *Syngrapha (Plusia) egena*	see Peridroma (No. 334)		
336 *Megacoelum modestum*	**12**	**D 5%:** 30-35 kg/ha	On foliage when pests appear

337 *Pratylenchus brachyurus*	Crop rotation		
338 *Leucopholis rorida*	**10**	**D** or **G 10%:** 60-80 kg/ha	To soil surface and work in 7.5-12 cm (apply before planting)
	see also Lachnosterna (No. 354)		
339 *Coelosternus granicollis*	**13**	**WP 50%:** 300-500 g/100 l water	On stem and leaves when pests appear; repeat after 2 weeks if necessary
340 *Lagochirus obsoletus*	see Coelosternus (No. 339)		
341 *Carpolonchaea chalybea*	**9**	**WP 20%:** 1 kg/100 l water	Preventive measure: On stem and foliage when flies are on the wing
	28	**ES 40%:** 200 cc/100 l water	When first signs of damage are visible
	39	**ES 20%:** 150 cc/100 l water	
342 *Aonidomytilus albus*	**27, 33.6**	**ES 60%:** 150 cc/100 l water	When scales appear; repeat after 2 weeks
	39, 43	**ES 20%:** 200 cc/100 l water	
343 *Erinnyis ello*	see Herse (No. 372)		As soon as young caterpillars are found
344 *Zonocerus elegans*	see Zonocerus (No. 35) and Zonocerus (No. 705)		On foliage when grasshoppers appear
345 *Scirtothrips manihoti*	**12**	**WP 50%:** 200 g/100 l water	On foliage when first signs of damage are seen
	see also Dendrothripoides (No. 377)		
346 *Corynothrips stenopterus*	see Scirtothrips (No. 345) and Dendrothripoides (No. 377)		
347 *Erythroneura cassavae*	**27, 39**	**ES 20%:** 100 cc/100 l water	On foliage when pests appear
348 *Bemisia nigeriensis*	**27, 30, 39, 46**	**ES 20%:** 100-150 cc/100 l water	On foliage when pests appear; repeat after 2 weeks
	35	**ES 20%:** 200-250 cc/100 l water	

Pest	Product	Formulation and Dosage	Where and when to apply
349 *Planococcus citri*		see Planococcus (No. 100)	
350 *Saissetia coffeae*		see Saissetia (No. 455)	
351 *Tetranychus urticae*		see Tetranychus (No. 327) and (No. 820)	On first signs of damage
352 *Dasynus manihotis*	**12** **35**	**D 10%:** 30-40 kg/ha **ES 20%:** 300-400 cc/100 l water see also Physomerus (No. 313)	When bugs appear

353 *Radopholus similis*	Crop rotation see also Radopholus (No. 2)		
354 *Lachnosterna* sp.	**7**	**D** or **G 10%:** 20-30 kg/ha	To soil surface and work in 10-15 cm. Apply before planting or after harvest
	10	**D** or **G 10%:** 60-80 kg/ha	
355 *Heteroderes laurenti*	**10**	**D** or **G 10%:** 20 kg/ha see also Lachnosterna (No. 354)	To soil surface before planting, work in 10-15 cm
356 *Chrysochus chinensis*	see Lachnosterna (No. 354) and Diabrotica (No. 172)		
357 *Paria viridicyaneus*	see Lachnosterna (No. 354) and Diabrotica (No. 172)		
358 *Alcidodes orientalis*	**13**	**D 2%:** 40-50 kg/ha see also Cylas (No. 359)	On emerging foliage and stems; repeat at fortnightly intervals
359 *Cylas formicarius*	**13**	**D 2%:** 40-50 kg/ha	To soil surface at base of plants in strips 15-20 cm wide; repeat after 3-4 weeks
		WP 50%: 2 kg/500 l water	Spray 1-3 times at a rate of 500 l/ha on soil
		ES 20%: 500 cc/100 l water	Dip the slips for 5 minutes in the emulsion
	12	**D 10%:** 300 g/100 m²	In Stores: Sweep out store and dust all internal surfaces with dust
		see also Euscepes (No. 360)	
360 *Euscepes batatae*	**10**	**D 10%:** 100-120 kg/ha see also Cylas (No. 359)	In field where sweet potatoes had been planted before: to soil surface and work in 15-20 cm. Apply before planting or after harvest
361 *Blosyrus ipomoeae*	**13**	**D 2%:** 50-60 kg/ha **WP 50%:** 2 kg/500 l water/ha	After planting to soil surface and on young foliage

Pest	Product	Formulation and Dosage	Where and when to apply
362 *Aegeria* sp.	**12** **13, 15, 53** **34**	**WP 50%:** 2.4 kg/500 l water/ha **WP 50%:** 800-1000 g/500 l water/ha **ES 25%:** 1.2-1.6 l/500 l water/ha	On foliage, when first signs of damage are seen; if necessary repeat at fortnightly intervals
363 *Omphisa anastomosalis*	see Aegeria (No. 362)		
364 *Megastis grandalis*	see Aegeria (No. 362)		
365 *Coreocoris fuscus*	see Physomerus (No. 313) and Dasynus (No. 352)		When bugs appear
366 *Chaetocnema confinis*	**12**	**WP 50%:** 1.6 kg/500 l water	On foliage when pests appear
367 *Aspidomorpha areata*	see Chaetocnema (No. 366)		
368 *Cassida bivittata*	see Chaetocnema (No. 366)		
369 *Oidaematophorus monodactylus*	see Chaetocnema (No. 366)		On foliage when first signs of damage are seen
370 *Lecithocera effera*	see Chaetocnema (No. 366) and Aedia (No. 374)		
371 *Bedellia orchilella*	**27, 34, 37, 39**	**ES 20%:** 100 cc/100 l water	On foliage when first signs of damage are seen
372 *Herse cingulata*	**11** **39**	**D 10%** **WP 50%:** 2 kg/500 l water **ES 50%:** 600 cc/500 l water	On foliage when young caterpillars appear
373 *Theretra japonica*	see Herse (No. 372) and Aedia (No. 374)		
374 *Aedia (Anophia) leucomelas*	**13**	**WP 20%:** 1.2-1.6 kg/500 l water	On foliage when young caterpillars appear

ypsilon		see Acdia (No. 374)		
376 *Zonocerus variegatus*		see Zonocerus (No. 35)		
377 *Dendrothripoides ipomoeae*	**39, 48**	see Selenothrips (No. 85)	**D 1%:** 30 kg/ha **ES 20%:** 800 cc/500 l water	On foliage and stems when first signs of damage are seen
378 *Physomerus grossipes*		see Physomerus (No. 313) and Dasynus (No. 352)		
379 *Halticus tibialis*		see Physomerus (No. 313) and Dasynus (No. 352)		
380 *Tetranychus urticae*		see Tetranychus (Nos. 327, 820)		
380a *Acraea acerata*	**12**		**D 10%:** 20 kg/ha	On foliage when first signs of damage are seen Repeat after 2 weeks if necessary

FRUITS

Pineapple

Date-palm

Banana

Papaw

Mango

Citrus

Pineapple *(Ananas sativus)*

Pest	Product	Formulation and Dosage	Where and when to apply
381 *Meloidogyne* sp.	Crop rotation **143** see also Radopholus (No. 382)	**L:** 200-250 l/ha	Pre-planting treatment of the soil. Apply the fumigant in rows 30 cm apart at a depth of 15-25 cm in well moistened soil, which should be rolled after treatment
382 *Radopholus similis*	Crop rotation **152**	**ES:** 25 l/ha	Post-planting treatment of the soil (to established plants less than 8 months old). Method see No. 381
383 *Rhinotermes intermedius*	**13** **27**	**ES 20%:** 250-500 cc/100 l water **ES 20%:** 300-400 cc/100 l water	Pour emulsion into the galleries; 0.5-1 l for each plant or on the base of the plant
384 *Dysmicoccus brevipes*	**27, 33.6** **39** **47**	**ES 60%:** 150 cc/100 l water **ES 20%:** 200-250 cc/100 l water **ES 25%:** 1000 cc/1000 l water	Dip planting material before setting 100-250 cc emulsion to the base of the plant; repeat after 4 weeks if necessary
385 *Holopothrips ananasi*	**12** **33.10**	**D 5%** **ES 25%:** 100-150 cc/100 l water	On foliage especially in leaf base
386 *Planococcus citri*	**27, 39** **25**	**ES 25%:** 100-150 cc/100 l water **ES 50%:** 100 cc/100 l water	On foliage when pests appear; repeat at fortnightly intervals
387 *Diaspis bromeliae*	**27, 39** **35**	**ES 20%:** 200 cc/100 l water **ES 20%:** 300 cc/100 l water	On the attacked parts of the plant; repeat after 10 days
388 *Metamasius ritchiei*	**12** **13, 53**	**D 5%** **WP 50%:** 250-300 g/100 l water	On leaves, fruit stalks and fruits when weevils appear

389 *Cholus* sp.	see Metamasius (No. 388)		Dust or spray on fruits when pests appear
390 *Atherigona* sp.	**12, 18**	**D 10%**	On fruits
391 *Thecla basilides*	**12**	**D 10%** **WP 50%:** 300 g/100 l water	On fruits when moths are on the wing
392 *Tmolus echion*	see Thecla (No. 391)		

Date-palm *(Phoenix dactylifera)*

Pest	Product	Formulation and Dosage	Where and when to apply
393 *Rhynchophorus phoenicis*	see Rhynchophorus (No. 568)		
394 *Ommatissus binotatus*	**25**	**ES 50%:** 500 cc/500 l water	When 50-75% of the eggs are hatched
	27, 39	**ES 20%:** 150 cc/100 l water	
	35	**ES 50%:** 625 cc/500 l water	
	42	**ES 50%:** 200 cc/500 l water	
395 *Parlatoria blanchardii*	**27**	**ES 60%:** 100 cc/100 l water	On foliage when pests appear
	35	**WP 25%:** 400 g/100 l water	Repeat after 2 weeks
	39	**ES 50%:** 100 cc/100 l water	
396 *Pseudococcus* sp.	**27, 39**	**ES 20%:** 100-150 cc/100 l water	On fruit stems
397 *Batrachedra amydraula*	**12**	**WP 50%:** 1 kg/375 l water	Apply 1-2 l of the spray per date-bunches one week after pollination. Repeat after 15-25 days. (The dates sprayed with DDT-insecticides should not be eaten before 30 days after last spray)
	27	**ES 10%** (Oil-ES-Springwash): 500 cc/100 l water	
	12 + 27	**WP 50%:** 1 kg + **WP 25%:** 1.2 kg/375 l/water	
398 *Myelois decolor*	**27**	**ES 60%:** 800 cc/800 l water	Spray when first signs of damage are seen (comp. the flight period)
	31	**ES 20%:** 2.5 l/500 l water	
	53	**WP 50%:** 1 kg/500 l water	
399 *Ephestia cautella*	see Batrachedra (No. 397)		Spray when first signs of damage are seen
400 *Paratetranychus afrasiaticus*	see Paratetranychus (No. 401)		
401 *Paratetranychus simplex*	**82**	**D:** 100 g/tree	On those dates which are to be eaten fresh
		WP 75%: 2.5 kg/500 l water	When red spiders appear on date bunches; for dates which are to be packed or those to be collected from the trees after they are dry

402 *Meloidogyne* sp.	see Meloidogyne (No. 101)		
403 *Radopholus similis*	**Hot water: 55°C**		As preventive measure: Dip the planting material in the water for 20 minutes
	27	**ES 25%:** 1.2 l/1000 l water	To the established plants
404 *Pratylenchus coffeae*	see Pratylenchus (No. 3) and Radopholus (No. 403)		
405 *Rotylenchus multicinctus*	see Radopholus (No. 403)		
406 *Odoiporus longicollis*	**13**	**ES 20%:** 300 cc/100 l water	Apply the insecticide to pseudostem; 2-3 applications per year
	see Cosmopolites (No. 407)		500-600 cc
407 *Cosmopolites sordidus*	**13**	**D 0.5%:**	Dust soil surface around base
	13	**ES 20%:** 1800 cc/600 l water	Apply spray to the base of stem to a height of about 30 cm and the surrounding 20-30 cm of soil. 2-3 applications per year
	13. 39	**ES 20%:** 250 cc/100 l water	Pieces of pseudostems are used to attract the weevils. They may be either slices across the stem or split lengthwise and 40-50 cm long. These baits are placed on the ground, treated with the insecticide and covered with trash. They are left in position for three weeks. Fresh pieces of stem are then placed in the same way. Baits inspected weekly can be used to obtain some idea of the degree of infestation in a banana area
	27	**G 10%:** 25 kg/ha	Apply the granular to the ground around stems Repeat 2-3 times at monthly intervals

Pest	Product	Formulation and Dosage	Where and when to apply
408 *Tomnoschoita nigroplagiata*	see Cosmopolites (No. 407)		
409 *Metamasius hemipterus*	see Odoiporus (No. 406)		
410 *Castnia atymnius humboldti*	see Odoiporus (No. 406)		Apply the spray to lower part of pseudo-stem. 2-3 applications per year
411 *Stephanitis typicus*	**27, 39**	**ES 20%:** 1 l/1000 l water	On first signs of damage
412 *Pentalonia nigronervosa*	**27, 28, 29, 39, 47, 48** **42** (dig out and destroy the Bunchy top V-infected plants)	**ES 20%:** 800-1000 cc/1000 l water **S 100%:** 300 cc/ha	When pests appear
413 *Pseudococcus comstocki*	**27, 34, 39, 46**	**ES 20%:** 1-1.5 l/1000 l water	When pests appear. Repeat after 10 days if necessary
414 *Lamprosema octosema*	**12, 22**	**ES 25%:** 6-8 l/1000 l water	Apply on bunch with the youngest 5 leaves when it is about half as high as it will become in the erect position
415 *Colaspis hypochlora*	**12**	**WP 50%:** 2 kg/1000 l water	On foliage, when pests appear
416 *Hieroxestis subcervinella*	**13**	**D 2%** **ES 20%:** 300-400 cc/1000 l water	On bunches, when first signs of damage are seen. Apply at three-weekly intervals
417 *Zonocerus variegatus*	see Zonocerus (No. 35)		
418 *Dacus curvipennis*	see Lamprosema (No. 414)		On bunches (ripening fruits) when first signs of damage are seen. Repeat after 2 weeks

419 *Scirtothrips signipennis*	see Selenothrips (No. 85)		When pests appear, apply at 6 weekly intervals on bunches and the throats, stems and bases of parent plants and suckers, and the surrounding soil
420 *Aspidiotus destructor*	**27, 33, 34, 39, 43**	**ES 25%:** 1-1.5 l/1000 l water	On attacked plant parts. Repeat after 3 weeks
420a *Oiketicus kirbyi or other leaf-feeding caterpillars*	**13** **22**	**ES 20%:** 4 kg/ha **WP 25%:** 8 kg/ha	When caterpillars appear

Papaw *(Carica papaya)*

Pest	Product	Formulation and Dosage	Where and when to apply
421 *Rhabdocnemis obscura*	**9, 13**	**WP 50%:** 300-500 g/100 l water	On trunks when weevils appear
422 *Gryllotalpa africana*	**13**	**WP 50%:** 300 g/100 l water see also Gryllotalpa (No. 7) (Bait)	Spray the lower part of young trunks. Broadcast on soil surface
423 *Planococcus citri*	**27, 39**	**ES 25%:** 150 cc/100 l water	On trunks when pests appear; repeat after 2 weeks
424 *Morganella longispina*	**35**	**ES 50%:** 125-150 cc/100 l water	On trunks when pests appear; repeat after 2 weeks
425 *Diacrisia investigatorum*	**12** **13**	**WP 50%:** 200 g/100 l water **WP 20%:** 200 g/100 l water	On foliage, when caterpillars appear
426 *Pergandeida robiniae*	see Pergandeida (No. 669)		
427 *Dacus pedestris*	**12, 18**	**WP 50%:** 200-250 g/100 l water see Ptecticus (No. 428) and Ceratitis (No. 523)	On ripening fruits when flies are on the wing or when first signs of damage are seen. Repeat after 2 weeks if necessary
428 *Ptecticus elongatus*	**12**	**D 10%**	On fruits when first signs of damage are seen

429 *Batocera rufomaculata*		see Anthores (No. 10)		On trunk and branches when beetles appear
430 *Squamura tetraonis*	**12** **13**		**ES 25%:** 2 l/100 l water **ES** or **WP 20%:** 750-1000 g/100 l water	On trunk when moths are on the wing or when first signs of damage are seen
431 *Dinoderus distinctus*		see Squamura (No. 430)		On branches and twigs when pests appear
432 *Rhytidodera simulans*	**13**		**ES** or **WP 20%:** 1.5-2 l/100 l water	On branches when beetles appear
433 *Drosicha stebbingii*	**27, 39**		**ES 25%:** 2 l/1000 l water	When mealybugs are seen on shoots, flowers and fruits
434 *Bombotelia jocosatrix*	**12**		**WP 50%:** 3-4 kg/1000 l water	On foliage, when caterpillars appear
435 *Rhynchaenus mangiferae*	**39** **42**		**ES** or **WP 25%:** 1-1.5 kg/1000 l water **ES 50%:** 1000 cc/1000 l water	On foliage when first signs of damage are seen
436 *Deporaus marginatus*		see Rhynchaenus (No. 435)		
437 *Stathmopoda* sp.		see Leucoptera (No. 25)		On foliage when first signs of damage are seen
438 *Orthaga exvinacea*	**12**		**ES 25%:** 500 cc/100 l water	On foliage when first signs of damage are seen
439 *Parasa lepida*	**12**		**WP 50%:** 400 g/100 l water	On foliage when young caterpillars appear
440 *Nutaurelia zambesina*		see Stathmopoda (No. 437) Orthaga (No. 438) and Parasa (No. 439)		On foliage when young caterpillars appear

Pest	Product	Formulation and Dosage	Where and when to apply
441 *Cricula trifenestrata*	see Stathmopoda (No. 437) and Parasa (No. 439)		
442 *Selenothrips rubrocinctus*	**25**	**ES 50%:** 1 kg/1000 l water	On foliage when first signs of damage are seen. Repeat after one week
	33.4	**ES 50%:** 1.5 kg/1000 l water	
	42	**ES 50%:** 0.5-0.75 kg/1000 l water	
	see also Selenothrips (No. 85) and Scirtothrips (No. 527)		
443 *Pseudococcus adonidum*	**27, 34, 39**	**ES 25%:** 1.5-2 l/1000 l water	On foliage when pests appear. Soaking spray needed. Repeat after 3-4 weeks
444 *Ferrisia virgata*	see Ferrisia (No. 72)		
445 *Coccus mangiferae*	**35**	**ES 25%:** 4 l/1000 l water	When scales appear; repeat after 2-3 weeks. Soaking spray needed
	27, 39	**ES 25%:** 1.5 l/1000 l water	
	see also Saissetia (No. 488)		
446 *Coccus hesperidum*	see Coccus (No. 445) and Saissetia (No. 488)		
447 *Eucalymnatus tessellatus*	see Coccus (No. 445) and Saissetia (No. 488)		
448 *Phenacaspis cockerelli*	**35**	**WP 25%:** 4 kg/1000 l water	When scales appear; repeat after 2-3 weeks. Soaking spray needed
449 *Apsylla cistellata*	**12**	**WP 50%:** 5 kg/1000 l water	On foliage and shoots against the adults in March, against the nymphs in September
	39, 48	**WP 25%:** 2 kg/1000 l water	
450 *Scirtothrips mangiferae*	**27, 40**	**ES 25%:** 750-1000 cc/1000 l water	On first signs of damage
451 *Erosomyia mangiferae*	**28**	**ES 40%:** 1 l/1000 l water	On first signs of damage

452 *Idiocerus clypealis*	**12** **33.10**	**WP 50%:** 5 kg/1000 l water **ES 50%:** 500-750 cc/1000 l water	As soon as the inflorescence appears. Repeat after 3-4 weeks
453 *Idiocerus atkinsoni*	see Idiocerus (No. 452)		
454 *Idiocerus niveosparsus*	see Idiocerus (No. 452)		
455 *Saissetia coffeae*	**27, 34, 39** **35** see also Saissetia (No. 488)	**WP** or **ES 25%:** 1.5-2 kg/1000 l water **WP 25%:** 4 kg/1000 l water	On foliage and fruits when young scales appear; repeat after 2 weeks
456 *Coccus viridis*	see Saissetia (No. 455)		When scales appear
457 *Ceroplastes rubens*	see Ceroplastes (No. 487)		When scales appear
458 *Cryptorrhynchus (Sternochetus) mangiferae*	**12** **27** **34, 40** **13**	**WP 50%:** 2.5 kg/1000 l water **WP 25%:** 1 kg/1000 l water **WP** or **ES 25%:** 1.5 kg/1000 l water **WP 20%:** 3 kg/1000 l water	On young fruits and foliage, when first signs of damage are seen
459 *Cryptorrhynchus gravis*	see Cryptorrhynchus (No. 458)		
460 *Philotroctis eutraphera*	see Cryptorrhynchus (No. 458)		On foliage and fruits when moths are on the wing
461 *Ceratitis cosyra*	**12** **27** **33.6, 33.10** see also Ceratitis (No. 523)	**WP 50%:** 2 kg/500 l water **WP 25%:** 500-750 g/500 l water **ES 60%:** 750 cc/500 l water	Apply as cover spray at fortnightly intervals during active season of fruit flies As cover spray and against the young larvae which have penetrated the fruits
462 *Dacus ferrugineus tryoni*	see Ceratitis (No. 461)		
463 *Anastrepha chiclayae*	see Ceratitis (No. 461)		
464 *Amblypelta lutescens*	see Pseudotheraptus (No. 604)		On foliage and fruits as cover spray

Citrus *(Citrus sp.)*

Pest	Product	Formulation and Dosage	Where and when to apply
465 *Tylenchulus semipenetrans*	**Warm water 45°C:**		Dip the infected roots of young trees for 25 minutes before planting
	152	**ES:** 100 l/ha	Treat the plants in the field (soil injection) or with irrigation-water 15-20 cm deep
	see also Aphelenchoides (No. 563)		
466 *Radopholus similis*	see Tylenchulus (No. 465)		
467 *Odontotermes obesus*	**13**	**G 5%:** 10-20 g/sq.m **ES 20%:** 500-1000 cc/100 l water	To soil surface and work in 15-25 cm Apply to the base of trunk and to roots
468 *Lachnosterna citri*	**10**	**G** or **D 10%:** 10 g/sq.m	To soil surface and work in 10-15 cm
469 *Solenopsis geminata*	**13, 17, 27**	**ES 20%:** 200-300 cc/100 l water	On foliage, trunk and into the small holes in the earth (several litres)
470 *Agrilus occipitalis*	see Macrophora (No. 472)		On trunk; two applications (June and August)
471 *Agrilus auriventris*	see Macrophora (No. 472)		do.
472 *Macrophora accentifer*	**13**	**ES 20%:** 2.5 l/100 l water	On trunk; two applications per year
473 *Melanauster chinensis*	see Macrophora (No. 472)		
474 *Cratosomus punctulatus*	see Macrophora (No. 472)		

475 *Ephestia vapidella*	**12** **13, 15** **25**	**WP 50%:** 300 g/100 l water **ES 20%:** 250 cc/100 l water **ES 50%:** 200 cc/100 l water	On trunk when first signs of damage are seen; repeat after 3-4 weeks
476 *Apate monachus*	see Chreostes (No. 12)		
477 *Squamura tetraonis*	see Squamura (No. 430)		
478 *Diploschema rotundicolle*	**13, 15**	**ES 20%:** 1.2-1.5 l/100 l water	On branches and twigs in January; repeat after 4 weeks
479 *Eurytoma fellis*	Cut off and burn galls **28** **39**	**ES 40%:** 100-200 cc/100 l water **ES 50%:** 100 cc/100 l water	On young stems when first signs of damage are seen
480 *Nezara viridula*	see Nezara (No. 841)		
481 *Rhynchocoris humeralis*	see Rhoecocoris (No. 483)		
482 *Biprorulus bilax*	see Rhoecocoris (No. 483)		
483 *Rhoecocoris sulciventris*	**12** **13** **31** **35** * **39** **42**	**ES 20%:** 1.25 l/500 l water **ES 25%:** 1.5 l/500 l water **ES 20%:** 3 l/500 l water **ES 50%:** 750 cc/500 l water **WP 25%:** 1 kg/500 l water **ES 50%:** 500 cc/500 l water	On foliage and shoots in June and July. During spring and early summer combined with spring fungicidal sprays (* only combine with neutral copper fungicides)
484 *Mictis profana*	see Rhoecocoris (No. 483)		
485 *Distantiella collarti*	see Distantiella (No. 93) and Rhoecocoris (No. 483)		
486 *Aphis spiraecola*	**27, 28, 36, 39, 41, 42, 48** **35**	**ES 20%:** 500 cc/500 l water **WP 25%:** 1-2 kg/500 l water	When pests appear in large numbers

Pest	Product	Formulation and Dosage	Where and when to apply
487 *Ceroplastes floridensis*		**Washing soda + Oil** 12.5 kg + **white oil:** 450 cc/ 500 l water	When scales have settled on twigs; repeat after 2-3 weeks
	27	**ES 25%:** 1 l/500 l water	Apply spray when young scales have emerged from the eggs and have settled on the leaves. Repeat after 2-3 weeks
	35	**WP 25%:** 2 kg/500 l water	
	39	**ES 50%:** 500 cc/500 l water	
488 *Saissetia nigra*	**35 + 60**	**WP 25%:** 2 kg + **white oil:** 6.25 l/500 l water	When young scales appear; repeat after 3 weeks
	39 + 60	**WP 25%:** 750 g + **white oil:** 6.25 l/500 l water	
	Ant-control may be a necessary supplementary measure see also Coccus (No. 445) and Saissetia (No. 455)		
489 *Icerya purchasi*	see Saissetia (No. 488)		
490 *Drosicha stebbingii*	**27**	**ES 25%:** 1 l/500 l water	When mealybugs are seen on shoots
	39	**ES 50%:** 500 cc/500 l water	
491 *Pinnaspis* sp.	**82** (Disp. sulphur) see Saissetia (Nos. 455, 488) and Unaspis (No. 507)	**WP:** 4 kg/1000 l Bordeaux mixt.	In spring, when scales appear, i.e. just as buds are swelling
492 *Diaprepes abbreviatus*	**12**	**WP 50%:** 1-1.5 kg/500 l water	When pests appear
493 *Maleuterpes dentipes*	see Diaprepes (No. 492)		When pests appear
494 *Phyllocnistis citrella*	**27**	**ES 25%:** 1 l/1000 l water/ha	On foliage when first signs of damage are seen
	39	**ES 50%:** 500 cc/1000 l water/ha	
495 *Sparganothis stultana*	**12**	**WP 50%:** 1-1.5 kg/500 l water	On foliage when first signs of damage are seen
	13	**WP 25%:** 1 kg/500 l water	
	39	**WP 25%:** 500 g/500 l water	

496 *Papilio demoleus*	**12** **33.6**	**WP 50%:** 3 kg/1000 l water **ES 50%:** 1-1.5 kg/1000 l water	On foliage when young caterpillars appear
497 *Oecophylla smaragdina*	see Oecophylla (No. 36)		On foliage
498 *Atta insularis*	see Chapter III, p. 469 and Chapter V, p. 136		
499 *Spanioza erythreae*	**25** **28** **34, 39, 48**	**ES 50%:** 2 kg/1000 l water **ES 40%:** 500 cc/1000 l water **ES 25%:** 1 l/1000 l water	On foliage when first signs of damage are seen; repeat after 2 weeks, if necessary
500 *Scirtothrips citri*	see Spanioza (No. 499)		
501 *Aleuracanthus woglumi*	**28, 33.10** **35** **39** **42** **60**	**ES 40%:** 1 l/1000 l water **ES 25%:** 3 l/1000 l water **ES 50%:** 500-750 cc/1000 l water **ES 50%:** 1.4 kg/1000 l water **White oil:** 12 l/1000 l water	On foliage when underside of leaves show black, oval scales and first signs of damage are seen. Repeat after 2 weeks
502 *Aleurotrachelus citri*	see Aleuracanthus (No. 501)		
503 *Toxoptera citricida*	see Toxoptera (No. 87)		When pests appear
504 *Toxoptera aurantii*	see Toxoptera (No. 87)		
505 *Parlatoria pergandii*	see Aonidiella (No. 535)		
506 *Coccus hesperidum*	see Coccus (No. 445) (Ant-control; **13 WP 50%:** 1 kg/100 l water)		When scales appear (Ants swarming on trees indicate presence of scales) (Spray the trunk and soil beneath the tree)
507 *Unaspis citri*	**39** see also Saissetia (No. 488)	**ES 25%:** 1.25 kg/1000 l water	Treat the centres of the trees, the spray being directed from the inside outwards (during dormant period). Post bloom

Pest	Product	Formulation and Dosage	Where and when to apply
508 *Anychus latus*	**27, 39, 48, 72** **49** **68, 68.1** **70** **73**	**ES 25%:** 1 l/1000 l water **WP 25%:** 1.2 kg/1000 l water **WP 25%:** 1.25 kg/1000 l water **WP 25%:** 3 kg/1000 l water **WP 25%:** 2 kg/1000 l water	On foliage when first signs of damage are seen. Soaking spray needed. Repeat after 1 week, if necessary
509 *Metatetranychus citri*	see Anychus (No. 508)		
510 *Tetranychus urticae*	see Anychus (No. 508)		
511 *Aceria sheldoni*	**42, 33.10** **82** (Lime sulphur) **82** (Colloidal or dispers. sulphur) **68, 68.1**	**ES 50%:** 1-1.5 kg/1000 l water **L:** 5 kg/400 l water **WP:** 4 kg/1000 l water **ES 50%:** 600-900 cc/1000 l water	Over the whole tree when shoot growth commences, or late in dormant season just as buds are swelling or after the crop has been harvested When buds are swelling. Repeat fortnightly
512 *Diaphorina citri*	**27** **35** **39**	**ES 25%:** 1 l/1000 l water (20 l/tree) **ES 50%:** 1 l/1000 l water **ES 20%:** 1 l/1000 l water	As soon as adults appear on shoots. Repeat after 2 weeks
513 *Tropinota vittula*	**22**	**WP 50%:** 2.5 kg/1000 l water	When beetles appear
514 *Prays citri*	**25, 42** **27**	**ES 50%:** 1 l/1000 l water **ES 25%:** 1-1.5 l/1000 l water	On first signs of damage
	see also Tropinota (No. 513) and Prays (No. 560)		
515 *Pachnaeus litus*	**12**	**WP 50%:** 2 kg/1000 l water	On foliage and young fruits when weevils appear
516 *Maleuterpes spinipes*	see Pachnaeus (No. 515)		

517 *Argyrotaenia citrana*	**11**	**WP 50%:** 1 kg/1000 l water	On foliage and fruits when first signs of damage are seen or before young caterpillars penetrate the fruits (waiting period between treatment and harvest: 2 weeks)
	12	**WP 50%:** 2-4 kg/1000 l water	
	25	**ES 50%:** 750 cc/1000 l water	
	39	**WP 25%:** 2 kg/1000 l water	
	41	**WP 25%:** 750-1000 g/1000 l water	
	42	**ES 50%:** 1 kg/1000 l water	
518 *Argyroploce leucotreta*	see Argyrotaenia (No. 517)		
519 *Citripestis sagittiferella*	see Argyrotaenia (No. 517)		
520 *Cryptoblabes gnidiella*	see Argyrotaenia (No. 517)		
521 *Ophideres fullonia*	**12**	**WP 50%:** 6.25 kg/1000 l water	On ripening fruits, i.e. when first fruitfall is observed. Repeat fortnightly during the active season of the moth
522 *Achaea lienardi*	see Ophideres (No. 521)		
523 *Ceratitis capitata*	**12**	**WP 50%:** 5 kg/500 l water	As cover spray: Apply a cover spray so as to wet as much of the foliage and fruit as possible without undue overflow. The spray should be aimed at the inner side of the tree canopy. Apply at 3-4 weekly intervals during active season of fruit fly (see also Chapter II, p. 43)
	18	**WP 50%:** 5 kg/500 l water	
	23	**ES 25%:** 1 l/500 l water	
	33.6, 33.10, 42	**ES 50%:** 0.75-1 kg/500 l water	
	27 + 86	**WP 40%:** 75 g + **yeast:** 1 kg/3 l water	Application by aircraft 40 l/ha, 4 applications per season

Pest	Product	Formulation and Dosage	Where and when to apply
523 *Ceratitis capitata*	**23**	**WP 25%:** 1 kg + **dry sol. fish albumen:** 3 kg/500 l water	Apply the bait in the form of large drops at least once weekly. Repeat the application after rain. Begin applying the bait about six weeks before the fruit begins to ripen and continue to do so (except during the safe and picking periods) until approximately 3 weeks after the crop has been gathered (Per tree: 150-500 cc of bait, depending on size)
		ES 25%: 1 l + **sugar:** 37.5 kg/500 l water	
	31	**WP 50%:** 500 g + **sugar:** 37.5 kg/500 l water	
		WP 50%: 500 g + **dry sol. fish albumen:** 3 kg/500 l water	
	35	**WP 25%:** 1 kg + **sugar:** 37.5 kg/500 l water	
		WP 25%: 1 kg + **dry sol. fish albumen:** 3 kg/500 l water	
		ES 50%: 3 l + **yeast hydrolisate:** 1.5 kg/500 l water	Apply the spray with spray pump fitted with a coarse nozzle. The bait can be splashed on foliage with a whitewash brush or applied through a container with a perforated lid such as a shaker-topped bottle
		ES 50%: 3 l + **sugar:** 37.5 kg/500 l water	
	25	**ES 50%:** 3 l + **sugar:** 37.5 kg/500 l water	
524 *Dacus ornatissimus*	see Ceratitis (No. 523)		
525 *Anastrepha ludens*	see Ceratitis (No. 523)		
526 *Vespa orientalis*	see Ophideres (No. 521)		
527 *Scirtothrips aurantii*	**35**	**ES 50%:** 750-1000 cc/1000 l water	When ½-¾ petals have fallen; repeat after 4 weeks
	39, 48	**ES 20%:** 750-1000 cc/1000 l water	
	42	**ES 50%:** 250-500 cc/1000 l water	

528 *Heliothrips hacmorrhoidalis*	see Scirtothrips (No. 527)		
529 *Leptoglossus zonatus*	**12** **35**	**WP 50%:** 4 kg/1000 l water **ES 50%:** 1 l/1000 l water	On young fruits and foliage when pests appear
530 *Planococcus citri*	**27** **35** **39**	**ES 25%:** 1.25-1.5 l/1000 l water **ES 20%:** 3 l/1000 l water **ES 50%:** 500-750 cc/1000 l water	When white colonies of mealybugs are seen in large numbers. Soaking spray is necessary. Repeat after 3-4 weeks
531 *Aspidiotus hederae*	see Lepidosaphes (No. 538)		
532 *Chrysomphalus dictyospermi*	see Aonidiella (No. 535)		
533 *Chrysomphalus ficus*	**35** see Aonidiella (No. 535)		On foliage and fruits when scales are visible. Soaking spray is necessary. Repeat after 2 weeks
534 *Chrysomphalus pinnulifer*	see Aonidiella (No. 535)		
535 *Aonidiella aurantii*	**22.5** **27**	**ES 50%:** 1.25 kg/1000 l water **WP 25%:** 3 kg/1000 l water (also combined with white oil 1 : 80 or 1 : 40)	Post bloom treatment When young twigs and foliage are infested (Double spray programme; repeat after 2 weeks)
	27 + 60	**ES 60%:** 1.5 kg + white oil 12.5-20 kg/1000 l water	
	35	**WP 25%:** 5-6 kg/1000 l water	Before spraying it may be advisable to prune out all spent, dead wood from inside the trees so that they may be easily and completely sprayed. Soaking spray is necessary: 35-45 l for a well-grown tree (3 m high)
	35 + 60	**ES 50+:** 3 l + white oil: 12.5 l/1000 l water	
		(Ant control: **13 WP 50%:** 1 kg/100 l water: treatment of the nests or of the base of the plant and soil below)	
	39	**ES 50%:** 1-1.5 l/1000 l water (and also combined with white oil: 1 : 80 or 1 : 40)	

Pest	Product	Formulation and Dosage	Where and when to apply
536 *Selenaspidus articulatus*	see Aonidiella (No. 535)		
537 *Parlatoria ziziphi*	see Aonidiella (No. 535)		
538 *Lepidosaphes gloverii*	see Aonidiella (No. 535)		When scales appear; repeat after 3 weeks
539 *Lepidosaphes beckii*	see Lepidosaphes (No. 538)		
540 *Unaspis yanonensis*	see Lepidosaphes (No. 538)		
541 *Phyllocoptrupa oleivorus*	**68**	**ES 50%:** 600 cc/1000 l water	Post bloom treatment. Repeat in summer and autumn.
	82 (Lime sulphur + wett. sulphur)	20 kg + 5 kg/1000 l water	3 weeks after flowers have dropped. When rust mites appear on leaves and fruits
	(Colloidal or dispers. sulphur)	**WP:** 4 kg/1000 l water	When fruit is 1-2 cm in diameter
	(Sulphur-dust)	**D:** 50-80 kg/ha	As soon as presence of mites is established. Post bloom and later. Repeat at weekly intervals
	60	**White oil-ES:** 25 kg/1000 l water	When fruit is 1-2 cm in diameter
	Zineb	**WP 65%:** 1.2 kg/1000 l water	On first signs of damage

OIL PLANTS

Olive

Coco-nut and Oil-palm

Sesame

Castor

Ground-nuts

Olive *(Olea europaea)*

Pest	Product	Formulation and Dosage	Where and when to apply
542 *Tylenchulus semipenetrans*		see Tylenchulus (No. 465)	
543 *Pratylenchus coffeae*		see Radopholus (No. 102)	
544 *Hylobius perforatus*	**13**	**WP 20%:** 2-2.5 kg/500 l water	On trunk and branches when weevils appear. Repeat after 3 weeks if necessary
545 *Hylesinus toranio*		see Xyleborus (No. 16)	On branches and twigs when pests appear
546 *Phloeotribus oleae*	Cut out the attacked twigs **13**	**WP 20%:** 2 kg/500 l water	Spray the twigs when beetles appear. Repeat after 4 weeks
547 *Zeuzera pyrina*		see Phloeotribus (No. 546)	
548 *Otiorrhynchus cribricollis*	**13**	**WP 20%:** 2 kg/1000 l water	On foliage when weevils appear
549 *Saissetia oleae*		see Saissetia (Nos. 455 and 488)	On foliage and shoots when young scales appear
550 *Selenaspidus articulatus*		see Aonidiella (No. 535)	
551 *Mylabris oleae*	**12**	**WP 50%:** 1-2 kg/500 l water	When beetles appear
552 *Argopistes oleae*	**27, 39**	**WP 25%:** 500 g/500 l water	On foliage when first signs of damage are seen

553 *Margaronia quadristigmalis*	**12 + 40**	**WP 50%:** 1-1.5 kg + **WP 20%:** 500 g/ 500 l water (mixture)	On foliage when first signs of damage are seen
554 *Acherontia atropos*	**12**	**WP 50%:** 1.5 kg/500 l water	On foliage, when young caterpillars are seen
555 *Aleurolobus olivinus*	see Aleuracanthus (No. 501)		On foliage, when pests are visible
556 *Spilococcus simulator*	see Planococcus (No. 530)		
557 *Liothrips oleae*	**12**	**D 5%** **ES** or **WP 50%:** 500-750 g/500 l water	When pests appear. Repeat after 2 weeks if necessary
	27, 28, 39	**ES 25%:** 500 cc/500 l water	
558 *Euphyllura olivina*	**27, 47, 48, 33.10**	**ES 20%:** 500 cc/500 l water	In spring when psyllids appear. Repeat if necessary
	35	**ES 25%:** 2 l/1000 l water	
	42	**ES 50%:** 400 cc/1000 l water	
559 *Teleonemia australis*	**39**	**ES 50%:** 250 cc/500 l water	On first signs of damage
560 *Prays oleae*	**23**	**WP 25%:** 1.5 kg/500 l water	On young fruits when 3rd generation of moths appear (in June)
	28	**ES 40%:** 500 cc/500 l water	
	39	**WP 20%:** 500-750 g/500 l water	
	42	**ES 50%:** 500 cc/1000 l water	
561 *Parlatoria oleae*	**35**	**WP 25%:** 2 kg/500 l water	When young scales appear on shoots. Repeat after 2 weeks
	see also Aonidiella (No. 535)		
562 *Dacus oleae*	**23**	**ES 50%:** 600 cc/1000 l water (1st treatment) 400-600 cc/1000 l water (2nd treatment)	Treatment is begun when damage appears. Further treatment depends on the size of the olives when first attacked. If the first treatment is made early on small fruits a second treatment will be necessary after 30-40 days, or when any new infection appears. (About 7 litres liquid per medium sized tree.)
	27	**ES 60%:** 250 cc/1000 l water (1st treatment) 1 l/1000 l water (2nd treatment)	
	28	**ES 40%:** 750 cc/1000 l water (1st treatment) 1.5 l/1000 l water (2nd treatment)	
	42	**ES 50%:** 500 cc/1000 l water	

Coconut- and Oil-palm *(Cocos nucifera and Elaeis guineensis)*

Pest	Product	Formulation and Dosage	Where and when to apply
563 *Aphelenchoides cocophilus*	Pull out infected plants and burn them Fumigate the soil with a nematocide (see Meloidogyne No. 1)		
564 *Melittomma insulare*	**Coal-tar creosote** (Mixture)		Gouge out infected tissues, extending cavity to centre of tree, inwards and upwards, but avoiding, where possible, the sound wood at ground level Wait 24 hours Treat excised surfaces with the mixture, 2nd application 1 week later, when light coloured dust and particles, showing residual infestations, may be seen
565 *Oryctes boas*	Take away breeding materials (old and fallen palms) **9**	**D 5%:** mixed with saw dust 1:1	Stumps and logs should be cut down, dug out and burned. Apply in the leaf axils of coconut crowns. Repeat after 1 month
566 *Oryctes rhinoceros*	**9** see Oryctes (No. 565)	**WP 25%:** 500-1000 g/100 l water	Apply on traps (consisting of attractive breeding materials: palm trunk) which are laid in coconut gardens (at beginning of rainy season)

567 *Rhynchophorus ferrugineus*	**9, 10**	**D 5%** or **10%**	When the pest is active. Mix the dust with equal quantity of sand and place this mixture in the leaf axils of the seedlings once a month
	13	**WP 50%:** 2 kg/100 l water	Preventive measure Apply on trunk at beginning of rainy season. Repeat after one month
	39 + 10	**ES 50%:** 50 cc + **ES 50%:** 50 cc in 10 l water	Bore a hole of 1-2 cm in diameter into the centre of the stem. Fix a piece of metal tubing and screw it securely into the excavated hole. Connect the free end of the tube on to the hose of a sprayer containing the prepared spray liquid and gently pump until slight pressure is felt and no more of the spray is found to enter the stem. Repeat in about a month's time
568 *Rhynchophorus phoenicis*	**9**	**D 5%** or **10%** see also Rhynchophorus (No. 567)	Dust the crowns and trunks of palms once a month when the beetles are on the wing
569 *Rhina barbirostris*		see Rhynchophorus (No. 567)	
570 *Chrysomphalus ficus*		see Chrysomphalus (No. 533)	
571 *Amerrhinus pantherinus*	**13**	**WP 20%:** 400-500 g/100 l water see also Rhynchophorus (No. 568)	Apply on leaf stalks when weevils appear
572 *Coelaenomenodera elaeidis*	**27, 34, 39**	**WP** or **ES 25%:** 1 kg/1000 l water	On leaves when first signs of damage are seen
573 *Brontispa longissima*	**12** **13**	**WP 50%:** 3 kg/1000 l water **WP 50%:** 2 kg/1000 l water see also Coelaenomenodera (No. 572)	When beetles appear
574 *Plesispa Reichei*		see Coelaenomenodera (No. 572) and Brontispa (No. 573)	

Pest	Product	Formulation and Dosage	Where and when to apply
575 *Promecotheca Cumingi*		see Coelaenomenodera (No. 572) and Brontispa (No. 573)	
576 *Promecotheca Reichei*		see Coelaenomenodera (No. 572) and Brontispa (No. 573)	
577 *Nephantis serinopa*	**12**	**WP 50%:** 3-5 kg/1000 l water see also Coelaenomenodera (No. 572) and Brontispa (No. 573)	When caterpillars appear
578 *Homaledra sabalella*		see Coelaenomenodera (No. 572) and Nephantis (No. 577)	
579 *Agonoxena argaula*		see Coelaenomenodera (No. 572) and Brontispa (No. 573)	
580 *Parasa lepida*		see Parasa (No. 79) and Coelaenomenodera (No. 572)	
581 *Ploneta diducta*		see Parasa (No. 79) and Coelaenomenodera (No. 572)	
582 *Narosa conspersa*		see Parasa (No. 79) and Coelaenomenodera (No. 572)	
583 *Natada nararia*		see Setora (No. 125) and Coelaenomenodera (No. 572)	When caterpillars appear
584 *Thosea asigna*		see Setora (No. 125) and Coelaenomenodera (No. 572)	When caterpillars appear
585 *Thosea sinensis*		see Thosea (No. 318) and Coelaenomenodera (No. 572)	When caterpillars appear
586 *Chalcocelides albiguttata*		see Setora (No. 125) and Coelaenomenodera (No. 572)	When caterpillars appear
587 *Levuana iridescens*		see Coelaenomenodera (No. 572)	When caterpillars appear
588 *Artona catoxantha*		see Coelaenomenodera (No. 572)	When caterpillars appear
589 *Castnia licus*	**13**	**ES 20%:** 5 l/100 l water	Drench the heart of the palm with the emulsion in such a way that the emulsion runs down behind the leaf bases between these and the stem (2 l/tree)

590 *Pimelephila ghesquierei*	**15** **40**	**ES 20%:** 1 l/1000 l water **ES 20%:** 600-800 cc/1000 l water	On base of the young palms when caterpillars appear
591 *Brassolis sophorae*	**13**	**ES 20%:** 1.5 kg/100 l water Remove caterpillar nests from trees any time they can be found and destroy the insects Keep cultivation clean	On foliage when caterpillars appear Preventive measure: Apply the emulsion to the "heart" of the palm in such a way that it runs down between the bases of all affected leaves
592 *Sexava coriacea*	see Brassolis (No. 591)		
593 *Aularches miliaris*	see Brassolis (No. 591)		
594 *Tropidacris latreillei*	see Brassolis (No. 591)		
595 *Aleurodicus destructor*	see Aleuracanthus (No. 501)		
596 *Vinsonia stellifera*	**35** **39**	**ES 25%:** 4 l/1000 l water **ES 20%:** 2 l/1000 l water	When scales appear in large numbers. Repeat after 3 weeks
597 *Aspidiotus destructor*	**35** see Aspidiotus (No. 420)	**ES 60%:** 3 l/1000 l water	When scales appear in large numbers. Repeat after 3 weeks
598 *Diaspis boisduvalii*	see Vinsonia (No. 596)		
599 *Ischnaspis longirostris*	see Lepidosaphes (No. 538) Vinsonia (No. 596) and Ischnapsis (No. 42)		
600 *Pinnaspis buxi*	see Lepidosaphes (No. 538) and Vinsonia (No. 596)		
601 *Acritocera negligera*	**13**	**WP 50%:** 200-300 g/100 l water	Apply on leaf bases and flower spikes when moths are on the wing, i.e. when first signs of damage are seen
602 *Diacalandra taitenisis*	**13**	**WP 20%:** 3 kg/1000 l water	On young nuts, leaf base and upper parts of stems when weevils appear

Pest	Product	Formulation and Dosage	Where and when to apply
603 *Tirathaba rufivena*	**13**	**WP 50%:** 1.5 kg/1000 l water	On flower spikes, stems and young fruits when moths are on the wing, i.e. when first signs of damage on flower spikes are visible
604 *Pseudotheraptus wayi*	**12** **13**	**Kerosene-Spray:** 1.5 kg a.i./ha **WP 50%:** 3-4 kg/1000 l water **WP 20%:** 2-4 kg/1000 l water When control of scales is necessary at the same time, apply a combined spray: **12** or **13** + **35** (see Phenacaspis No. 607)	Aircraft-spraying Spray the crowns, when first signs of damage are seen. Repeat at 3-monthly intervals
605 *Amblypelta lutescens*	see Pseudotheraptus (No. 604)		
606 *Amblypelta cocophaga*	see Pseudotheraptus (No. 604)		
607 *Phenacaspis cockerelli*	**35**	**WP** or **ES 25%:** 4 kg/1000 l water	appear

608 *Holotrichia Helleri*	see Exopholis (No. 104)		Work into the soil to a depth of 15-20 cm (as preventive measure; before planting)
609 *Agonoscelis pubescens*	**12**	**D 5%:** 30-40 kg/ha **WP 50%:** 3 kg/1000 l water	On foliage and stems as soon as bugs appear in large numbers
	27, 39	**D 1.5%:** 30-40 kg/ha **ES 25%:** 1-1.5 l/1000 l water	
	35	**WP 40%:** 1.5-2.5 kg/1000 l water	
610 *Baris helleri*	**13**	**WP 50%:** 1.5 kg/1000 l water	On foliage and stems when weevils appear
611 *Aphthona bimaculata*	**12**	**D 2%:** 40 kg/ha **WP 50%:** 2 kg/1000 l water	On foliage when beetles appear
612 *Ootheca mutabilis*	see Aphthona (No. 611)		
613 *Epilachna chrysomelina*	see Aphthona (No. 611)		
614 *Maruca testulalis*	**39**	**ES 20%:** 1 l/1000 l water	On foliage when first signs of damage or caterpillars are seen
	see also Fundella (No. 328)		
615 *Hieroglyphus banian*	see Hieroglyphus (No. 245) and Zonocerus (No. 35)		When pests appear
616 *Thrips* sp.	see Selenothrips (No. 85)		
617 *Cyrtopeltis tenuis*	**12**	**WP 50%:** 2-3 kg/1000 l water	On foliage and shoots when bugs appear
	13	**WP 50%:** 1-1.5 kg/1000 l water	
	39	**ES 50%:** 500 cc/1000 l water	
	42	**ES 50%:** 400-600 cc/1000 l water	
618 *Lygus vosseleri*	see Cyrtopeltis (No. 617) and Creontiades (No. 797) and Lygus (No. 44)		

Pest	Product	Formulation and Dosage	Where and when to apply
619 *Myzodes persicae*	see Myzodes (No. 717)		
620 *Antigastra catalaunalis*	**12**	**WP 50%:** 3 kg/1000 l water	On leaves, shoots and capsules as soon as the leaves are spun together
	13, 15	**ES 20%:** 1.5 l/1000 l water	
	34, 39	**ES 20%:** 1 l/1000 l water	
621 *Aspavia* sp.	see Agonoscelis (No. 609)		
622 *Eusarcoris ventralis*	see Agonoscelis (No. 609)		
623 *Phricodus* sp.	see Agonoscelis (No. 609)		
624 *Tetranychus urticae*	**26, 35**	**ES 20%:** 1-1.5 l/1000 l water	On foliage when first signs of damage are seen, soaking spray needed. Repeat after 10-12 days
	25	**ES 50%:** 1.5 l/1000 l water	
	42	**ES 50%:** 400-800 cc/1000 l water	

625 *Radopholus similis*		see Radopholus (No. 2)		
626 *Parasa vivida*		see Leucoplema (No. 28) and Coelaenomenodera (No. 572)		
627 *Tarayama diplocyma*		see Leucoplema (No. 28) and Coelaenomenodera (No. 572)		
628 *Achaea janata*	**9** **12**		**WP 25%:** 2.5-3 kg/1000 l water **WP 50%:** 3 kg/1000 l water	When young caterpillars start to skeletonise the leaves
629 *Prodenia litura*		see Prodenia (No. 132)		When young caterpillars appear
630 *Euproctis rubricosta*		see Achaea (No. 628)		When young caterpillars appear
631 *Euproctis producta*		see Achaea (No. 628)		
632 *Dasychira georgiana*	**12** **27, 34, 39** **53**		**D 5%** **WP 50%:** 4 kg/1000 l water **ES 20%:** 1 l/1000 l water **WP 50%:** 2 kg/1000 l water	When young caterpillars appear
633 *Dasychira inclusa*		see Empoasca (No. 636)		
634 *Orgyia mixta*		see Dasychira (No. 632)		
635 *Ptyelus grossus*		see Dasychira (No. 632)		
636 *Empoasca flavescens*	**27, 39**	see also Empoasca (No. 814)	**ES** or **WP 25%:** 1-1.25 l/1000 l water	On foliage, when first signs of damage are seen. Repeat after 2 weeks if necessary
637 *Tetranychus urticae*		see Tetranychus (No. 820)		

Pest	Product	Formulation and Dosage	Where and when to apply
638 *Nezara viridula*	**35**	**D 5%**	When bugs appear and cause damage
		WP 40%: 2 kg/1000 l water	
	39	**WP 25%:** 1.5 kg/1000 l water	
	see also Rhoecocoris (No. 483)		
639 *Lygus* sp.	**12**	**WP 50%:** 3 kg/1000 l water	When bugs appear and cause damage
	see also Nezara (No. 638)		
640 *Dichocrocis punctiferalis*	**12**	**D 5%:** 30-50 kg/ha	On capsules and shoots when first signs of damage are visible. Repeat after 3 weeks if necessary
		WP 50%: 3-5 kg/1000 l water	
	13	**WP 50%:** 1-2 kg/1000 l water	
	14.1	**ES 40%:** 2-4 l/1000 l water	
	39	**ES 25%:** 1 l/1000 l water	
641 *Adelphocoris apicalis*	**14.1**	**ES 40%:** 2 l/500 l water	On capsules and shoots when first signs of damage are visible. Repeat after 3 weeks if necessary

642 *Meloidogyne* sp.	Crop rotation see Meloidogyne (No. 304)		
643 *Pratylenchus* sp.	Crop rotation see Meloidogyne (No. 304)		
644 *Schizonycha africana*	see Lachnosterna (No. 354)		
645 *Hodotermes mossambicus*	see Hodotermes (No. 170)		
646 *Graphognathus leucoloma*	**7, 27**	**G 10%:** 20-25 kg	As curative measure: Row-treatment. On soil surface and work into soil
		ES 20%: 1-2 l/1000 l water	Apply round plant base 1-2 l per sq.metre
	13	**WP 50%:** 1 kg/750 l water/ha	As preventive measure: On foliage when weevils appear
647 *Sphenoptera perotetti*	**39** see also Graphognatus (No. 646)	**ES 50%:** 750 cc/750 l water/ha	On base of plants, stems and foliage when pests appear as preventive measure
648 *Alcides arcuatus*	see Sphenoptera (No. 647)		
649 *Creontiades pallidus*	**12**	**WP 50%:** 2-2.5 kg/750 l water/ha	On foliage when pests appear; repeat after 3 weeks if necessary
	13	**WP 50%:** 750-1000 g/750 l water/ha	
	27, 34, 39	**ES 25%:** 750-1000 cc/750 l water/ha	
650 *Hilda patruelis*	**7**	**WP 50%:** 2.5 kg/500 l water/ha	Before planting, spray the field with the suspension and work into top 5-7.5 cm of soil
	27, 34, 39,	**ES** or **WP 25%:** 750-1000 g/ 750 l water/ha	As soon as the first signs of damage are seen; repeat after 3 weeks if necessary
	36	**ES 25%:** 1.5 l/750 l water/ha	

Pest	Product	Formulation and Dosage	Where and when to apply
651 *Dysmicoccus brevipes*	see Dysmicoccus (No. 384)		On foliage and shoots when pests appear
652 *Luperodes quaternus*	see Chaetocnema (No. 366)		On foliage when beetles appear
653 *Spilosoma strigatula*	**27, 34** **42**	**WP 25%:** 750-1000 g/750 l water/ha **ES 50%:** 400-600 cc/750 l water/ha	On foliage when young caterpillars appear
654 *Amsacta albistriga*	see Spilosoma (No. 653)		
655 *Catopsilia eurythme*	see Spilosoma (No. 653)		
656 *Myllocerus* sp.	**13** **39**	**WP 20%:** 1-1.5 kg/750 l water/ha **WP 25%:** 750 g/750 l water/ha	On foliage when weevils appear
657 *Stomopteryx subsecivella*	**12**	**WP 50%:** 3.75 kg/750 l water/ha	On first signs of damage
658 *Maruca testulalis*	see Maruca (No. 614) and Fundella (No. 328)		On foliage when first signs of damage are seen
659 *Lamprosema indicata*	see Maruca (No. 614) and Fundella (No. 328)		
660 *Laphygma exigua*	**12** **13** **25**	**WP 50%:** 3-3.5 kg/750 l water/ha **WP 50%:** 750-1000 g/750 l water/ha **ES 50%:** 1000-2000 cc/750 l water/ha	On foliage when young caterpillars, i.e. when first signs of damage are seen
661 *Achaea finita*	see Laphygma (No. 660)		
662 *Prodenia litura*	see Laphygma (No. 660)		
663 *Chrotogonus* sp.	**13**	**WP 50%:** 750-1000 g/750 l water/ha	On first signs of damage

664 *Scirtothrips dorsalis*	**27, 34, 39** **29** **42**	**ES 25%:** 375-750 cc/750 l water/ha **ES 40%:** 375-750 cc/750 l water/ha **ES 50%:** 300-400 cc/750 l water/ha	On foliage when first signs of damage are seen. Repeat after 2 weeks if necessary
665 *Taeniothrips distalis*	see Scirtothrips (No. 664)		
666 *Heliothrips indicus*	see Scirtothrips (No. 664)		
667 *Cicadulina arachidis* *Cicadulina similis*	**26, 27, 33.10, 39, 41, 42**	**ES 25%:** 750 cc/750 l water	On foliage when first pests appear; repeat at fortnightly intervals
668 *Empoasca fabae*	see Cicadulina (No. 667)		
669 *Pergandeida robiniae*	**26, 27, 29, 30, 32, 33, 37, 38, 39, 41, 42, 47, 49** **29** **35** **52**	**ES 20%:** 560-750 cc/750 l water **ES 40%:** 750 cc/750 l water **ES 25%:** 1125 cc/750 l water **S 6%:** 750 cc/750 l water	On foliage and stems when pests appear
670 *Tetranychus urticae*	see Tetranychus (No. 327 and 820)		
671 *Frankliniella tritici*	see Thrips (No. 810)		
672 *Frankliniella fusca*	see Thrips (No. 810)		
673 *Monolepta australis*	**12**	**WP 50%:** 2 kg/1000 l water	When beetles appear
674 *Oxycetonia versicolor*	**22**	**WP 50%:** 2 kg/1000 l water	Only when beetles cause considerable damage to flowers
675 *Coryna apicicornis*	see Oxycetonia (No. 674)		
676 *Aphanus sordidus*	**12**	**D 5%:** 250 g/100 kg pods	After sun-drying, mix dust with the pods before storing. One mixing is enough

TOBACCO, PYRETHRUM, SPICES AND DRUGS

Tobacco

Pyrethrum

Pepper

Chillies

Quinine

Tobacco *(Nicotiana sp.)*

Pest	Product	Formulation and Dosage	Where and when to apply
677 *Meloidogyne* sp.	**143**	**L:** 120 l/ha to a depth of 20-25 cm at planting station or in the row	Field: 2-3 weeks before transplanting the tobacco seedlings
	146	**L:** 60 l/ha to a depth of 20-25 cm at planting station or in the row	Field: 2-3 weeks before transplanting the tobacco seedlings
	143	**L:** 550 l/ha to a depth of 25 cm at 40 cm intervals	Seedbed: Several weeks before planting
	146	**L:** 350 l/ha to a depth of 25 cm at 40 cm intervals	do.
	149	**L:** 500 cc/sq.m (cover the bed with polythene; control nematodes, weeds and some soil borne fungi)	do.
678 *Melolonthinae* *Rutelinae*	**7**	**G 10%:** 24 kg/ha **WP 40%:** 6 kg/ha	Broadcast on soil surface when preparing for planting and work in 6-10 cm
	10, 16	**G 10%:** 60-80 kg/ha **WP 50%** or **ES 50%:** 12 kg/ha	
	13	**ES 20%:** 2 l/200 l water	Pour 50-100 cc of the solution down the base of the stem
679 *Drasterius* sp. *Heteroderes* sp. *Agriotes* sp.	**10** **16**	**WP 50%:** 3 kg/3000 l water/ha **WP 25%:** 3 kg/3000 l water/ha	Around the stems when plants are transplanted so that the soil is wet (setting-water treatment)
	7	**WP 25%:** 10-12 kg/500 l water/ha	Broadcast on soil surface 1 month before planting and work in 15-20 cm
	10	**WP 50%:** 10 kg/500 l water/ha	
	13	**WP 50%:** 4-5 kg/500 l water/ha	
	17	**G 5%:** 10 kg/ha	
	27	**G 10%:** 20 kg/ha	

680 *Gryllotalpa africana*	see Gryllotalpa (No. 7)		
681 *Scapteriscus vicinus*	see Gryllotalpa (No. 7)		
682 *Gonocephalum acutangulum*	**7** **10**	**WP 40%:** 1.5 kg/6000 l water/ha **WP 50%:** 2.4 kg/6000 l water/ha	60 cc to the plant, planted after the rains
	see also Drasterius (No. 679) and Opatrum (No. 683)		
683 *Opatrum sabulosum*	**7**	**D 2.5%:** 25 kg mixed with fertilizer	Put the material in the planting hole and mix with the soil before planting
	see also Drasterius (No. 679) and Gonocephalum (No. 682)		
684 *Scotia (Euxoa, Agrotis) segetum*	**7, 12** **13**	**D 5%:** 40 kg/ha **D 2%:** 40 kg/ha	Apply dust to plant and surrounding soil
	7 **12** **13**	**WP 40%:** 900 g/300 l water/ha **WP 50%:** 3 kg/300 l water/ha **WP 50%:** 450 g/300 l water/ha	Spray base of stem and surrounding soil
		Bait = WP 50%: 100 g + bran 40 kg mixture, 40 kg/ha	Broadcast on soil surface
	7	**Bait = WP 40%:** 200 g + 20 kg bran mixture (add sufficient water to make a soft porridge-like slurry) **12.21** or **30.1** may also be used in this way	Scatter the bait along the rows in the late afternoon so that it does not dry out before nightfall
685 *Scotia (Agrotis) ypsilon*	**9**	**Bait = D 5%:** 10 kg + bran 125 kg mixture, dampen with water so that the materials are crumbly and not over-moist	Broadcast on soil surface of 1 hectare
686 *Feltia subterranea*	see Scotia (No. 684)		
687 *Brachytrypus membranaceus*	see Gryllulus (No. 63) and Brachytrypus (No. 150)		
688 *Paralixus truncatulus*	**13**	**WP 50%:** 2 kg/500 l water	Spray stem when pests appear

Pest	Product	Formulation and Dosage	Where and when to apply
689 *Trichobaris trinotata*	**39**	**ES 50%:** 750 cc/500 l water	On stems and leaves when first signs of damage are seen
	see also Paralixus (No. 688)		
690 *Phthorimaea heliopa*	**12**	**D 5%:** 40 kg/ha	
		WP 25% or **ES 25%:** 3 kg/600 l water/ha	As preventive measure: Spray or dust advanced crops fortnightly
	39	**D 1%:** 40 kg/ha	As soon as first seedlings in seedbeds show swollen stems
		ES 50%: 300-450 cc/600 l water/ha	
691 *Nezara viridula*	**13**	**WP 50%:** 1 kg/500 l water/ha	On leaves and stems when pests appear
	35.3	**Dust 1%:** 25-30 kg/ha	
	see also Cyrtopeltis (No. 617) and Nezara (No. 841)		
692 *Planococcus citri*	**34**	**ES 20%:** 1.25-1.5 l/750 l water/ha	When pests appear. Repeat after 10 days
	35	**ES 50%:** 2.5 l/750 l water/ha	
	39	**ES 20%:** 1.5 l/750 l water/ha	
693 *Ditylenchus dipsaci*	**39**	**ES 50%:** 750 cc/1000 l water/ha	On foliage and stems when first signs of damage are seen
694 *Epilachna 28-maculata*	**12**	**WP 50%:** 2 kg/500 l water/ha	When beetles appear
	13	**WP 20%:** 2 kg/500 l water/ha	
695 *Lema bilineata*	**12**	**D 5%:** 20-25 kg/ha	When beetles appear
	see also Epilachna (No. 694)		
696 *Epithrix hirtipennis*	**12**	**D 5%:** 20-30 kg/ha	The lowest leaves on the plant must be treated
		WP or **ES 25%:** 1.5 kg/250 l water/ha	
	34	**ES 25%:** 250 cc/250 l water/ha	
697 *Mimaulus thesii*	**7**	**WP 40%:** 1.25 kg/500 l water/ha	
	13, 15	**WP 50%:** 1 kg/500 l water/ha	When weevils appear

698 *Psara periusalis*	**27**	**ES 60%:** 500 cc/500 l water/ha	When first signs of damage appear
699 *Phthorimaea operculella*	**12**	**WP 50%:** 3 kg/750 l water/ha	As preventive measure: Spray every 14 days after first signs of damage appear
	27	**ES 25%:** 1.5 l/750 l water/ha	When first signs of damage (mines) appear
	28	**ES 40%:** 1000 cc/750 l water/ha	
	39	**ES 50%:** 500-750 cc/750 l water/ha	
700 *Diacrisia obliqua*	see Thosea (No. 318)		When caterpillars appear
701 *Protoparce sexta*	**11**	**ES 25%:** 4 l/500 l water/ha	When caterpillars appear
	21, 34	**ES 25%:** 2 l/500 l water/ha	
	see also Mimaulus (No. 697)		
702 *Heliothis (obsoleta) zea*	**0**	**Bait = WP:** 1 kg + maize meal 9 kg (mixture) 10 kg/ha	To buds of plants when small caterpillars appear
	11	**Bait = WP 50%:** 250 g + maize meal 10 kg (mixture) 10 kg/ha	
	12	**Bait = WP 50%:** 250 g + maize meal 10 kg (mixture) 10 kg/ha	
		D 5%: 20-25 kg/ha	On buds and foliage; repeat at fortnightly intervals
		WP or **ES 50%:** 2 kg/750 l water/ha	
	21	**ES 25%:** 2 l/1000 l water/ha	
	30.1	**ES 60%:** 0.5-1 l/1000 l water/ha	
703 *Prodenia litura*	**12**	**WP 50%:** 3-4 kg/750 l water/ha	When caterpillars appear or first signs of damage are seen
	see also Mimaulus (No. 697) and Prodenia (No. 837)		
704 *Laphygma exigua*	see Laphygma (No. 660)		
705 *Zonocerus elegans*	**10**	**WP 50%:** 2 kg/1000 l water	Cover a strip 10-15 m wide round the plot
	12	**D 5%**	
		WP 50%: 3 kg/1000 l water	
	13	**D 2%**	
		WP 50%: 1 kg/1000 l water	
	35	**ES 50%:** 3 l/1000 l water	
706 *Catantops opulentus*	see Zonocerus (No. 705)		

Pest	Product	Formulation and Dosage	Where and when to apply
707 *Thrips tabaci*	**27** **39**	**ES 25%:** 600-750 cc/500 l water **ES 50%:** 250 cc/500 l water	When first signs of damage appear
	see also Thrips (No. 810)		
708 *Frankliniella fusca*	see Thrips (No. 810)		
709 *Heliothrips haemorrhoidalis*	see Scirtothrips (No. 527)		
710 *Anaphothrips obscurus*	see Thrips (No. 707 and 810)		
711 *Cyrtopeltis tenuis*	see Cyrtopeltis (No. 617)		
712 *Dicyphus minimus*	**39**	**D 1%:** 15-20 kg/ha **ES 25%:** 750-1000 cc/750 l water/ha	On folige as needed
713 *Orosius argentatus*	see Empoasca (Nos. 636 and 814)		
714 *Empoasca tabaci*	see Empoasca (Nos. 636 and 814)		
715 *Bemisia tabaci*	**28, 33.10** see Bemisia (No. 817)	**ES 40%:** 625 cc/1200 l water/ha	When the plants look sickly and are full of very minute, white flying insects
716 *Trialeurodes tabaci*	see Bemisia (No. 817) and Bemisia (No. 715,		
717 *Myzodes persicae*	**21** **27** **35** **36** **39** **28** **42**	**ES 25%:** 1.25 l/750 l water/ha **ES 25%** or **WP 25%:** 1 l/750 l water/ha **ES 25%** or **WP 25%:** 1.25-2 l/750 l water/ha **ES 20%:** 1 l/750 l water/ha **ES 50%** or **WP 50%:** 300-500 cc/750 l water/ha **ES 40%:** 500 cc/750 l water/ha **ES 50%:** 400-800 cc/750 l water/ha	When aphids appear on plants. Do not apply insecticides for 5 days before transplanting

718 *Macrosiphon solani*		see Myzodes (No. 717)		
719 *Cyaneolytta pectoralis*		see Mylabris (No. 856)		
720 *Heliothis virescens*		see Heliothis (No. 702)		
721 *Heliothis assulta*		see Heliothis (No. 702)		
722 *Lasioderma serricorne*	**2**	synergised pyrethrum **spray:** tel quel		Spray the room once a fortnight
	13 **17**	**WP 50%:** 1 kg/100 l water **WP 20%:** 2.5 kg/100 l water	100 cc/ sq.m	Treatment of the walls of tobacco stores
		see also Balanogastris (No. 166)		
723 *Setomorpha margalaestriata*		see Lasioderma (No. 722)		
724 *Ephestia elutella*		see Lasioderma (No. 722)		

Pyrethrum *(Chrysanthemum cinerariaefolium)*

Pest	Product	Formulation and Dosage	Where and when to apply
725 *Nysius* sp.	see Creontiades (No. 797)		On stems when pests appear
726 *Frankliniella dampfi*	see Thrips (No. 727)		
727 *Thrips tabaci*	**28, 48**	**ES 40%:** 500 cc/500 l water/ha	On foliage when pests appear. Repeat 2 weeks later
728 *Myzodes persicae*	see Myzodes (No. 717)		
729 *Tetraryolius bucleni*	**28, 48**	**ES 40%:** 500-750 cc/500 l water/ha	Repeat after 14 days
	see Tetranychus (No. 820) or Thrips (No. 727)		

730 *Meloidogyne* sp.		see Meloidogyne (No. 101)	Pre-plant treatment
731 *Radopholus similis*		see Radopholus (No. 102)	do.
732 *Disphinctus maesarum*		see Heliothis (No. 137)	
733 *Ferrisia virgata*		see Ferrisia (No. 72)	When mealybugs appear
734 *Saissetia coffeae*		see Saissetia (No. 455) and Saissetia (No. 488)	
735 *Lepidosaphes piperis*	**39**	**ES 50%:** 750-1000 cc/1000 l water	On foliage and stems when scales appear. Repeat after 2 weeks
736 *Thosea sinensis*		see Thosea (No. 318)	
737 *Cricula trifenestrata*		see Parasa (No. 439)	
738 *Gynaikothrips Karny*		see Thrips (No. 810)	
739 *Elasmognathus greeni*		see Habrochila (No. 38)	
740 *Diplogomphus hewitti*		see Habrochila (No. 38)	
741 *Longitarsus nigripennis*	**12** **39**	**WP 50%:** 4 kg/1000 l water **D 1%:** 15 kg/ha	When beetles appear on plant. Repeat after 2 weeks
742 *Lophobaris piperis*	**13**	**WP 50%:** 1 kg/1000 l water see also Trichobaris (No. 689)	On foliage and stems when weevils appear or when first signs of damage are seen
743 *Dasynus piperis*		see Dasynus (No. 352) and Leptoglossus (No. 529)	
744 *Elasmognathus hewitti*		see Habrochila (No. 38)	

Chillies *(Capsicum sp.)*

Pest	Product	Formulation and Dosage	Where and when to apply
745 *Meloidogyne* sp.	see Meloidogyne (No. 304)		
746 *Radopholus similis*	see Meloidogyne (No. 304)		
747 *Hodotermes mossambicus*	see Hodotermes (No. 170)		
748 *Scirtothrips dorsalis*	see Scirtothrips (No. 664) and Thrips (No. 810)		
749 *Empoasca lybica*	see Empoasca (No. 814)		
750 *Tetranychus* sp.	see Tetranychus (No. 327)		
751 *Anthonomus Eugenii*	**12**	**D 5%:** 25-30 kg/ha **WP 50%:** 4 kg/1000 l water	On foliage when weevils appear. Repeat weekly
	22	**WP 20%** or **ES 20%:** 10 kg/1000 l water	
752 *Phthorimaea gudmanella*	**22**	**WP 20%** or **ES 20%:** 10-15 kg/1000 l water	On flowers and young pods when first signs of damage are seen
753 *Zonosemata electa*	**35**	**WP 40%:** 4 kg/1000 l water	On foliage when flies appear or when first signs of damage are seen. Repeat at fortnightly intervals
754 *Helopeltis westwoodi*	**12**	**D 5%:** 20-30 kg/ha **WP 50%:** 2-4 kg/1000 l water	On foliage when pests appear or when first signs of damage are seen

755 *Meloidogyne* sp.		see Meloidogyne (Nos. 1 and 101)		
756 *Coccus viridis*		see Saissetia (No. 455) and Saissetia (No. 488)		On trunks and leaves when scales appear
757 *Howardia biclavis*		see Howardia (No. 76)		
758 *Alcides cinchonae*	**12** **13, 15**		**WP 50%:** 5 kg/1000 l water **ES 20%:** 2-4 l/1000 l water	On leaves and twigs when weevils appear. Repeat after 2-3 weeks if necessary
759 *Helopeltis cinchonae*	**12**		**WP 50%:** 5 kg/1000 l water	On foliage when bugs appear
760 *Dactylispa manteroi*	**12**		**WP 50%:** 3 kg/1000 l water	On foliage when beetles appear
761 *Metanastria hyrtaca*		see Parasa (No. 79) and Parasa (No. 439)		
762 *Odonestis plagifera*		see Parasa (No. 79) and Protoparce (No. 701)		
763 *Deilephila nerii*		see Parasa (No. 79) and Protoparce (No. 701)		
764 *Boarmia crepuscularia*		see Parasa (No. 79) and Protoparce (No. 701)		
765 *Euproctis varia*		see Parasa (No. 79) and Protoparce (No. 701)		
766 *Heliothrips haemorrhoidalis*		see Scirtothrips (No. 527)		On first signs of damage
767 *Anaphothrips orchidii*		see Selenothrips (No. 85) and Scirtothrips (No. 527)		On first signs of damage
768 *Pachypeltis vittiscutis*		see Helopeltis (No. 754)		
769 *Tetranychus urticae*		see Tetranychus (No. 820)		
770 *Hemitarsonemus lata*		see Hemitarsomemus (No. 147)		On foliage when first signs of damage are seen

RUBBER AND FIBRES

Rubber

Cotton

Sisal

Hibiscus or Roselle

Ramie

Jute

Kapok

Rubber *(Hevea brasiliensis)*

Pest	Product	Formulation and Dosage	Where and when to apply
771 *Meloidogyne* sp.	see Meloidogyne (Nos. 1 and 101)		
772 *Pratylenchus coffeae*	see Pratylenchus (No. 3) and Radopholus (No. 102)		
773 *Psilopholis vestita*	**7, 16** see also Colasposoma (No. 5)	**ES 20%:** 100-150 cc/100 l water/ha	2-4 l of emulsion in dibble holes made close to the tree so as to reach the tap root
774 *Coptotermes marabitanus*	**7, 16**	**ES 20%:** 250 cc/100 l water	Apply emulsion to the amount of 1-2 l round the base of the attacked tree Scrape down any mud trails on the trunk before application
Coptotermes curvignathus	**10**	**ES 20%:** 500 cc/100 l water	
Pseudacanthotermes militaris	**13**	**ES 20%:** 125-250 cc/100 l water	
775 *Batocera rufomaculata*	see Anthores (No. 10)		On trunk and branches when pests appear
776 *Stenodontes downesi*	see Anthores (No. 10)		
777 *Xyleborus affinis*	see Xyleborus (Nos. 16 and 110)		
778 *Lawana candida*	see Lawana (No. 18)		
779 *Planococcus citri*	see Planococcus (No. 692)		
780 *Ferrisia virgata*	see Ferrisia (No. 72)		
781 *Coccus viridis*	see Saissetia (Nos. 455 and 488)		
782 *Saissetia nigra*	see Saissetia (Nos. 455 and 488)		

783 *Orgyia postica*		see Cephonodes (No. 32)	
784 *Erinnyis ello*		see Herse (No. 372)	
785 *Osmilia flavolineata*		see Zonocerus (No. 35)	
786 *Zonocerus variegatus*		see Zonocerus (No. 35)	
787 *Atta cephalotes*		see Chapter III p. 469 and Chapter V p. 136	
788 *Abgrallaspis cyanophylli*	**39**	**ES 50%:** 750 cc/1000 l water see also Phenacaspis (No. 448)	When scales appear (in nurseries) repeat after 2 weeks
789 *Tetranychus urticae*		see Anychus (No. 508) and Tetranychus (No. 820)	
790 *Tarsonemus translucens*		see Tarsonemus (No. 302)	
791 *Dinocoris variolosus*		see Nezara (No. 841)	
792 *Theraptus devastans*		see Cyrtopeltis (No. 617) and Nezara (No. 691)	

Cotton *(Gossypium sp.)*

Pest	Product	Formulation and Dosage	Where and when to apply
793 *Sphenoptera* sp.	**13, 15**	**ES 20%:** 2 l/1000 l water/ha	On foliage and stems when beetles appear. Repeat at fortnightly intervals
	34	**ES 25%:** 2 l/1000 l water/ha	
794 *Apion soleatum*	see Sphenoptera (No. 793) and Anthonomus (No. 824)		
795 *Eutinobothrus brasiliensis var. gossypii*	see Sphenoptera (No. 793)		
796 *Hodotermes mossambicus*	see Hodotermes (No. 170)		
797 *Creontiades pallidus*	**9 + 12 + 82**	**Cotton-Dust = 2-5-50%:** 25-30 kg/ha	On foliage when bugs appear, i.e. when an average of 10 bugs per 50 sweeps occur or when 20-25 bugs are found per 100 terminals in young squaring cotton
	12	**D 5%:** 20 kg/ha	
		ES 50%: 2 l/500 l water/ha	
	13	**ES 20%:** 2.5 l/500 l water/ha	
	19.3	**ES 25%:** 6 l/500 l water/ha	
	22	**ES 25%:** 6 l/500 l water/ha	
	23.1	**ES 25%:** 500 cc/500 l water/ha	
	27	**ES 25%:** 750-1000 cc/500 l water/ha	
	28	**ES 40%:** 0.5-0.75 l/500 l water/ha	
	31	**ES 50%:** 0.6 l/500 l water/ha	
	34	**D 1%:** 24-30 kg/ha	
		ES 20%: 1.5 l/500 l water/ha	
	35	**D 5%:** 30 kg/ha	
		ES 20%: 3-4 l/500 l water/ha	
	37	**D 1%:** 30 kg/ha	
		ES 20%: 1.5 l/500 l water/ha	
	42	**ES 50%:** 1 l/500 l water/ha	
	53	**WP 50%:** 3-4 kg/500 l water/ha	

798 *Podagrica puncticollis*	**12**	**WP 50%** or **ES 50%:** 2 kg/500 l water/ha	On foliage when beetles appear
	22	**ES 20%:** 5 l/500 l water/ha	
799 *Syagrus rugifrons*	**13**	**WP 20%:** 2 kg/500 l water	On foliage when beetles appear
	see also Podagrica No. 798)		
800 *Acrocercops bifasciata*	**39**	**ES** or **WP 25%:** 1-1.25 kg/500 l water/ha	On foliage when first mines are visible
	see also Leucoptera (No. 25)		
801 *Syllepta derogata*	**12**	**D 10%:** 25-30 kg/ha **ES 50%:** 6 l/500 l water/ha	On foliage, when young caterpillars appear or when first signs of damage are seen
	53	**WP 50%:** 2 kg/500 l water/ha	
802 *Phycita infusella*	**39**	**D 1%:** 20 kg/ha **ES 50%:** 500 cc/500 l water/ha	On first signs of damage. Repeat after 2 weeks
803 *Estigmene acrea*	**14**	**ES 25%:** 2 l/500 l water/ha	On foliage when caterpillars appear
	27	**ES 60%:** 1 l/500 l water/ha	
	39	**ES 50%:** 1 l/500 l water/ha	
	53	**WP 50%:** 3-4 kg/500 l water/ha	
804 *Cosmophila flava*	see Estigmene (No. 803) and Laphygma (No. 807)		
805 *Scotia (Agrotis) ypsilon*	**15**	**D 2%:** 20 kg/ha **ES 20%:** 2 l/1000 l water/ha	Apply on the lower parts of plants and soil surface around the stems
	22	**ES 25%:** 12 l/1000 l water/ha	
	13	**ES 25%:** 1.5 l/1000 l water/ha	
	19.3	**ES 25%:** 10-12 l/1000 l water/ha	
806 *Xanthodes graellsi*	see also Laphygma (No. 807) and Alabama (No. 809)		
807 *Laphygma exigua*	see Laphygma (No. 807) and Scotia (No. 805) — Alabama (No. 809)		
	9	**D 1%:** 25 kg/ha **ES 50%:** 1 kg/500 l water/ha	When caterpillars appear
	12	**ES 50%:** 3 l/500 l water/ha	

Pest	Product	Formulation and Dosage	Where and when to apply
808 *Zonocerus elegans*	**13**	**D 2%:** 15 kg/ha **ES 20%:** 1.5 l/500 l water/ha	On foliage when pests appear
	15	**ES 20%:** 2.5 l/500 l water/ha	
809 *Alabama argillacea*	**12**	**WP 75%:** 6 kg/500 l water/ha	On foliage when caterpillars appear
	15	**ES 20%:** 2.5 l/500 l water/ha	
	23	**ES 50%:** 1 l/500 l water/ha	
	31	**WP 50%:** 1.5 kg/500 l water/ha	
	34	**ES 20%:** 2 l/500 l water/ha	
	35	**ES 40%:** 2 l/500 l water/ha	
	37	**ES 25%:** 1 l/500 l water/ha	
	39, 42	**ES 50%:** 500 cc/500 l water/ha	
	53	**WP 50%:** 2 kg/500 l water/ha	
	57	**WP 50%:** 20 kg/500 l water/ha	
		All products can be applied as dust (20-30 kg/ha)	
	see also Scotia (No. 805)		
810 *Thrips tabaci*	**12**	**ES 50%:** 1 l/500 l water/ha	On foliage when first signs of damage appear
	13	**ES 20%:** 1-1.5 l/500 l water/ha	
	16	**ES 20%:** 750 cc/500 l water/ha	
	19.3	**ES 25%:** 5-6 l/500 l water/ha	
	23.1	**ES 25%:** 500 cc/500 l water/ha	
	23.5	**ES 25%:** 3 l/500 l water/ha	
	34	**ES 25%:** 400 cc/500 l water/ha	
	35	**ES 40%:** 1.25 l/500 l water/ha	
	37	**ES 25%:** 0.75 l/500 l water/ha	
	53	**WP 50%:** 1 kg/500 l water/ha	
		All products can be applied as dust (20-30 kg/ha)	
	42	**ES 50%:** 400-800 cc/500 l water/ha	
811 *Caliothrips fumipennis*	see Thrips (No. 810)		
812 *Lygus vosseleri*	see Creontiades (No. 797)		

813 *Campylomma nicolasi*	see Creontiades (No. 797)		
814 *Empoasca facialis*	**9**	**D 2%:** 20-30 kg/ha	On foliage when lower leaves show signs of hopperburn or margins and interveinal spaces. Repeat after 3 weeks if necessary
	9 + 12 + 82	**Cotton-Dust = 2-5-50%:** 20-30 kg/ha	
	12	**D 5%:** 20-30 kg/ha	
		ES 50%: 1.5 l/500 l water/ha	
	13	**ES 20%:** 2.5 l/500 l water/ha	
	22	**ES 60%:** 3.5-4 l/500 l water/ha	
	27	**ES 60%:** 400-500 cc/500 l water/ha	
		ES 50%: 1 l/500 l water/ha	
	28	**ES 40%:** 500 cc/500 l water/ha	
	33.10, 34, 37	**ES 25%:** 1 l/500 l water/ha	
	35	**ES 40%:** 3 l/500 l water/ha	
		D 5%: 25-30 kg/ha	
	39	**ES 50%:** 500 cc/500 l water/ha	
	53	**WP 50%:** 2 kg/500 l water/ha	
	42	**ES 50%:** 400-800 cc/500 l water/ha	
815 *Empoasca devastans*	see Empoasca (No. 814)		
816 *Paurocephala gossypii*	see Empoasca (No. 814)		
817 *Bemisia tabaci*	**28**	**ES 40%:** 1-1.5 l/500 l water/ha	On foliage, when larvae are seen. Repeat after 2 weeks if necessary
	39	**ES 50%:** 500 cc/500 l water/ha	
	42	**ES 50%:** 400-1000 cc/500 l water/ha	
	see also Bemisia (No. 348)		
818 *Aphis (Cerosipha) gossypii*	**9**	**D 1-2%:** 25-30 kg/ha	On foliage when colonies of aphids are visible
	23.1	**ES 25%:** 500 cc/500 l water/ha	
	26	**ES 20%:** 1.5 l/500 l water/ha	
	27	**ES 25%:** 1 l/500 l water/ha	
	33, 38, 49	**ES 25%:** 2 l/500 l water/ha	
	33.10	**ES 25%:** 1.5 l/500 l water/ha	
	34	**ES 25%:** 1.2 l/500 l water/ha	
	35	**ES 25%:** 2-4 l/500 l water/ha	
	37	**ES 25%:** 1 l/500 l water/ha	
	39	**ES 50%:** 300-800 cc/500 l water/ha	
	41	**ES 25%:** 1.5 l/500 l water/ha	
	42	**ES 50%:** 300-600 cc/500 l water/ha	

Pest	Product	Formulation and Dosage	Where and when to apply
819 *Ferrisia virgata*	see Ferrisia (No. 72)		
820 *Tetranychus urticae*	**22.6**	**ES 60%:** 500 cc/500 l water/ha	On foliage when first signs of damage are visible (leaves apear leathery and faded)
	23.1 *	**ES 25%:** 1 l/500 l water/ha	
	26	**ES 20%:** 1.5 l/500 l water/ha	
	28	**ES 40%:** 1 l/500 l water/ha	
	33	**ES 25%:** 3 l/500 l water/ha	Repeat at 10 day intervals until control is obtained
	37, 38, 78	**ES 25%:** 2 l/500 l water/ha	
	39, 42	**ES 50%:** 400-600 cc/500 l water/ha	
	49	**ES 25%:** 2-3 l/500 l water/ha	Direct application to lower leaf surfaces
	68 *	**ES 25%:** 1 l/500 l water/ha	
	70 *	**ES 50%:** 3-4 l/500 l water/ha	
	73 *	**ES 25%:** 2.5-4 l/500 l water/ha	
	82 (Ultrasulphur)	**WP:** 1.25 kg/ha **D:** 25-30 kg/ha Products can also be applied as dust	
	* use when red spiders are resistant to other acaricides.		
821 *Hemitarsonemus lata*	see Hemitarsonemus (No. 147)		
822 *Anychus latus*	see Tetranychus (No. 820)		
823 *Eriophyes gossypii*	**26**	**ES 20%:** 1.5 l/500 l water/ha	Apply on leaves when a few woolly patches appear (leaves wrinkled and deformed)
	28	**ES 40%:** 750-1000 cc/500 l water/ha	
	39	**ES 50%:** 500-750 cc/500 l water/ha	
	42	**ES 50%:** 1.5 l/500 l water/ha	
	33.10	**ES 50%:** 500-750 cc/500 l water	
824 *Anthonomus grandis*	**9**	**ES 25%:** 2.5 l/500 l water/ha	Apply when 10% punctured square infestation is found. Repeat at 4-6 day intervals. Continue as needed
	12 + 15	**ES 25%:** 4.5 l + **ES 50%:** 0.5 l/500 l water/ha	

	12 + 19.3	**ES 25%:** 4.5 l + **ES 50%:** 4.5 l/500 l water/ha	
	12 + 22	**ES 25%:** 4.5 l + **ES 50%:** 4.5 l/500 l water/ha	
	16	**ES 20%:** 2.8 l/500 l water/ha	
	34	**ES 25%:** 1 l/500 l water/ha	
	35	**ES 50%:** 2 l/500 l water/ha	
	37	**ES 50%:** 500 cc/500 l water/ha	
	38	**ES 50%:** 1 l/500 l water/ha	
	53	**WP 80%:** 1.25 kg/500 l water/ha	
	27.1, 42	**ES 50%:** 800-1000 cc/500 l water/ha	
825 *Bucculatrix thurberiella*	**15**	**ES 50%:** 1 l/500 l water/ha	On foliage when first damage is seen
	22	**ES 50%:** 12 l/500 l water/ha	
	27	**ES 25%:** 1.5-2 l/500 l water/ha	
	37	**ES 50%:** 1.25 l/500 l water/ha	
	39	**ES 50%:** 1 l/500 l water/ha	
	53	**WP 80%:** 3 kg/500 l water/ha	
826 *Heliothis (obsoleta) zea*	**9 + 12**	**ES 25%:** 5 l + **ES 25%:** 5 l/500 l water/ha	Apply when an average of 5 small worms are found per 100 terminal buds. Repeat every 5-7 days until under control
	10 + 12	**ES 25%:** 4 l + **ES 25%:** 5 l/500 l water/ha	
	11	**ES 50%:** 3 l/500 l water/ha	
	12	**ES 25%:** 7.5 l/500 l water/ha **D 10%:** 30 kg/ha	
	12 + 19.3	**ES 25%:** 4.5 l + **ES 50%:** 4.5 l/500 l water/ha	
	12 + 22	**ES 25%:** 4.5 l + **ES 50%:** 4.5 l/500 l water/ha	
	15	**ES 50%:** 1 l/500 l water/ha	
	53	**WP 80%:** 1.5 kg/500 l water/ha	
	30.1	**ES 60%:** 1 l/500 l water/ha	
827 *Earias insulana*	**31 + 34**	**ES 25%:** 1.2 l + **ES 25%:** 3 l/500 l water/ha	do.

see also Heliothis (No. 826)

Pest	Product	Formulation and Dosage	Where and when to apply
828 *Earias biplaga*	see also Heliothis (No. 826)		
829 *Contarinia gossypii*	**28**	**ES 40%:** 2 l/500 l water/ha	On foliage when first signs of damage are seen. Repeat after 2 weeks if necessary
	39	**ES 50%:** 500 cc/500 l water/ha	
830 *Frankliniella dampfi*	see Thrips (No. 810)		
831 *Adelphocoris apicalis*	see Creontiades (No. 797)		
832 *Psallus seriatus*	see Creontiades (No. 797)		
833 *Poecilophila maculatissima*	**12**	**D 5%:** 20-30 kg/ha	On bolls when beetles appear
		WP 25% or **ES 25%:** 12-15 kg/500 l water/ha	
	15	**ES 20%:** 2.5-3 l/500 l water/ha	
	53	**D 5%:** 20-30 kg/ha	
		WP 50%: 5 kg/500 l water/ha	
834 *Pyroderces simplex*	**9**	**D 5%**	Dust stored seeds
	13	**D 2%**	
	9	**WP 25%:** 2 kg/500 l water/ha	Spray injured bolls
	see also Heliothis (No. 826)		
835 *Platyedra (Pectinophora) gossypiella*	**12 + 15**	**ES 25%:** 2 l + **ES 25%:** 600 cc/500 l water/ha	On foliage and bolls. Apply every 7 days until under control
	23	**ES 50%:** 4 l/500 l water/ha	
	31 + 34	**ES 25%:** 1.2 l + **ES 25%:** 3 l/500 l water/ha	
	53	**WP 50%:** 3-4 kg/500 l water/ha	
	27.1, 42	**ES 50%:** 1-1.6 l/500 l water/ha	
	see also Heliothis (No. 826)		
836 *Argyroploce leucotreta*	see also Heliothis (No. 826)		

837 *Prodenia litura*	**12 + 13**	**ES 20%:** 2.5 l + **ES 20%:** 1.25 l/500 l water/ha	On foliage and bolls when caterpillars appear
	22	**ES 20%:** 10 l/500 l water/ha	
	25	**ES 50%:** 1.5-2 l/500 l water/ha	
		see also Heliothis (No. 826) and Alabama (No. 809)	
	30.1	**ES 60%:** 1 l/500 l water/ha	
838 *Sacadodes pyralis*		see Prodenia (No. 837)	
839 *Diparopsis castanea*		see Heliothis (No. 826) and Argyroploce (No. 836)	
840 *Tarache notabilis*		see Prodenia (No. 837)	
841 *Nezara viridula*	**13**	**ES 20%:** 2.5 l/500 l water/ha	On foliage and bolls when bugs appear
	16	**WP 20%** or **ES 20%:** 5 kg/500 l water/ha	
	31	**WP 50%:** 3 kg/500 l water/ha	
	37	**ES 25%:** 4 l/500 l water/ha	
	39	**ES 50%:** 1000 cc/500 l water/ha	
	53	**WP 50%:** 5 kg/500 l water/ha	
	14.1	**WP 25%:** 4 kg/500 l water/ha	
	42	**ES 50%:** 0.4-1 l/500 l water/ha	
		All products can also be applied as dusts	
842 *Calidea dregii*		see Nezara (No. 841)	
843 *Oxycarenus hyalinipennis*	**9**	**D 5%:** 20-30 kg/ha	When bugs are seen on half opened bolls
	22	**D 10%:** 40-50 kg/ha	
844 *Dysdercus fasciatus*		see Nezara (No. 841)	
845 *Helopeltis schoutedeni*		see Nezara (No. 841)	

Sisal *(Agave sisalana)*

Pest	Product	Formulation and Dosage	Where and when to apply
846 *Scyphophorus interstitialis*	**7** **39**	**D 2%:** 20-30 kg/ha **D 1%:** 20-30 kg/ha	In bulbil nurseries: Broadcast on soil surface
	7 **10** **13, 15**	**D 2%:** 20-25 g/plant **D 5%:** 20-25 g/plant **D 1%:** 20-25 g/plant (At 25 g a plant and 5000 plants a hectare, dust treatment requires 125 kg of dust/ha)	In newly-transplanted areas: Apply the dust on the plants before planting and in the planting hole
	7 **13, 15**	**ES 20%:** 1.5 l/100 l water = 150 cc/plant **ES 20%:** 750-1000 cc/100 l water = 150 cc/plant	Immediately after planting, apply the liquid directly on the plant, so that it runs down into the soil and around the underground parts of the plant (750 l of insecticide liquid are sufficient to treat one hectare with 5000 plants)
	13	**ES 20%:** 12 l/100 l water	Before planting, soak the lower third of plants for 10-15 minutes in the liquid
	Keep Sisal areas cleared of old, broken plants (old, broken plants are breeding places for weevils)		

		Preventive measures: Chemical treatment of boles as toxic traps:
27, 28, 39	**ES 25%:** 150 cc/10 l water	Strip leaves from old boles. Cut away the top part (approx. 1/5) and treat the plane section with the emulsion. Protect against the sun with leaves, paper etc. Repeat the treatment every 2 weeks, first cutting away the top surface (3-5 cm) each time (approx. 10 boles per hectare)
27, 28, 39	**ES 25%:** 500-750 cc/100 l water	Split old sisal boles and place them on the soil surface with treated plane section downwards. Poison baits last only about 10 days, so baits must be renewed regularly

Hibiscus or Roselle *(Hibiscus Sabdariffa)*

Pest	Product	Formulation and Dosage	Where and when to apply
847 *Agrilus acutus*	**9, 12**	**D 10%:** 30-40 kg/ha	On foliage and stems when beetles appear. Repeat after 2-3 weeks
	39	**ES 25%:** 1.5-2 l/750 l water/ha	On stems when these show symptoms of damage
848 *Dysdercus fasciatus*	see Nezara (No. 841)		On foliage and stems when bugs appear
849 *Phenacoccus hirsutus*	see Planococcus (No. 19) and Ferrisia (No. 72)		
850 *Pandemis heparana*	**34, 39**	**ES 25%:** 1 l/750 l water/ha see also Leucoplema (No. 28)	On foliage when damage is visible
851 *Syllepta derogata*	see Syllepta (No. 801)		
852 *Ecpantheria hambletoni*	see Thosea (No. 318)		
853 *Empoasca devastans*	see Empoasca (No. 814)		
854 *Aphis (Cerosipha) gossypii*	see Aphis (No. 818)		
855 *Oxycarenus hyalinipennis*	**9**	**WP 50%:** 5 kg/750 l water/ha see also Oxycarenus (No. 843)	On foliage when bugs appear
856 *Mylabris pustulata*	**22**	**D 5%:** 30-40 kg	On flowers and buds when beetles appear
857 *Calidea dregii*	see Nezara (No. 841)		

Ramie *(Boehmeria nivea)*

858 *Paralixus truncatulus*	**9**	**D 10%:** 30-40 kg/ha see also Paralixus (No. 688)	On leaves and stems when pests appear
859 *Dasychira mendosa*	**9**	**D 10%:** 30-40 kg/ha see also Dasychira (No. 632)	On foliage when caterpillars appear
860 *Acraea zetes*		see Dasychira (No. 859)	
861 *Hypena lividalis*		see Dasychira (No. 859)	

Jute *(Corchorus capsularis and C. olitorius)*

Pest	Product	Formulation and Dosage	Where and when to apply
862 *Meloidogyne incognita*	Crop rotation see Meloidogyne (No. 304)		
863 *Apion corchori*	**9** **12** **13**	**D 10%:** 15 kg/ha **WP 50%:** 5 kg/500 l water/ha **ES 20%:** 1 l/500 l water/ha (Apply also against Jute stem girdler: *Nupserha bicolor postbrunnea* Dutt.)	On foliage and stems when weevils appear. Repeat after 2 weeks
864 *Trachys pacifica*	**27, 39**	**ES 25%:** 500 cc/500 l water/ha	On foliage when first mines are visible
865 *Diacrisia obliqua*	see Thosea (No. 318)		
866 *Cosmophila sabulifera*	**9**	**D 10%:** 30 kg/ha	On foliage when caterpillars appear
867 *Prodenia litura*	see Heliothis (No. 826) and Prodenia (No. 837)		
868 *Tetranychus urticae*	see Tetranychus (No. 820)		

869	*Ancylonotus tribulus*		see Anthores (No. 10) and Steirastoma (No. 58)	Treat the trunk, twice a year
870	*Tragischoschema nigroscriptum*		see Steirastoma (No. 58)	
871	*Glenea cantor*		see Steirastoma (No. 58)	
872	*Glenea novemguttata*		see Steirastoma (No. 58)	
873	*Planococcus citri*		see Planococcus (Nos. 100 and 692)	
874	*Tetranychus urticae*	**39**	**ES 25%:** 1 l/1000 l water	On foliage when first signs of damage are seen
875	*Myzodes persicae*	**9**	**WP 50%:** 5 kg/1000 l water see also Myzodes (No. 717)	When aphids appear on leaves and shoots
876	*Dichocrocis punctiferalis*		see Dichocrocis (No. 640)	On pods when the moths are on the wing or as soon as the first signs of damage are detected. Repeat after 2-3 weeks
877	*Mudaria variabilis*		see Acrocercops (No. 89)	On pods when the moths are on the wing or as soon as the first signs of damage are detected. Repeat after 2-3 weeks
878	*Dysdercus cingulatus*	**9**	**WP 50%:** 2-4 kg/1000 l	On pods as soon as the bugs appear and cause damage
879	*Dysdercus nigrofasciatus*		see Dysdercus (No. 878)	

Locusts

Pest	Product	Formulation and Dosage	Where and when to apply
Against hoppers in desert areas	**7**	**Bait = D 5%:** 2.5 kg + 97.5 kg wheat bran or 97.5 kg broken wheat or 97.5 kg rice bran or 97.5 kg crushed millet or 97.5 kg cotton seed meal or 97.5 kg barley or 97.5 kg millet or maize meal 25-30 kg/ha	Apply poisonous bait by hand broadcast over the area
	9	**Bait = D 5%** (containing 10-13% γ-isomere): 2 kg + 98 kg wheat bran or other baits (see above) 25-30 kg/ha	
Against hoppers and adults on crops	see Chrotogonus (Nos. 198, 663), Hieroglyphus (Nos. 207, 245), Valanga (Nos. 135, 322) and Zonocerus (Nos. 35, 705, 808)		Ground dusting and spraying

Termites on soil surface or in top soil	see Hodotermes (No. 170) and Odontotermes (No. 467)		
Termites attacking seeds	**7, 16** **13**	**WP 25%:** 500-750 g/100 kg seed **WP 20%:** 2 kg/100 kg seed	Preventive seed treatment: Mix insecticide with the seed before sowing
Termites attacking roots	see Neotermes (No. 105), Rhinotermes (No. 383), Coptotermes (No. 774) and Odontotermes (No. 257)		Apply emulsion with soil injector or lance in the root area of plants (see also Chapter III, p. 463) or pour emulsion into galleries
Termites in nests	**9, 12**	**Fog solution 10%**	Blow the thermal fog into an opened channel for several minutes. After treating close this channel. Repeat the treatment after 10 days
	7, 10, 13 **27, 39**	**ES 20%:** 50 cc/10 l water **ES 25%:** 30 cc/10 l water	Pour emulsion with a funnel and hose or watering-can into surface channels (see Chapter III, p. 463), 2-5 l per channel, depending on the size of nest

Ants

Pest	Product	Formulation and Dosage	Where and when to apply
Leaf-cutting ants	**64**	**L:** 20 cc per crater (by pressure cylinder)	Localize the size of the nest according to the distribution of the craters. Treat one to two craters per 10 sq.metres nest area (e.g. one nest with a size of 60 sq.m. = 12 m long and 5 m broad, needs 120-240 cc liquid). Penetrate the crater as deeply as possible with the hose of the pressure cylinder. To keep the gas in the underground system, seal around the hose with earth and close also the other surrounding craters. After the application pull out the hose and seal the hole. On sloping areas start treatment on the bottom craters. Repeat after 4 weeks if necessary
	7	**ES 25%:** 50 cc/10 l water	Localize the nest and the biggest and most crowded craters. Level out the crater with a hoe. Pour the emulsion through a funnel into the hose and thus into the channels. One litre per channel. Treat one crater per one sq.m. Repeat after 30-45 days if necessary
	7	**D 5%:** 30-50 g/crater	Localize the nest and level out the craters with a hoe. Apply the dust with a duster (through a hose) as deep as possible into the channels

	10	**ES 25%:** 100 cc/10 l water	Localize the nest. Cut away low vegetation (bushes) around the craters and level out the crater with a hoe. Pour the emulsion through a funnel into the hose and thus as deep as possible into the channels. Apply 250-300 cc per channel. Repeat after 3-4 weeks if necessary
	64	**L:** 4-5 cc/sq.m.	Localize the nest and the biggest and most crowded craters. Treat one crater per 4-5 sq.m. nest area. Craters near trunks and trees treat also. For other details see above
	see also Chapter III, p. 469		
Fire ants (Argentine ant)	**16**	**G 2.5%:** 20-25 kg/ha	Broadcast on soil surface. Repeat after 3-6 months
Harvesting ants	**16**	**G 2.5%:** 20-30 kg/ha	Broadcast on soil surface. Repeat if necessary
	7, 16	**WP 25%:** 500 g/100 kg seed	Seed-treatment: Mix insecticide with the seed before sowing
Indirect injurious ants	**13**	**WP 50%:** 1-2 kg/100 l water	Ant tracks-treatment: Spray the trunk and soil beneath the tree. Repeat after 4-5 weeks if necessary
		ES 20%: 3-5 l/100 l water	Impregnate paper strip (30 cm broad) and wrap the trunk with it
	7, 9, 16	**ES 25%:** 30-50 cc/10 l water	Earth-nest-treatment: Pour emulsion with a funnel or watering-can into the nest entrances. 2-5 l per nest, depending on its size

Pest	Product	Formulation and Dosage	Where and when to apply
	27, 34, 39	**ES 25%:** 20 cc/10 l water	Earth-nest-treatment: Pour emulsion with a funnel or watering-can into the nest entrances. 2-5 l per nest, depending on its size
	see also Solenopsis (No. 469)		
	see Oecophylla (No. 36) and Azteca (No. 82)		Tree nest-treatment: Spray the nest and the surrounding foliage

Other pests

Snails and Slugs	**137**	**Bait** = 100 g + wheat bran 5 kg + water 5-6 l (Metaldehyde and wheat bran are mixed dry then the water is added to make a crumbly mash)	Spread the poisonous bait where snails and slugs appear

INDEX