

ADDENDUM

NEMATODES

A Radioisotope Studies

- 1566 Dropkin, V. H., King, R. C. PLANT PARASITIC NEMATODES HOMOGENEOUSLY LABELED WITH RADIOPHOSPHORUS. Expt. Parasitol. 5, 5 (1956) 469-80.
- A quantitative study has been made of the volume and P content of root-knot and golden nematodes (Meloidogyne incognita acrita and Heterodera rostochiensis) during different stages of their life cycles. Galled tissues of plants infested with root-knot nematodes have accumulated P^{32} from labelled nutrient at a lower rate than uninfected roots of the same plant. Infection in one part of a root system, therefore, does not impair the ability of uninfected roots of the same plant to take up P. The P content of the nematode population of an infected tomato plant makes up no more than 10% of the total P of the plant. It follows that the unhealthy condition of the plant is not caused by the parasite "robbing" the host of this vital element. Less P is translocated out of gall roots than out of ungalled roots.
- 1567 Hunter, A. H. NUTRIENT ABSORPTION AND TRANSLOCATION OF PHOSPHORUS AS INFLUENCED BY THE ROOT KNOT NEMATODE (MELOIDOGYNE INCOGNITA ACRITA). Soil Sci. 86 (1958) 245-50.
- Greenhouse experiments with tomato plants grown in nutrient solution indicated that the observed detrimental effects of the root-knot nematode on growth cannot be attributed to an interference with the absorption or translocation of N, K, Ca, Mg, Fe, Cu or P. Although the rate of P absorption as indicated by use of P^{32} was reduced in the infected plants, the total percentage of P content of infected plants was higher than in normal plants. (CA 53: 17405a, 1959)
- 1568 Oteifa, B. A., Barrada, Y., El Gindi, D. M. AN APPROACH FOR USING LABELLED RADIOACTIVE PHOSPHORUS IN PHYSIO-PATHOLOGICAL STUDIES OF PLANT NEMATODE DISEASES. 2nd UN International Conference on the Peaceful Uses of Atomic Energy, A/CONF. 15/P/1494. 27 (1958) 48-50.
- P^{32} -labelled ($KH_2P^{32}O_4$) nutrient solution was used to study the effects of the root-knot nematode, Meloidogyne javanica (Chitwood) on the physio-pathological status of tomato plants, Lycopersicon esculentum Mill. The phosphorus content and the physiological route of the element through host tissue were affected. The root parasitic nematodes incite gall formation. An infection in the early stages of plant growth makes the host utilize its energy in the production of new lateral rootlets, i.e. meristematic tissue capable of absorbing more nutrient. The new rootlets then become infected with the newly hatched larvae. Extensive gall formation subsequently causes a reduction in the root absorptive surface. The presence and activity of the parasite in the root interfere with the translocation of nutrient. Phosphorus uptake by the nematode is, however, only 10%. Reasons for the interference are discussed.

B Ionizing Radiation Studies

- 1569 Anonymous. RADIATION OUT AS NEMATOCIDE. J. agric. Food Chem. 6, 8 (1958) 567.
- USA scientists are disappointed to find that nematodes can withstand large doses of radiation. It takes 120 000 r to kill the golden nematode, up to 20 000 r to sterilize the female. Some other nematodes require 350 000 to 640 000 r before giving up the ghost. (Humans will invariably die from a 650-r dose.) Plants cannot withstand the dosage necessary to kill nematodes, so there is no prospect that radiation can be used for killing nematodes on living plants. (from Research Newsletter)
- 1570 Fassuliotis, G. EFFECTS OF IONIZING RADIATIONS ON THE GOLDEN NEMATODE, HETERODERA ROSTOCHIENSIS. Radiation Res. 9 (1958) 112-3.
- The golden nematode, H. rostochiensis, is a parasite of potatoes and tomatoes. The resistant stage of the nematode, the cyst, containing several hundred embryonated eggs, was irradiated with x-rays from a G.E.

Maxitron 250 delivering a dose rate of 1000 r/min and with γ -rays from a Co^{60} source emitting 670 000 r/h at the Brookhaven National Laboratory, Upton, New York. The doses were 5, 10, 20, 40, 80, 160, 320, 640 and 1280 kr. Hatching tests from cysts exposed to both types of radiations revealed a disturbance in the response of the larvae, after a dose of 160 kr and above. A delay in the onset of hatching and a reduction in the total number of larvae emerging from the cysts resulted. No larvae hatched after 640 kr; they were found to be in a moribund condition one week after irradiation. Injury resulting in abnormal body movements became apparent after 80 kr. Eighty-four per cent of the females developing from larvae irradiated with 20 kr were sterilized, 98% after 40 kr, and 100% after 80 kr. However, no larvae hatched from the 20 and 40 kr-females. Viability was not altered in developing females following postirradiation storage of irradiated cysts for 6 months at 40°F. Chromosome aberrations in the form of fragments and bridges at anaphase were found in maturing eggs recovered from females which developed from irradiated larvae.

(Abstract of paper presented at the Intern. Congr. of Radiation Res., Burlington, Vermont, 10-16 Aug. 1958)

- 1571 Fassuliotis, G. OBSERVATIONS ON THE BIOLOGICAL EFFECTS OF IONIZING RADIATIONS ON THE LIFE CYCLE OF HETERODERA ROSTOCHIENSIS WOLLENWEBER, 1923. Ph. D. Thesis, New York Univ. 1958.
- 1572 Fassuliotis, G., Sparrow, A. H. PRELIMINARY REPORT OF X-RAY STUDIES ON THE GOLDEN NEMATODE. Plant Dis. Repr. 39, 7 (1955) 572.

Data were obtained which indicate that the life cycle of Heterodera rostochiensis is interrupted by x-rays at dosages of 20 000 r and above. The lowest dose found to inhibit the development of embryonated eggs is the same as the dose found to inhibit completely the sprouting of potatoes. Although the nematode data were obtained from free cysts, the results indicate that irradiation of tubers infected with the golden nematode will not only inhibit sprouting, but will probably also interrupt the life cycle of the parasite, thus eliminating one of the possible routes of spread of the golden nematode.

- 1573 Myers, R. F., Dropkin, V. H. EFFECTS OF X-RAYS AND γ -IRRADIATION ON SOIL AND PLANT-PARASITIC NEMATODES. Radiation Res. 9 (1958) 158.

Ten genera of plant parasitic and three genera of free-living nematodes were exposed to graded doses of radiation. Pot experiments showed that some genera required up to 160 000 rep for complete sterilization, whereas other genera were sterilized at doses between 20 000 and 40 000 rep. Dosages necessary to kill 50% of Panagrellus silusiae adults in culture within 24 h were between 400 000 and 500 000 rep. Similar dosages killed Tylenchorhynchus claytoni in pot experiments. A marked reduction in population size of cultures and pot experiments was noted at dosages well below the sterilizing dose. A high percentage of embryos of Panagrellus were killed at 5000 r. The ability of nematodes to survive large doses of irradiation is probably correlated with the cell constancy in these forms. The dosage necessary to sterilize plant parasitic nematodes is too high to make radiation a feasible tool for soil sterilization or for treatment of living plants.

(Abstract of paper presented at the Intern. Congr. of Radiation Res., Burlington, Vermont, 10-16 Aug. 1958)

- 1574 Myers, R. F., Dropkin, V. H. IMPRACTICABILITY OF CONTROL OF PLANT PARASITIC NEMATODES WITH IONIZING RADIATIONS. Plant Dis. Repr. 43, 3 (1959) 311-3.

Irradiation of 11 species of plant parasitic nematodes indicates that the dose required for complete sterilization is variable; reproduction being completely stopped with doses of 40 000 r in only one species. For six other species, doses above 160 000 r were required to stop reproduction. However, a large reduction in the reproduction of most species can be achieved with a dose of 80 000 r. The irradiation of nematodes in field soil with a Co^{60} source is not practical because of the length of time required to irradiate even small areas. Since damage to plant roots occurs at levels of irradiation below those required to disrupt the nematode's life cycle, control of plant parasitic nematodes in and on plant roots by ionizing radiations is not feasible. (auth.)

- 1575 Myers, R. F. THE SENSITIVITY OF SOME PLANT-PARASITIC AND FREE-LIVING NEMATODES TO GAMMA AND X-IRRADIATION. Nematologica 5 (1960) 56-63.

The sterilizing effect of ionizing rays was examined on 14 free-living and plant-parasitic nematodes. Reductions in population could be obtained with considerably lower doses than those required for complete sterilization. The embryonic stage is the most sensitive stage in the developmental cycle of Panagrellus silusiae. Larvae and adults support much higher doses. Cell division took place up to 320 000 r provided

the gonads were already formed. In Tylenchorhynchus claytoni cells matured up to 500 000 r as judged from an increase in length, and the formation of vulva and spicula. Body changes due to radiation could take the form of an increase or decrease in body length. These opposite effects were due to damage which prevented uptake of nourishment, or to sterilization without accompanying effect on food intake. Morphological changes occurred in both cases, and include cuticular and internal damage.

- 1576 Weischer, B. DIE WIRKUNG IONISIERENDER STRAHLEN AUF DIE ENTWICKLUNG VON HETERODERA ROSTOCHIENSIS UND H. SCHACHTII (The effects of ionizing rays on the development of Heterodera rostochiensis and H. schachtii). Nematologica 2 (1957) 300-5. (In German)

Cysts of the golden and the turnip nematode were subjected to radiation from a radium source. The dose was of the order of 400 r/h. Only after 72 h irradiation could any effect be observed. The duration of treatment was extended to 196 h for the experiments. Hatching of larvae was speeded up in the case of the golden nematode, and slowed down for the turnip nematode. The former is, however, interpreted as a pathological stimulus which significantly reduced vitality. This may be seen in experiments on infectivity extended over two generations.

- 1577 Wood, F. C., Goodey, J. B. EFFECTS OF GAMMA RAY IRRADIATION ON NEMATODES INFESTING CULTIVATED MUSHROOM BEDS. Nature 180 (1957) 760-1)

Nematodes in a compost from infested mushroom beds were identified as Ditylenchus destructor and Sap-robres, mostly Rhabditis spp. Duplicated 200 g samples were subjected to doses of 6000, 12 000, 24 000, 48 000 and 96 000 rep of γ -radiation from a Co^{60} -source. The inactivation dose for these nematodes appears to lie between 48 000 and 96 000 rep, more than twice as great as the 10 000 - 20 000 r found to in-activate cysts of potato-root nematode (Heterodera rostochiensis) (see Fassliotis and Sparrow, Plant Disease Reporter 39 (1956) 572).

APPENDIX

TABLE Ia

DISPERSAL OF RADIOISOTOPE-MARKED FOREST INSECTS

Insect	Isotope	No. released	Recovery and longevity	Maximum dispersal (km)	Authority
White Pine Weevil <u>Pissodes strobi</u>	Co ⁶⁰	64	33% in 60 d	--	[101]
" "	Sc ⁴⁶	1600	60-70% up to 8.5 months	0.22	[99]
Douglas Fir Beetle <u>Dendroctonus pseudotsugae</u>	P ³²	--	--	--	[260]
Southern Pine Beetle <u>Dendroctonus frontalis</u>	Ir ¹⁹²	20 000	--	--	[371]
Engelmann Spruce Beetle <u>Dendroctonus engelmanni</u>	P ³²	19 000	5% up to 14 d	--	[354]
" "	P ³²	--	--	4.8	[98]
European Pine Shoot Moth <u>Rhyacionia buliana</u>	Co ⁶⁰	104	42.9	0.046	[123]
White grubs	Ta ¹⁸²	Movement in soil		--	[371]

Jenkins, D.W. Table II in "Radioisotopes in ecological and biological studies of agricultural insects." p. 3-21 in "Radioisotopes and Radiation in Entomology. Proceedings of a Symposium, Bombay 5-9 December 1960". Vienna, IAEA, 1962, 307.

TABLE 1b

DISPERSAL OF RADIOACTIVE-MARKED ORCHARD INSECTS

Insect	Isotope	No. released	Longevity	Maximum dispersal (km)	Authority
<u>Plum curculio</u> <u>Conotrachelus nenuphar</u>	p ³²	82	up to 120 d	0. 11	[369] [370]
" "	Co ⁶⁰	705	up to 8. 5 months	0. 27	" "
" "	Zn ⁶⁵	23	up to 120 d	0. 041	" "
" "	Sr ⁸⁹	175	3 d	0. 123	" "
" "	I ¹³¹	86	--	0	" "
<u>Oriental Fruit Fly</u> <u>Dacus dorsalis</u>	p ³²	--	up to 40 d	--	[95]
<u>Fruit Fly</u> <u>Drosophila melanogaster</u>	p ³²	20 000	--	3. 84	[97]
<u>Mediterranean Fruit Fly</u> <u>Ceratitis capitata</u>	p ³²	944	--	32. 0	[92]
<u>Cherry Fruit Fly</u> <u>Rhagoletis cingulata</u>	p ³²	2010	up to 42 d	0. 287	[93]
<u>Walnut Husk Fly</u> <u>Rhagoletis completa</u>	p ³²	15% of natural population	--	14. 4	[91]

Jenkins, D.W. Table III in "Radioisotopes in ecological and biological studies of agricultural insects." p. 3-21 in "Radioisotopes and Radiation in Entomology. Proceedings of a Symposium, Bombay 5-9 December 1960". Vienna, IAEA, 1962, 307.

TABLE 1c
DISPERSAL AND FLIGHT RANGE OF
RADIOACTIVE-MARKED MOSQUITOES

Species	Locality	No. mosquitoes released × 1000	% Recovery	Maximum flight range (km)	Reference
<u>Aedes communis</u>	Churchill	3000	0.005	1.6	JENKINS and HASSETT [110]
<u>Aedes flavescens</u>	Saskatchewan	—	—	0.16	SHEMANCHUK <u>et al.</u> [348]
" "	Saskatchewan	415	0.02	10.5	<u>Ibid.</u> [115]
<u>Aedes nigromaculis</u>	California	400	0.12	3.0	THURMAN and HUSBANDS [118]
<u>Aedes spencerii</u>	Saskatchewan	—	—	0.023	SHEMANCHUK <u>et al.</u> [348]
<u>Aedes taeniorhynchus</u>	Florida	1000	0.03	32.0	PROVOST [111]
" "	Florida	1580	0.12	40.0	<u>Ibid.</u> [112]
" "	Georgia	2000	0.023	32.6	BIDLINGMAYER and SCHOOF [108]
<u>Anopheles bellator</u>	Brazil	3	—	0.8	ARAGÃO <u>et al.</u> [343] [107] [344]
<u>Anopheles gambiae</u>	Tanganyika	60	0.5	3.8	GILLIES [771]
<u>Culex tarsalis</u>	California	10	—	1.6	THURMAN and HUSBANDS [118]
<u>Psorophora confinnis</u> and <u>P. discolor</u>	Arkansas	50 —	0.09 —	9.6 2.4	QUARTERMAN <u>et al.</u> [114]

Jenkins, D.W. Table VI in "Radioisotopes in entomological studies of endemic and tropical diseases," p. 233-66 in "Radioisotopes in Tropical Medicine. Proceedings of a Symposium, Bangkok, 12-16 December 1960". STI/PUB/31, Vienna, IAEA. 1962, 379 p.

TABLE 1d

DISPERSAL AND FLIGHT RANGE OF RADIOACTIVE-MARKED FLIES

Locality	Habitat	No. flies released × 1000	% Recovery	Maximum flight range (km)	Reference
Housefly <u>Musca domestica</u>					
Oregon	Rural	36	4.6	19.2	LINDQUIST <u>et al.</u> [74]
Oregon	Rural	54	2.78	32.0	YATES <u>et al.</u> [90]
Arizona	City	31	0.73	4.8	SCHOOF <u>et al.</u> [80]
Arizona	City	56	0.51	8.0	SCHOOF <u>et al.</u> [80]
Arizona	City	342	1.8	14.4	SCHOOF and SIVERLY [82]
Georgia	Rural	13.5	8.0	13.1	QUARTERMAN <u>et al.</u> [78]
Georgia	City	40	0.24	12.2	QUARTERMAN <u>et al.</u> [79]
Blowfly <u>Phormia regina</u>					
Oregon	Rural	1.2	14.0	12.8	LINDQUIST <u>et al.</u> [74]
Oregon	Rural	60	2.64	44.8	YATES <u>et al.</u> [90]
West Virginia	City	16	0.06	16.5	SCHOOF and MAIL [81]
Georgia	City	--	--	6.4	QUARTERMAN <u>et al.</u> [79]

Jenkins, D.W. Table VII in "Radioisotopes in entomological studies of endemic and tropical diseases," p. 233-66 in "Radioisotopes in Tropical Medicine. Proceedings of a Symposium, Bangkok, 12-16 December 1960". STI/PUB/31, Vienna, IAEA. 1962, 379 p.

TABLE II

RADIATION STERILIZATION OF MEDICALLY-IMPORTANT INSECTS

Dosage (r)	Stage irradiated	% Sterility and egg laying	Insect	Reference
2500	male pupae	100%; few sterile eggs laid	<u>Callitroga hominivorax</u>	BUSHLAND and HOPKINS [1111]
5000	female pupae	100%; few sterile eggs laid	<u>Ibid.</u>	BUSHLAND and HOPKINS [1111]
8050	adults	few fertile eggs	<u>Drosophila</u>	HASSETT and JENKINS [1252]
16100	adults	100%; no eggs	<u>Ibid.</u>	HASSETT and JENKINS [1252]
3200	pupae	few eggs	<u>Anopheles quadri-maculatus</u>	DAVIS <u>et al.</u> [1116]
6400	pupae	50% reduction of sterile eggs	<u>Ibid.</u>	DAVIS <u>et al.</u> [1116]
12900	pupae	no decrease in fertile eggs	<u>Ibid.</u>	DAVIS <u>et al.</u> [1116]
8865	pupae	2% eggs hatched	<u>Ibid.</u>	DAVIS <u>et al.</u> [1116]
5000	adults	66% decrease in eggs, 39% hatch	<u>Ibid.</u>	DAVIS <u>et al.</u> [1116]
8885	adults	100% sterile, few eggs, no hatch	<u>Ibid.</u>	DAVIS <u>et al.</u> [1116]
10000	nymph	9-82% eggs hatched	<u>Pediculus humanus</u>	COLE <u>et al.</u> [888]
10000	adult	100%, no hatch	<u>Ibid.</u>	COLE <u>et al.</u> [888]

Jenkins, D.W. Table III In "Radioisotopes in entomological studies of endemic and tropical diseases," p. 233-66 in "Radioisotopes in Tropical Medicine. Proceedings of a Symposium, Bangkok, 12-16 December 1960". STI/PUB/31, Vienna, IAEA. 1962, 379 p.

TABLE III

MORTALITY OF IRRADIATED INSECTS OF MEDICAL INTEREST

Insect	Radiation	Dosage (r)	Mortality (%)	Time (days)	Reference
<u>Aedes aegypti</u> (adult)	x	20 000	50	18	TERZIAN [1333]
<u>Ibid.</u>	x	30 000	50	12	<u>Ibid.</u>
<u>Ibid.</u>	x	40 000	50	9	<u>Ibid.</u>
<u>Ibid.</u>	x	20 000	100	30	<u>Ibid.</u>
<u>Ibid.</u>	x	30 000	100	21	<u>Ibid.</u>
<u>Ibid.</u>	x	40 000	100	12	<u>Ibid.</u>
<u>Drosophila</u> adult (fasted)	B	60 000	100	1	KING and WILSON [1319]
<u>Ibid.</u> (fed)	B	80 000	60	14	<u>Ibid.</u>
<u>Ibid.</u>	γ	64 000	100	21	HASSETT and JENKINS [1252]
<u>Ibid.</u>	γ	193 000	100	2	<u>Ibid.</u>
<u>Blattella germanica</u> (60 days)	γ	72 000	14	--	<u>Ibid.</u>
<u>Musca domestica</u> egg	γ	130	50	1	COLE <u>et al.</u> [888]
<u>Ibid.</u> larva	γ	1 300	50	1	<u>Ibid.</u>
<u>Ibid.</u> pupae	γ	15 000	50	1	<u>Ibid.</u>
<u>Ibid.</u> male	γ	72 000	50	1	<u>Ibid.</u>
<u>Ibid.</u> female	γ	110 000	50	1	<u>Ibid.</u>
<u>Pediculus h. humanus</u> egg	γ	24 000	50	1±	<u>Ibid.</u>
<u>Ibid.</u> nymph ♂/♀	γ	170 000	50	1±	<u>Ibid.</u>
<u>Blattella germanica</u> nymph ♂/♀	γ	76 000	50	2	<u>Ibid.</u>
<u>Periplaneta americana</u> nymph	γ	28 000	50	1	<u>Ibid.</u>
<u>Ibid.</u> adult	γ	50 000	50	1	<u>Ibid.</u>

Jenkins, D.W. from Table IV in "Radioisotopes in entomological studies of endemic and tropical diseases," p. 233-66 in "Radioisotopes in Tropical Medicine. Proceedings of a Symposium, Bangkok, 12-16 December 1960". STI/PUB/31, Vienna, IAEA. 1962, 379 p.

TABLE IV

REFERENCES FOR THE SYNTHESIS OF SOME RADIO-LABELLED ORGANIC INSECTICIDES AND RELATED COMPOUNDS

Common name	Chemical name and isotope	Reference
<u>Chlorinated Hydrocarbon</u>		
Endrin	1, 2, 3, 4, 10, 10-hexachloro-6, 7-epoxy-1, 4, 4a, 5, 6, 7, 8, 8a-octahydro-1, 4-endo, endo-5, 8-dimethanonaphthalene-6, 7-C ¹⁴	[497]
DDT	2, 2-bis-(p-chlorophenyl)-1, 1, 1-trichloro-2-C ¹⁴ -ethane 2, 2-bis-(p-chlorophenyl)-4, 4'-C ¹⁴ -1, 1, 1-trichloroethane	[463] [480] [483] [465]
Thiodan	6, 7, 8, 9, 10, 10-hexachloro-1, 5, 5a, 6, 9, 9a-hexahydro-8, 9-methano-2, 4, 3-benzodioxathiepin-3-oxide-5a, 9a-C ¹⁴ ₂	[501]
<u>Organophosphorus</u>		
Co-Ral	O, O-diethyl O-3-chloro-4-methylumbelliferone-P ³² -phosphorothioate	[514]
Demeton	O, O-diethyl S-(and O)-2-(ethylthio)ethyl-P ³² -phosphorothioate	[634]
DDVP	O, O-dimethyl 2, 2-dichlorovinyl-P ³² -phosphate	[554] [555]
Diazinon	O, O-diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl)-P ³² -phosphorothioate	[542]
Dimethoate	O, O-dimethyl S-(N-methylcarbamoylmethyl)-P ³² -phosphorodithioate	[552]
Dipterex	O, O-dimethyl 1-hydroxy-2, 2, 2-trichloroethyl-P ³² -phosphonate	[554] [555]
Malathion	O, O-dimethyl S-(1, 2-dicarbethoxyethyl)-P ³² -phosphorodithioate	[567] [566]
Parathion	O, O-diethyl O-(p-nitrophenyl)-P ³² -phosphoro-S ³⁵ -thioate O, O-diethyl O-(p-nitrophenyl) phosphoro-S ³⁵ -thioate	[575] [578]
Ronnel	O, O-dimethyl O-(2, 4, 5-trichlorophenyl)-P ³² -phosphorothioate	[601]
<u>Carbamate</u>		
Sevin	1-naphthyl-1-C ¹⁴ -N-methyl carbamate	[706]
<u>Pyrethroid</u>		
Allethrin	d, 1-allethronyl-d, 1-cis, trans-2-C ¹⁴ -chrysanthemate d, 1-3-allyl-2-C ¹⁴ -methyl-4-oxo-2-cyclopenten-1-C ¹⁴ -yl chrysanthemate	[667] [679]
<u>Synergist</u>		
Piperonyl But-oxide	α-[2-(2-butoxyethoxy)ethoxy]-4, 5-methylenedioxy-2-propyltoluene-1-C ¹⁴ -methylene	[676]
<u>Repellent</u>		
Deet	N, N-diethyl-m-toluamide (C ¹⁴ -carboxy)	[714]

Hopkins, T.L. Table I of "Radioisotope Techniques and Recent Research on Metabolism of Insecticides in Insects." p. 101-111 in "Radioisotopes and Radiation in Entomology. Proceedings of a Symposium, Bombay 5-9 December 1960". Vienna, IAEA, 1962, 307.

TABLE V

RADIOTRACER STUDIES ON THE METABOLISM OF ORGANOPHOSPHATE INSECTICIDES BY PLANTS

(Abbreviations: Me = methyl, Et = ethyl, Ph = phenyl, antiChE = anticholinesterase agent
or cholinesterase inhibitor)

No.	Structure and name	Absorption and translocation	Hydrolysis products	Non-hydrolysed metabolites
1	$(\text{MeO})_2\text{P(O)OCH} = \text{CCl}_2$ DDVP	pea [555]	pea [555]	
2	$(\text{MeO})_2\text{P(O)OC(Me)} = \text{CHC(O)OMe}$ Phosdrin or OS 2046 alpha and beta isomers studied separately	Bryophyllum, cucumber, pea [560]	pea [1441] [560]; bean, Bryophyllum, corn, cucumber [560]; plants; $(\text{MeO})_2\text{P(O)OH}$; and $(\text{MeO})_2\text{P(O)OC(Me)} = \text{CHC(O)OH}$ [560]; pea; $(\text{MeO})_2\text{P(O)OH}$ and $(\text{MeO})_2\text{P(O)OC(Me)} = \text{CHC(O)OH}$ [598]	None in plants [1441] [560]
3	$(\text{MeO})_2\text{P(O)OC(Me)} = \text{CHC(O)OH}$ Carboxylic acid hydr. prod. of alpha Phosdrin		pea; $(\text{MeO})_2\text{P(O)OH}$ and $(\text{MeO})(\text{HO})\text{P(O)OC(Me)} = \text{CHC(O)OH}$ [598]	
4	$(\text{MeO})_2\text{P(O)OCHBr} \cdot \text{CCl}_2\text{Br}$ Dibrom		plants; $(\text{MeO})_2\text{P(O)OH}$, $\text{BrCl}_2\text{C} \cdot \text{CHO}$, $\text{Cl}_2\text{HC} \cdot \text{CHO}$, and complex amino acid conjugates	plants; $(\text{MeO})_2\text{P(O)OCH} = \text{CCl}_2$
5	$(\text{MeO})_2\text{P(O)CHOH} \cdot \text{CCl}_3$ Dipterex, Dylox, Bayer L13/59	pea [555]	pea [555]	
6	$(\text{MeO})_2\text{P(O)CHOC(O)Me}$ CCl_3 acetylated Dipterex	pea [555]	pea [555]	
7	$(\text{MeO})_2\text{P(O)SC}_2\text{H}_4\text{SEt}$ methyl isoxystox, thiol isomer of meta-Systox		many plants; $(\text{MeO})_2\text{P(O)OH}$, H_3PO_4 and lecithins [645]	many plants; $(\text{MeO})_2\text{P(O)SC}_2\text{H}_4\text{S(O)Et}$ and $(\text{MeO})_2\text{P(O)SC}_2\text{H}_4\text{S(O}_2\text{)Et}$ [645]
8	$(\text{MeO})_2\text{P(O)SC}_2\text{H}_4\text{S(O)Et}$ sulphoxide of methyl isoxystox		cabbage, potato; $(\text{MeO})_2\text{P(O)OH}$, H_3PO_4 and lecithins [645]	cabbage, potato; $(\text{MeO})_2\text{P(O)SC}_2\text{H}_4\text{S(O}_2\text{)Et}$ [645]

TABLE V (cont'd)

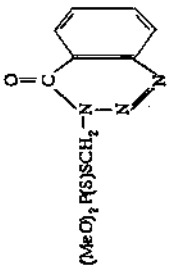
No.	Structure and name	Absorption and translocation	Hydrolysis products	Non-hydrolysed metabolites
9	$(\text{MeO})_2\text{P}(\text{O})\text{SC}_2\text{H}_4\text{S}(\text{O})_2\text{Et}$ sulphone of methyl isoxystox		cabbage, potato; $(\text{MeO})_2\text{P}(\text{O})\text{OH}$, H_3PO_4 and lecithins [645]	
10	$(\text{MeO})_2\text{P}(\text{S})\text{OPh}-\text{NO}_2-\text{H}$ methyl Parathion	many plants [574]	many plants [574]; hydrangea; H_3PO_4 and unidentified metabolites [574]	
11	$(\text{MeO})_2\text{P}(\text{S})\text{OPh}-\text{S}(\text{OMe})-\text{H}$ Bayer 25198	cotton [657]	cotton [657]	
12	 Guthion, Gusathion, Bayer 17147	cotton [562]	cotton; hydr. prod's including phosphatides [562]	cotton; two strongly lipophilic unidentified metabolites, of unknown toxicity, but no apparent $\text{P}=\text{O}$ Guthion [562]
13	$(\text{MeO})_2\text{P}(\text{S})\text{SCH}_2\text{C}(\text{O})\text{NHMe}$ Dimethoate, Rogor	corn, cotton, pea, potato [551]	corn, cotton, potato; $(\text{MeO})_2\text{P}(\text{O})\text{OH}$, $(\text{MeO})_2\text{P}(\text{S})\text{OH}$, $(\text{MeO})_2\text{P}(\text{S})\text{SCH}_2\text{C}(\text{O})\text{NHMe}$, and $(\text{MeO})_2\text{P}(\text{O})\text{SCH}_2\text{C}(\text{O})\text{OH}$ [551]; pea; as above plus H_3PO_4 [551]	corn, cotton, pea, potato $(\text{MeO})_2\text{P}(\text{O})\text{SCH}_2\text{C}(\text{O})\text{NHMe}$ [551] bean, lettuce; $(\text{MeO})_2\text{P}(\text{O})\text{SCH}_2\text{C}(\text{O})\text{NHMe}$; and a less polar antiChE-agent [763]
14	$(\text{CH}_3\text{O})_2\text{P}(\text{S})\text{SCH}_2\text{C}(\text{O})\text{NHMe}$ CL 18,706	cotton [551]	cotton [551]	
15	$(\text{MeO})_2\text{P}(\text{S})\text{SCH}_2\text{C}(\text{O})\text{OEt}$ $\text{CH}_2\text{C}(\text{O})\text{OEt}$ Malathion	bean [50]	bean; $(\text{MeO})_2\text{P}(\text{S})\text{OH}$, H_3PO_4 , $(\text{MeO})_2\text{P}(\text{S})\text{SH}$, $(\text{MeO})_2\text{P}(\text{S})\text{SCH}_2\text{C}(\text{O})\text{OH}$ and $\text{CH}_2\text{C}(\text{O})\text{OH}$ $(\text{MeO})_2\text{P}(\text{S})\text{SCH}_2\text{C}(\text{O})\text{OEt}$ $\text{CH}_2\text{C}(\text{O})\text{OEt}$?	bean; $(\text{MeO})_2\text{P}(\text{O})\text{SCH}_2\text{C}(\text{O})\text{OEt}$ $\text{CH}_2\text{C}(\text{O})\text{OEt}$
16	$(\text{EtO})_2\text{P}(\text{O})\text{SC}_2\text{H}_4\text{N}(\text{Et})_2$ Amlon	cotton, lemon [664]	cotton, lemon [664]	none in plants [664]

TABLE V (cont'd)

No.	Structure and name	Absorption and translocation	Hydrolysis products	Non-hydrolysed metabolites
17	$(EtO)_2P(O)SC_2H_4N(Et)_2 \cdot HX$ salts of Amiton (Tetram or Chipman R-6199 is hydrogen oxalate salt)	cotton: citrate, dimethyl sulphate, oxalate, picrate, phthalate, p-toluene sulphonate, trichloroacetate salts [844]; lemon: dimethyl sulphate, hydrochloride, oxalate, p-toluene sulphonate salts [844]; orange: oxalate salt [844]; cacao: p-toluene sulphonate salt [858]	cotton, lemon: oxalate salt [844]; cacao: p-toluene sulphonate salt [858]	none in plants [844] [858]
18	$(EtO)_2P(O)SC_2H_4S(Me)Et \cdot MeSO_3$ dimethyl sulphonium salt of isosystox	cotton, lemon [842]		cotton: unidentified metabolite [842]
19	$(EtO)_2P(O)SC_2H_4SEt$ and $(EtO)_2P(S)OC_2H_4SEt$ Systox Demeton (mixed isomers)	cotton [830] [732]; lemon [756]	many plants; field residue data [843]; plants: $(EtO)_2P(O)OH$, alcohols? [843]	apple, orange, walnut; $(EtO)_2P(O)SC_2H_4S(O)Et$, $(EtO)_2P(O)SC_2H_4S(O)_2Et$, $(EtO)_2P(S)OC_2H_4S(O)_2Et$ plus $OC_2H_4S(O)Et$ and/or $(EtO)_2P(S)OC_2H_4S(O)_2Et$ and/or $(EtO)_2P(O)OC_2H_4S(O)Et$ [843]
20	$(EtO)_2P(O)SC_2H_4SEt$ isosystox, thiol isomer of Systox or Demeton	cotton, lemon [844] [842]; bean, lemon [841]; potato, tobacco [848]; bean, borago, mustard [848]; apple, bean, coleus [849]; lettuce, nettles [820]; alfalfa, cotton, sugar beet [595]; cotton [755]	cotton [844]; bean, cotton [846] [847]; orange [843]; potato, tobacco [846] [847]; bean, borago, mustard [848]; apple, bean, coleus [848]; lettuce, nettles [820]; alfalfa, cotton, sugar beet [595]; cotton [755]	orange; $(EtO)_2P(O)SC_2H_4S(O)Et$, $(EtO)_2P(O)SC_2H_4S(O)_2Et$ [843]; cotton: $(EtO)_2P(O)SC_2H_4S(O)Et$, $(EtO)_2P(O)SC_2H_4S(O)_2Et$ [835] [836]; Brassica, nettles, sugar beet, turnip; 3 unidentified metabolites [838]; bean, lettuce, unidentified metabolite(s) [841]; potato, tobacco; unidentified "more toxic" compounds [846]; bean, borago, mustard; 2 un- identified metabolites [848]; lettuce, nettles; $(EtO)_2P(O)SC_2H_4S(O)Et$ plus 1 unidentified oxidative metabolite plus 2nd unidentified metabolite [820]

TABLE V (cont'd)

No.	Structure and name	Absorption and translocation	Hydrolysis products	Non-hydrolysed metabolites
21	$(EtO)_2P(OSC_2H_4S(O)Et)$ sulphoxide of ioxystoc	cotton, lemon [642]	cotton [642]	cotton; $(EtO)_2P(OSC_2H_4S(O)_2Et)$ [642]
22	$(EtO)_2P(S)OC_2H_4SEt$ Systox or Demeton	cotton, orange [643]; bean, lemon [641]; turnip [820]; many plants [651]	bean, cotton, orange [643]	orange; $(EtO)_2P(S)OC_2H_4S(O)_2Et$, $(EtO)_2P(OSC_2H_4S(O)Et)$ [643]; plants; unidentified metabolite(s) [638]; bean, lemon; unidentified metabolite(s) [641]; cotton; $(EtO)_2P(S)OC_2H_4S(O)Et$ plus $(EtO)_2P(S)OC_2H_4S(O)_2Et$ and/or $(EtO)_2P(OSC_2H_4S(O)_2Et)$ [635]; turnip; 3 unidentified metabolites [820]
23	$(EtO)_2P(S)OC_2H_4N(Et)_2$ thiono isomer of Amiton	cotton, lemon [644]	cotton, lemon [644]	cotton; $(EtO)_2P(S)SCH_2S(O)Et$, $(EtO)_2P(S)SCH_2S(O)_2Et$, $(EtO)_2P(OS)SCH_2S(O)Et$, $(EtO)_2P(OS)SCH_2S(O)_2Et$ [589]; pea; $(EtO)_2P(S)SCH_2S(O)Et$, $(EtO)_2P(S)SCH_2S(O)_2Et$ [589]; alfalfa, cotton, lemon; as above on cotton [755]; bean; as above on cotton [590]
24	$(EtO)_2P(S)SCH_2SEt$ Thimet or Phorate	many plants [589]; alfalfa, cotton, sugar beet [595]; alfalfa, cotton, lemon [755]; bean [590]; pea [592]	many plants [589]; alfalfa, cotton, sugar beet [595]; cotton [755]; bean; $(EtO)_2P(S)SH$, $(EtO)_2P(S)OH$, $(EtO)_2P(O)OH$, H_3PO_4 , unknown (maybe de-ethylated deriv.) [590]; pea [592]	cotton; $(EtO)_2P(S)SCH_2S(O)Et$, $(EtO)_2P(S)SCH_2S(O)_2Et$, $(EtO)_2P(OS)SCH_2S(O)Et$, $(EtO)_2P(OS)SCH_2S(O)_2Et$ [589]; pea; $(EtO)_2P(S)SCH_2S(O)Et$, $(EtO)_2P(S)SCH_2S(O)_2Et$ [589]; alfalfa, cotton, lemon; as above on cotton [755]; bean; as above on cotton [590]
25	$(EtO)_2P(S)SC_2H_4SEt$ Dayton, Dithiodemeton, Ekatine	cotton [657]; alfalfa, cotton, sugar beet [595]; alfalfa, bean, cotton, lemon [755]; pineapple [558]	cotton [657]; alfalfa, cotton, sugar beet [595]; alfalfa, cotton [755]; cotton; diethyl phosphoric acids?, H_3PO_4 ?, phospholipids [755]; cotton, tomato and 10 other plants [558]	alfalfa, bean, cotton, lemon; $(EtO)_2P(S)SC_2H_4S(O)Et$, $(EtO)_2P(S)SC_2H_4S(O)_2Et$, $(EtO)_2P(OS)SCH_2S(O)_2Et$, $(EtO)_2P(OS)SCH_2S(O)_2Et$ [755]; cotton, tomato and 10 other plants; as above [558]; cotton; $(EtO)_2P(S)SC_2H_4S(O)Et$, $(EtO)_2P(S)SC_2H_4S(O)_2Et$ [754]

TABLE V (cont'd)

No.	Structure and name	Absorption and translocation	Hydrolysis products	Non-hydrolyzed metabolites
26	$(EtO)_2P(S)P(S)(OEt)_2$? impurity in Delnav	bean, cotton, tomato [749]	bean, cabbage, cotton, tomato [749]	bean, cabbage; more polar derivatives, possibly phosphorothiolates [749]
27	$(EtO)_2P(S)OPh-NO_2-4$ Parathion	many plants [574]; apple [581]	many plants [574]; grape and lemon leaf juice [574]	
28	$EtOP(S)(OPh-NO_2-4)_2$ impurity in Parathion	plants [574]	plants [574]	
29	$(EtO)_2P(S)OPh-S(O)Me-4$ Bayer 25141	cotton [557]	cotton [557]	cotton; $(EtO)_2P(S)OPh-S(O)_2Me-4$, $(EtO)_2P(S)OPh-SMe-4$ (trace), $(EtO)(EtS)POOPh-S(O)Me-4$ (major), $(EtO)(EtS)POOPh-S(O)_2Me-4$ [657]
30	$(EtO)_2P(S)O-N<\begin{array}{c} \text{C(=O)-} \\ \text{C(=O)-} \end{array}>$ Bayer 22408	cotton [726]	cotton; $(EtO)(HO)P(O)O$ -naphthalimido, H_3PO_4 incorporated into plant products? [726]	cotton; $(EtO)_2P(O)O$ -naphthalimido [726]
31	$(EtO)_2P(S)S<\begin{array}{c} \text{O} \\ \text{O} \end{array}>$ impurity in Delnav	bean, cotton, tomato [749]	bean, cabbage, cotton, tomato [749]	bean, cabbage; more polar derivative, probably $(EtO)_2P(O)S-P$ -dioxane-2 [749]
32	$(EtO)_2P(S)S<\begin{array}{c} \text{O} \\ \text{O} \end{array}>$ Delnav studies on separate and combined <u>cis</u> and <u>trans</u> isomers	bean, cotton, tomato [749]	bean, cabbage, cotton, tomato [749]	bean, cabbage; more polar derivatives, more active antiChE agents, possibly phosphorothiolates [749]
33	$EtOP(O)(NMe_2)_2$	turnip [520]	turnip [520]	turnip; $EtOP(O)(NMe_2)(NHMe)$? $EtOP(O)(NHMe)_2$? [520]
34	$MeHN(P(O)(NMe_2)_2)_2$	turnip [520]	turnip [520]	turnip; $(MeHN)_2P(O)NMe_2$? [520]
35	$\underline{1-PH}HN(P(O)(NMe_2)_2)_2$	turnip [520]	turnip [520]	turnip; $\underline{1-PH}HN(P(O)(NHMe)(NMe_2))$? [520]

TABLE V (cont'd)

No.	Structure and name	Absorption and translocation	Hydrolysis products	Non-hydrolysed metabolites
36	η -BuHNPO(NMe ₂) ₂	turnip [820]	turnip [820]	turnip: η -BuHNPO(NHMe)(NMe ₂) ₂ , η -BuHNPO(NHMe) ₂ ; [820]
37	(Me ₂ N) ₂ PO impurity in Schradan	bean [604]; turnip [820]; sugar beet, strawberry [618]	bean [804]; turnip [820]; sugar beet, strawberry [618]; plants [616]	bean; more and less polar derivative(s), some containing organically bound formaldehyde [804]; turnip: (Me ₂ N) ₂ PO(NHMe) ₂ [820]; sugar beet: (Me ₂ N) ₂ PO(NMe-CH ₂ OH) [618]; plants; unidentified intermediate [616]
38	(Me ₂ N) ₂ POF Dimefox, Hanaue	pea [804]; bean [751]	pea [804]	pea: less and probably also more polar derivative(s), some containing organically bound formaldehyde and antiChE activity [804]
39	(MeHN)(Me ₂ N)PO(OH) (NMe ₂) ₂ demethylated Schradan		turnip [820]	
40	(Me ₂ N) ₂ PO(OH)(NMe ₂) ₂ and (Me ₂ N) ₂ PO(OH)PO(NMe ₂) (Me ₂ N) ₂ PO(OH) Schradan or OMPA, technical	brussel sprout, hop, sugar beet, strawberry [617]	brussel sprout, hop, sugar beet, strawberry [617]	
41	(Me ₂ N) ₂ PO(OH)(NMe ₂) ₂ Schradan or OMPA	sugar beet, strawberry [618]; bean, cabbage, hop, pea, strawberry [609] [750]; groundnut [627]; bean [756] [829] [826]; lemon, orange [824]; borage, mustard [614]; apple, bean, chrysanthemum, coleus [752]; cotton [625]	clover, turnip [820]; sugar beet, strawberry [618]; plants [616]; bean [751] [829] [826]; groundnut [627]; lemon, orange [824]; borage, mustard [614]; apple, bean, chrysanthemum, coleus [608] [752]; plants: (Me ₂ N) ₂ PO(OH), (Me ₂ N)(Me ₂ N)PO(OH); plus non-chloroform extractibles [620]; cotton, (Me ₂ N) ₂ PO(OH), H ₂ PO ₄ ? [825]; many plants; (Me ₂ N) ₂ PO(OH); [821]	plants; general reviews [414, 622]; bean; unidentified plant meta-bolite(s) [804]; bean, brussel sprout, clover, turnip: (MeHN)(Me ₂ N)PO(OH)(NMe ₂) ₂ [820]; clover: (MeHN)(Me ₂ N)PO(OH)(NMe ₂) ₂ plus antiChE agents [820]; plants: (Me ₂ N)PO(OH), (Me ₂ N)PO(OH)(NMe ₂) ₂ , (HOCH ₂ -MeN)(Me ₂ N)PO(OH)(NMe ₂) ₂ , (MeHN)(Me ₂ N)PO(OH)(NMe ₂) ₂ ; [820]; plants; no non-hydrolysed intermediates [616]; bean; antiChE agent(s) [829]

J. E. Casida, Table I in "Metabolism of organophosphate insecticides by plants: A review." p. 49-64 in "Radioisotopes and Radiation in Entomology. Proceedings of a Symposium, Bombay 5-9 December 1960".

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<u>Acanthoscelides obtectus</u>	B, x	1419	<u>Formica</u> spp.	I ¹³¹	48
	B, x	1357		p ³²	51
	B	1243		p ³²	317
	B	1242		p ³²	54
		893		p ³²	55
<u>Acarus siro</u>	B	1515	Ant		
<u>Acethion</u>	p ³²	541	<u>Lasius</u>		
	p ³²	563	- <u>niger</u>		21
<u>Acyrtosiphum onobrychidis</u>			- <u>minutus</u>	p ³²	62
see <u>Aphid</u>			<u>Monomorium pharaonis</u>	γ	888
<u>Adalia bipunctata</u>	Ta ¹⁶²	60	<u>Pogonomyrmex badius</u>	I ¹³¹	48
<u>Aedes</u> spp.			Review		53
see Mosquito			General	p ³²	32
<u>Aeschna</u> spp.	I ¹³¹	293	<u>Anthonomus grandis</u> (boll weevil)	Co ⁶⁰	351
<u>Agriotes obscurus</u>		121		γ	1115
(see also Wireworm)			Aphid	p ³²	135
<u>Agrotis orthogonia</u>	Co ⁶⁰	358	<u>Acyrtosiphum onobrychidis</u>	p ³²	609
(see also Cutworm)			<u>Anuraphis</u> sp.	p ³²	30
<u>Aldrin</u>	C ¹⁴	436	<u>Aphis fabae</u>	p ³²	609
	C ¹⁴	435		p ³²	750
<u>Allethrin</u>	C ¹⁴	666		p ³²	407
	C ¹⁴	667		p ³²	751
	C ¹⁴	668		p ³²	649
	C ¹⁴	670		p ³²	753
	C ¹⁴	672		p ³²	26
	C ¹⁴	723		p ³²	632
Alpha particles				p ³²	21
Dosimetry		920		p ³²	22
		921		p ³²	24
Effects		986	- <u>gossypii</u>	S ³⁵	630
		922	- <u>medicaginis</u>	p ³²	626
		906	- <u>leguminosae</u>	p ³²	366
		851	<u>Brevicoryne brassicae</u>	p ³²	23
<u>Amblyomma</u>					131
- <u>americanum</u>	p ³²	363	<u>Liosomaphis abietina</u>	p ³²	657
- <u>maculatum</u>	p ³²	519	<u>Myzus</u>		26
American Cyanamid 12880	p ³²	737	- <u>ascalonicus</u>	p ³²	27
Ammon	p ³²	644		p ³²	28
	p ³²	512	- <u>persicae</u>	p ³²	108
<u>Anagasta kuhniella</u>				p ³²	609
see <u>Ephesia kuhniella</u>				p ³²	23
<u>Anasa tristis</u> (squash bug)	p ³²	319		p ³²	31
	I ¹³¹	293		p ³²	29
Anguon's grain moth				p ³²	27
see <u>Sitotroga cerealella</u>				p ³²	28
<u>Anobium punctatum</u> (common furniture beetle)	γ	1246	Predators	S ³⁵	732
	γ	1245		Ta ¹³²	60
<u>Anopheles</u> spp.			<u>Apis mellifera</u> : see Bee		
see Mosquito			<u>Apotertix eurycephalus</u>	x	1041
Ant			see also Grasshopper		
<u>Camponotus ligniperda</u>	p ³²	49	<u>Arctia caja</u>	S ³⁵	124
<u>Crematogaster lineolata</u>	I ¹³¹	48	Arsenic, radioisotope of	As ⁷⁶	793
<u>Formica</u> spp.	p ³²	49	<u>Attagenus piceus</u>	γ	1252
	p ³²	50		γ	1253

<u>Bacillus Rossi</u>	β, γ, x	838	external sources	815
Barium, radioisotope of	Ba^{140}		*	816
<u>Blattella germanica</u>		337	*	834
<u>Drosophila</u>		249		1010
		299	*	824
<u>Musca domestica</u>		337	*	847
Bayer L 13/59				814
see Dipterea			*	825
Bayer 21/199			*	826
see Co-Ral				842
Bayer 19639				395
see Di-Syston			*	846
Bayer 22408	P^{32}	726		1202
Bayer 25141	P^{32}	656		1104
	P^{32}	657	Flies	305
Bee				844
Contamination (nectar)	P^{32}	613	Grain and food pests	1525
	P^{32}	614		1357
Labelling	P^{32}	368		1239
queens		368		1243
workers	Au^{199}	353		1241
Metabolism		214		1240
Radiation effects	β	777		1419
	γ	1258		1242
	γ	1019		1522
	γ	1020		1342
	x	1021		1343
	x	1135		1340
	x	1248		1517
disease, on	β	1564		1214
	γ	1565		1515
Beta-rays				776
Bees			Grasshopper	1325
contaminated combs		1564		828
Cockroach			*	827
longevity		887		775
sex-attractant		1335		837
<u>Drosophila</u>				1204
chromosome breaks		817		871
comparison of radiations		851	<u>Habrobracon</u>	
		1186	Development	1276
dosimetry		1169		811
		1170	egg production and hatchability	383
eclosion decay		1268		1137
general radiation effects				1138
eggs or larvae		1182	morphology	1032
		573	relative effects (different	*
		1051	radiations)	*
		821		811
		1228		383
pupae		822		830
mutagenesis				1137
ingested radioisotopes	P^{32}	397		1138
	P^{32}	398	radioisotopes (ingested)	P^{32}
	P^{32}	393		P^{32}, Sr^{90}
	P^{32}	396	sterilizing effects	1117
external sources		989		830
		1372	Mite	1515

*) Some comparison with other ionizing radiation(s)

Silk worm		<u>Blattella germanica</u>	Ca ⁴⁵	337
effect on germ cells	1233		Cd ¹¹⁵	337
recovery	838		Ce ¹⁴⁴	367
virus multiplication	314		Fe ⁵⁹	337
BHC and isomers	723		H ³	243
	C ¹⁴		I ¹³¹	293
	C ¹⁴		I ¹³¹	337
	C ¹⁴		P ³²	246
	C ¹⁴		P ³²	509
	C ¹⁴		P ³²	566
	C ¹⁴		P ³²	541
	C ¹⁴		S ³⁵	247
	C ¹⁴		S ³⁵	278
	C ¹⁴		S ³⁵	276
	C ¹⁴		Sr ⁸⁹	402
	C ¹⁴		Zn ⁶⁵	337
	C ¹⁴	insecticide metabolism		
	C ¹⁴	Malathion		566
	Cl ³⁶			509
	Cl ³⁶	OP-insecticides		541
	Cl ³⁶	Sevin		704
	Cl ³⁶	Systox		633
	Cl ³⁶	Labelling	Ce ¹⁴⁴	367
	Cl ³⁶	Metabolism		247
	Cl ³⁶			278
	Cl ³⁶			246
	Cl ³⁶			293
	Th			236
				242
Application to				243
houseflies	441	Radiation effects		1291
	443			
	444	ingested radioisotopes		
	440	Blow flies		
	439	see <u>Calliphora</u>		
	445	Boll weevil		
mosquitoes	442	see <u>Anthonomus grandis</u>		
<u>Triatoma infestans</u>	456	<u>Bombyx mori</u>		
Analytical studies	455	Genetics		934
	454			1082
	449			1083
	779			1084
	780			959
	1533			960
	450	Metabolism and biochemistry		292
	451			392
	452			158
	453			174
Residue analysis	447			175
Synthesis	1563			206
Systemic action in plants	446			152
<u>Blaberus fusca</u>	x			157
<u>Blaberus crantifer</u>	x			201
<u>Blatta orientalis</u>	P ³²			160
	P ³²			162
<u>Blattella germanica</u>	Ba ¹⁴⁰			188
	C ¹⁴			154
	C ¹⁴			171
	C ¹⁴			199
	C ¹⁴			163

Metabolism and biochemistry	164	<u>Brachycentrus</u> (caddis fly)	P ³²	42
	177	<u>Brevicoryne brassicae</u>		
	178	see Aphid		
	179	Bromine, radioisotope of	Br ⁸²	
	187	DDT analogues		784
	170			760
	169			761
	150			493
	202			494
	200			736
Silk protein (particular emphasis on)	207			737
	203			432
	172	ethylene dibromide		766
	173	<u>Periplaneta americana</u>		294
	229			
	204	C.		
	176	Cabbage moth		
	165	see <u>Hylemyia brassicae</u>		
	180	Cabinet beetle		
	181	see <u>Trogoderma versicolor</u>		
	182	Caddis fly		
	183	see <u>Halesus interpunctatus</u>		
	184	Cadelle beetle		
	187	see <u>Tenebriones mauritanicus</u>		
	186	Cadmium, radioisotope of	Cd ¹¹⁶	337
	224	Caesium, radioisotope of	Cs ¹³⁷	
	228	grasshopper		252
	205	mosquito, caddis fly		267
	210			268
	209			266
	208	grain disinfestation		1518
	192			1538
Radiation effects	903	<u>Calandra (Sitophilus)</u>		
	959	- <u>granaria</u>		
	904	radiation effects		893
	960		β	1340
	900		γ	1144
	β	838	γ	1304
	γ	1559	γ	889
	γ	1148	γ	890
	γ	1147	γ	891
	x	1282	x	1341
	x	1283	x	1260
	x	1136	x	1122
	x	1247	- <u>oryzae</u>	
	x	1279	radiation effects	893
	x	1082	γ	1518
	x	1083	γ	1304
	x	1084	γ	889
	Ca ⁴⁵	302	γ	890
	Ca ⁴⁵	263	γ	891
	Ca ⁴⁵	264	x	1518
	Ca ⁴⁵	265	x	1541
Review	328	Calcium, radioisotopes of	Ca ⁴⁵	
Virus	314	<u>Bombyx mori</u>		302
	315			283
	1317			264
Book lice				265
see <u>Psocoptera</u>		<u>Conotrachelus nenuphar</u>		370
<u>Bracon gelechiae</u>	P ³²			369
	134			

<u>Drosophila</u>		299	- <u>ulrichi</u>	p ³²	297
Flies		290	Carbon, radioisotope of	C ¹⁴	
		78	Aldrin		436
		347			435
<u>Habrobracon</u>		337	Allethrin		667
		383			668
		400			666
<u>Pieris rapae</u>		1299			672
Roaches		337			670
Trees		352	BHC		
<u>Calliphora</u> (blow flies)	p ³²	347	Analytical studies		450
	p ³²	76			454
- <u>erythrocephala</u>	p ³²	77			449
- <u>vomitoria</u>	p ³²	349	Metabolism		446
	p ³²	77			439
<u>Callitroga</u>					447
- <u>americana</u>	x	1120			448
labelling	p ³²	340	Synthesis		450
- <u>erythrocephala</u>			Bromacetic acids		499
metabolism	C ¹⁴	240			500
- <u>hominivorax</u>			Carbamate		702
mass rearing		1478	Chlorobenzene		459
		1489			457
radiation effects	x, γ	1111			458
	γ	1471	DDT		
	γ	1466	Analysis		738
	γ	1472	Grain pests		477
		1467			468
		1121	<u>Musca domestica</u>		469
		1481			478
		1109			479
		1469			488
		1483			474
		1488			475
		1484			485
		1436			728
(cf. Part II, II A: 1)					471
review articles (sterile		1482	Mosquitoes		466
male technique)		1475			737
		1476			490
		1477			491
		1470			492
		1485	<u>Pediculus humanus humanus</u>		486
- <u>macellaria</u>			Persistence in soils		472
tagging	p ³²	336	Physical properties		460
dispersal	p ³²	79			462
	p ³²	78			461
	p ³²	84	Plants, translocation in		476
<u>Callosobruchus chinensis</u> (weevil)		588	Roaches		464
<u>Caloglyphus mycophagus</u>					487
see Mite					477
<u>Calotermes flavicollis</u>					471
see Termites			Synthesis		465
<u>Camnula pellucida</u>					480
see Grasshopper					483
<u>Camponotus ligniperda</u>					484
see Ants					463
<u>Carabus</u>					432
- <u>auratus</u>	p ³²	297	Dieldrin		435
- <u>hortensis</u>	p ³²	297	Dimethyl phthalate		716

Dimethyl phthalate	717	Carbophos	p ³²	574
<u>Dolycoris baccarum</u>	35	<u>Celerio euphorbiae</u> (hawk moth)	p ³²	274
Endrin	497			275
	498	<u>Ceratitis capitata</u>	p ³²	98
Fumigants			γ	1493
Cyanides				92
HC ¹⁴ N	427	see also Fruit flies		
	421	Cerium	Ce ¹⁴⁴	
KC ¹⁴ N	426	Labelling		
	419	(fleas, mosquitoes, roaches)		367
NaC ¹⁴ N	420	(flies, mosquitoes)		267
Methyl bromide	423			268
	761			266
	764	<u>Lygus oblineatus</u>		36
	765	<u>Chilo suppressalis</u>	C ¹⁴	191
	767			588
Ethylene dioxide	429	Chipman R-6200	p ³²	658
	422	<u>Chironomus</u>		
	424	- <u>tentans</u>	H ³ , S ³⁵ , C ¹⁴	226
Carbon tetrachloride	744	- <u>thummi thummi</u>	x	948
Isodrin	496	see also <u>Metriocnemus</u>		
Nicotine		<u>hydropetricus</u>		
Analysis	683	<u>Chloekris conspersa</u>		
	685	see Grasshopper		
	692	Chlorine, radioisotope of	Cl ³⁶	
Metabolism	995	BHC		
	684	Analysis		778
	681			779
	696			455
(Bio)synthesis	694			780
	682	Insect resistance		431
	687	Metabolism		439
	693	<u>Conotrachelus nenuphar</u>		369
	697	Lindane		431
	686	Chlorobenzene	C ¹⁴	459
	698		C ¹⁴	457
	688		C ¹⁴	458
	689	Chlorothion	p ³²	665
	700	<u>Chortophaga viridifasciata</u>		
	691	see Grasshopper		
	690	<u>Chrysopa oculata</u>	S ³²	732
	701	Cicada		
Piperonyl butoxide	671	see <u>Tibicen</u> spp		
	676	Cigarette beetle		
	677	see <u>Lasioderma serricorne</u>		
Pyrethrins	675	<u>Cimex lectularius</u>	γ	888
	678		p ³²	519
	680	Cinerins	C ¹⁴	671
	673		C ¹⁴	680
	674	Cobalt, radioisotope of	Co ⁶⁰	
Pyrethroids	679	<u>Anthonomus grandis</u>		351
Repellent	717	<u>Bombyx mori</u>		332
	714	<u>Conotrachelus nenuphar</u>		370
	715			369
Rotenone	708	<u>Pissodes strobi</u>		101
Sevin	706	<u>Rhyazionia buoliana</u>		123
	703	Wire- and cutworms		350
	704			125
Systox	633			358
Thiodan	601			788
Carbon tetrachloride	C ¹⁴ 744			
398				

Wire- and cutworms	357	- <u>dorsalis</u>	γ	1171
<u>Coccinella septempunctata</u>	Ta ¹⁸² 59	- <u>orientalis</u>	γ	1493
	60	- <u>trypsi</u>	p ³²	96
<u>Coccinellidae</u>	S ³⁵ 732	see also Fruit flies	γ	1492
	Ra ²²⁶ 58	<u>Dahlbomius fuscipennis</u>		
	Ta ¹⁸² 59	Radiation effects	x	1244
	Ta ¹⁸² 60		x	1365
Cockroach			x	1366
see <u>Blaberus craniifer</u>			x	1367
<u>Blattella germanica</u>		Radiographic technique	x	1560
<u>Leucophaea maderae</u>		DDT		
<u>Periplaneta americana</u>		C ¹⁴ , see under C ¹⁴		
	p ³² 808	DDT analogues	I ¹³¹	473
	p ³² 140		Br ⁸²	784
	S ³⁵ 270		Br ⁸²	760
Collembola	γ 1432		Br ⁸²	761
	γ 2		Br ⁸²	493
Compound 2046	p ³² 659		Br ⁸²	494
	p ³² 660		Br ⁸²	786
Confused flour beetle			Br ⁸²	787
see <u>Tribolium confusum</u>		Effects on insect metabolism		307
<u>Conotrachelus nenuphar</u> (plum		(labelled pool technique, P ³²)		277
curculio)	p ³² 65			138
	p ³² , S ³⁵ , Cl ³⁶ , Ca ⁴⁵ 369			495
	Co ⁶⁰ , Zn ⁶⁵ , Sr ⁹⁰ , I ¹³¹	DDVP	p ³²	554
	various 370		p ³²	557
Copper, radioisotope of	Cu ⁶⁴		p ³²	723
<u>Drosophila</u> , metabolism		Death watch beetle		
	298	see <u>Xestobium rufovillosum</u>		
	299	<u>Deilephila euphorbiae</u>	p ³²	297
	300	Delnav (Hercules AC-528)	p ³²	520
Co-Ral (Bayer 21/199)	p ³² 515		p ³²	749
	p ³² 737		p ³²	739
	p ³² 513		p ³²	758
	p ³² 514		p ³²	521
	p ³² 517		p ³²	723
	p ³² 518	Demeton	p ³²	639
	p ³² 516		p ³²	641
	p ³² 758		p ³²	648
	p ³² 519		p ³²	628
<u>Corcyra cephalonica</u> (rice moth)			p ³²	649
Toxicity	Zn ⁶⁵ 304		p ³²	636
Radiation effects	β 1214		p ³²	632
Cotton moth			p ³²	754
see <u>Pectinophora malvella</u>			p ³²	595
Crane fly		<u>Dendroctonus</u>		
see <u>Tipula paludosa</u>		- <u>engelmanni</u>	I ¹³¹	64
<u>Ctenicera aeripennis</u> destructor			Sc ⁴⁶ , Rb ⁸⁶ , Ag ¹¹⁰ , Ir ¹⁹²	
see Wireworm			I ¹³¹	354
<u>Culex</u>				98
see Mosquito		- <u>frontalis</u>	Ir ¹⁹²	371
Cutworm		- <u>pseudotsugae</u>	p ³²	260
<u>Agriotes orthogonia</u>	Co ⁶⁰ 358	<u>Dermacentor variabilis</u> (Tick)	C ¹⁴	190
<u>Euxoa ochrogaster</u>	Co ⁶⁰ 358	<u>Dermestes</u>		
		- <u>ater</u>	γ	1252
			γ	1253
		- <u>vulpinus</u>	C ¹⁴	233
		DFP	p ³²	740
			p ³²	535
				399

D.

DFP					
	p ³²	531	Metabolism, toxicity	p ³²	556
	p ³²	528			56
	p ³²	522		p ³²	557
	p ³²	536		p ³²	723
	p ³²	537	Synthesis	p ³²	554
	p ³¹	523	Di-Syston (Bayer 19639)	p ³²	580
	p ³²	538		p ³²	595
	p ³²	532		S ³⁵	553
	p ³²	534		p ³²	559
	p ³²	525	DNP; see Dinitrophenol		
	p ³¹	526	<u>Dolycoris baccarum</u> (wheat bug)	C ¹⁴	35
	p ³²	524		C ¹⁴	356
	p ³²	527	Dow ET-57	p ³²	802
	p ³²	539		p ³²	603
		727		p ³²	685
	p ³²	533	Dragon fly		
	p ³¹	540	see <u>Aeschna</u> sp		
	p ³²	529	<u>Drosophila</u>		
	p ³²	530	Work on radiation effects from normal external sources has not been indexed separately. (See Part II, particularly under L A:1, B, C:1-4 and D.)		
Diazinon					
Analysis	p ³²	544			
	p ³²	545			
Metabolism	p ³²	543			
	p ³¹	741	Radioisotope studies (labelling, distribution and metabolism) and genetic effects from attached or ingested radioisotopes are cited under Fruit flies.		
	p ³²	742			
	p ³²	568			
	p ³²	736			
	p ³²	541			
Synthesis	p ³²	545	Dytiscid larvae	p ³²	61
	p ³²	547			
	p ³²	542	E.		
	p ³²	546	E 605	p ³²	584
	p ³²	548	E 1059		
	p ³²	549	see Systox, active substance of		
Dicaphon	p ³²	665	Endrin	C ¹⁴	497
Dieldrin		434		C ¹⁴	498
	R ³² , S ³⁵	437	<u>Ephestia kuehniella</u>		1515
	C ¹⁴	435		x	1336
	R ³² , Cl ³⁶ , S ³⁵ , C ¹⁴	723		x	962
		495		x	1000
Diethyltoluamide		812		x	1052
	C ¹⁴	715		x	1053
Diisopropylphosphorofluoridate				x	1280
see DFP				x	1054
Dimefox	p ³²	762		x	1376
	p ³²	604		x	1025
Dimethoate	p ³²	552	(ingested)	p ³²	132
	p ³²	553		y	1026
	p ³²	783		y	1298
	p ³²	551			1114
	p ³²	541	appraisal of sterile male technique	S ³⁵	705
Dimethylphthalate	C ¹⁴	716	EPTC	C ¹⁴	429
	C ¹⁴	717	Ethylene dioxide	C ¹⁴	422
Dinitrophenol (DNP)	p ³²	709		C ¹⁴	424
	p ³²	712	<u>Euchaetia egle</u>	I ¹³¹	293
	p ³²	707			
		142	European corn borer		
Dipterex			see <u>Pyrausta nubilalis</u>		
Metabolism, toxicity	p ³²	743	<u>Survgaster integriceps</u> (grain bug)	p ³²	694
	p ³²	555		p ³²	864

<u>Euxoa ochrogaster</u> see Cutworm			<u>Drosophila</u>	p ³²	282
<u>Exenterus candensis</u>	x	1560		p ³²	95
F.				p ³²	378
<u>Fannia</u>				p ³²	94
- <u>canicularis</u>	p ³²	338		p ³²	390
- <u>pusio</u>	p ³²	84		C ¹⁴	360
Firebrat			- <u>ananassae</u>	p ³²	96
see <u>Thermobia domestica</u>				Cu ⁶⁴	298
Fleas			- <u>funebis</u>	Fe ⁵⁹	300
<u>Hystrichopsylla</u> sp	Ce ¹⁴⁴	367	- <u>gibberosa</u>	I ¹³¹	309
<u>Malaraeus telchinum</u>	Ce ¹⁴⁴	71	- <u>melanogaster</u>		
	Ce ¹⁴⁴	406	genetic effects of	p ³²	380
<u>Xenopsylla cheopis</u>	Ce ¹⁴⁴	367	radioisotopes	p ³²	385
	various	1296		p ³²	377
Flies				p ³²	386
see under				p ³²	387
<u>Calliphora</u>				p ³²	389
<u>Callitroga</u>				p ³²	388
<u>Fannia</u>				C ¹⁴	376
Fruit fly			labelling	p ³²	390
<u>Glossina</u>				p ³²	95
<u>Hexagonia</u>				p ³²	94
<u>Hylemyia</u>				C ¹⁴	360
<u>Hypoderma</u>			metabolism	p ³²	96
<u>Lucilia</u>				Cu ⁶⁴	298
<u>Musca domestica</u>				Fe ⁵⁹	299
<u>Phoenicia</u>				Cu ⁶⁴	300
<u>Phormia</u>				C ¹⁴	141
Flour mite				p ³²	284
see <u>Acarus siro</u>				p ³²	285
<u>Tyroglyphus farinae</u>				p ³²	286
<u>Formica</u> spp	I ¹³¹	56		p ³²	287
	p ³²	48		p ³²	288
	p ³²	51		p ³²	283
	p ³²	55		C ¹⁴	324
- <u>rufopratensis minor</u>	p ³²	49		Ca ⁴⁵	290
- <u>pratensis</u>	p ³²	49	Dinitrophenol	H ³	220
- <u>rufa</u>	p ³²	50	Parathion	p ³²	712
- <u>polycetana</u>	p ³²	317	- <u>pseudoobscura</u>	p ³²	581
	p ³²	54	- <u>robusta</u>	p ³²	707
Fruit fly				Cu ⁶⁴	298
<u>Ceratitis capitata</u> (Mediterranean fruit fly)	γ	1493		Fe ⁵⁹ , Cu ⁶⁴	299
	p ³²	96		Cu ⁶⁴	300
		92	- <u>simulans</u>	Ba ¹⁴	249
<u>Dacus</u>				p ³²	284
- <u>cucurbitae</u> (melon fruit fly)	γ	1493		p ³²	286
	p ³²	96		p ³²	287
- <u>dorsalis</u> (oriental fruit fly)	p ³²	95	- <u>virilis</u>	p ³²	288
	γ	1171		Cu ⁶⁴	298
	γ	1493		Fe ⁵⁹	299
	p ³²	96		p ³²	380
- <u>orientalis</u>	p ³²	96	<u>Rhagoletis</u>		
- <u>tryoni</u>	γ	1492	- <u>cingulata</u> (cherry fruit fly)	p ³²	93
<u>Drosophila</u>	γ	1493	- <u>completa</u>	p ³²	91
		1490			
		1491	G.		
	B	844	<u>Galleria mellonella</u> (greater wax moth)	I ¹³¹	293
	p ³²	379	Gay harlequin caterpillar		
			see <u>Euchaetia egle</u>		

"Gammexane"				<u>Ephestia</u> <u>Kühniella</u>		
see BHC				<u>Eurygaster</u> <u>integriceps</u>		
<u>Glossina</u> sp.		1496		<u>Lygus</u> <u>rugulipennis</u>		
- <u>morsitans</u>	γ	1152		<u>Oryzaephilus</u> <u>surinamensis</u>		
	γ	874		<u>Plodia</u> <u>interpunctella</u>		
- <u>palpalis</u>	γ	1494		<u>Pyrausta</u> <u>nubilalis</u>		
Gnat				<u>Rhyzopertha</u> <u>dominica</u>		
see <u>Hippelatus</u>				<u>Sitophilus</u>		
Gold, radioisotope of	Au ¹⁹⁸			<u>Sitotroga</u> <u>cerealella</u>		
Spray		794		<u>Tenebrio</u> <u>molitor</u>		
Bees		353		<u>Tenebriodes</u> <u>mauritanicus</u>		
<u>Gonepterix</u> <u>rhamni</u>	C ¹⁴	231		<u>Tribolium</u> <u>confusum</u>		
Grain and grain products				<u>Tyroglyphus</u> <u>farinae</u>		
Detection of infestation of -	x	1545		<u>Tyrophagus</u> <u>noxius</u>		
	x	1547		Radioisotopes used on pests of -		
	x	1540			P ³²	319
	x	1544			C ¹⁴	35
	x	1546			P ³²	128
	x	1550			Zn ⁶⁵	304
	x	1551			C ¹⁴	232
	x	1552			C ¹⁴	468
		1554'		Radiosensitivity of pests of -		
Evaluation of infestation of -	P ³²	1554			x	1336
Insecticide residues in -	Br ⁸²	760			B, x	1357
	Br ⁸²	761			B	1239
	C ¹⁴	702			B	1240
	C ¹⁴	767			x	1052
	C ¹⁴	764			x	1419
	C ¹⁴	765			B	1243
	Br ⁸²	766			B	1242
	C ¹⁴	421			x	855
Irradiation of		1521			x	1053
		1533			x	1554'
		1535			x	856
		1528			γ	1524
		1536			γ	1275
		1529			γ	1253
		1532			B	1342
		1530				1304
		1524			γ	1144
		1527			γ	1150
		1508			x	1054
		1531			x	1341
		1113			x	1123
		1537			γ	1265
		1501			x	1025
		1517			x	1260
		1509			x	1122
		1510			x	1515
		1518			x	1516
		1511			x	1297
		1512			γ	889
See also under beta-rays					γ	890
Pests of -					γ	891
For individual pests, see						1114
<u>Acanthoscelides</u> <u>obtectus</u>					x	665
<u>Acarus</u> <u>siro</u>					γ	1298
<u>Calandra</u>					γ	886
<u>Corcyra</u> <u>cephalonica</u>				Grain bug		
<u>Dolycoris</u> <u>baccarum</u>				see <u>Eurygaster</u> <u>integriceps</u>		

Grain mite			- <u>differentialis</u>	x	848
see <u>Tyrophagus noxius</u>				x	1326
Grasshopper	α	920		x	1327
	α	921		x	1328
	p^{32}	341		x	820
	p^{32}	103		x	1329
	x	1125		x	1350
	x	915		x	955
	x	1353	<u>Podisma sapporensis</u>	β	1204
	x	1421		γ	871
	x	965	<u>Romalea microptera</u>	Ca^{45}	252
	x	1215	<u>Trimerotropis maritima</u>	x	916
	x	1216	Gypsy moth		
<u>Apotettix eurycephalus</u>	x	1041	see <u>Porthetria dispar</u>		
<u>Camnula pellucida</u>	p^{32}	261	<u>Gryllotalpa gryllotalpa</u>	p^{32}	297
	p^{32}	102		p^{32}	296
<u>Chloealtis conspersa</u>	x	1062	<u>Gryllus</u>		
<u>Chortophaga viridifasciata</u>	β	1385	- <u>bimaculatus</u>	C^{14}	321
	β	828		C^{14}	189
	β	827		C^{14}	322
	β	775	- <u>domesticus</u>	p^{32}	283
	β	837		x	878
	γ	907	Gusathion	p^{32}	562
	γ	908		p^{32}	561
	x	907			
	x	1385			
	x	912			
	x	828	H^3		
	x	827	see Tritium		
	x	775	<u>Habrobracon</u>		
	x	1386	Radiation effects		1313
	x	923			1179
	x	1306			1130
	x	1322			1436
	x	924			983
	x	1334			1336
	x	916			962
	x	942		α	986
	x	925		α	922
	x	909		α	906
	x	217		β	1276
	x	926		β	1117
	x	1408		β	810
	x	810		β	811
	x	1259		β	1138
	x	1066		γ	810
		902		γ	811
				γ	1137
<u>Melanoplus</u>				γ	1138
- <u>bilaturatus</u>	p^{32}	102	ingested radioisotopes	p^{32}	1032
- <u>femur rubrum</u>	x	916		p^{32}	1033
- <u>differentialis</u>	β	1325		p^{32}	382
	γ	848		p^{32}	1295
	γ	849		p^{32}	269
	n	848		p^{32}	132
	n	849		p^{32}	830
	n	820		S^{35}	393
	x	1323		Ca^{45}	393
	x	1324		Ca^{45}	400
	x	928		St^{89}	383
	x	929		St^{89}	401

ingested radioisotopes	Sr ⁸⁹	830	Hercules AC-528		
	Sr ⁹⁰	400	see Delnav		
	x	863	<u>Hexagenia</u>	p ³²	42
	x	930	<u>Hippelatus pusio</u> (eye gnat)		
	x	1336	see Gnat		
	x	864	House longhorn beetle		
	x	1254	see <u>Hylotrupes bajulus</u>		
	x	1089	Hydrogen cyanide (HCN)	C ¹⁴	427
	x	865		C ¹⁴	426
	x	998		C ¹⁴	421
	x	858	<u>Hylemyia</u> spp		
	x	999	<u>Anthomyidae</u>	p ³²	339
	x	1392	- <u>brassicae</u>	p ³²	355
	x	1295	<u>Hylotrupes bajulus</u> (house longhorn beetle)	γ	1126
	x	1424			
	x	859	<u>Hypoderma bovis</u>	p ³²	743
	x	832			
	x	1393	I.		
	x	1402	Indian meal moth		
	x	1177	see <u>Plodia interpunctella</u>		
	x	978	Iodine, radioisotope of	I ¹³¹	
	x	1374	Ant		56
	x	1375			48
	x	833	<u>Bombyx mori</u>		195
	x	1149			207
	x	931	<u>Conotrachelus nenuphar</u>		370
	x	1093			369
	x	1426	DDT-analogue		473
	x	967			432
	x	979	<u>Dendroctonus engelmanni</u>		64
	x	1311			354
	x	1277	Flies and roaches		309
	x	1394			78
	x	1427			305
	x	930			233
	x	861			294
	x	830			337
	x	981	Iridium	Ir ¹⁹²	354
	x	1273			371
	x	1395	Iron, radioisotope of	Fe ⁵⁹	299
	x	1281			337
	x	1267	Isodrin	C ¹⁴	496
	x	1396		C ¹⁴	498
	x	1397		C ¹⁴	723
	x	862	J.		
	x	1274	Japanese beetle; see <u>Popillia japonica</u>		
	x	867			
	x	868			
	x	1139	K.		
	x	1191	KCN; see Potassium cyanide		
	x	1017	L.		
<u>Halesus interpunctatus</u> (caddis fly)			<u>Lasioderma serricornis</u> (cigarette beetle)	γ	1252
Sr ⁹⁰ , Ru ¹⁰⁶ , Cs ¹³⁷ , Ce ¹⁴⁴		266		γ	1253
Sr ⁹⁰ , Ru ¹⁰⁶ , Cs ¹³⁷ , Ce ¹⁴⁴		267		γ	893
Harlequin cabbage bug					664
see <u>Murgantia histrionica</u>			<u>Lasius niger</u>		
Hawk moth			see Ant		
see <u>Celerio euphorbiae</u>			<u>Leptohylemyia coarctata</u> (wheat bulb fly)	p ³²	75
<u>Heliothrips haemorrhoidalis</u>					
see Thrips					

Lesser grain borer see <u>Rhizopertha domestica</u>			Madeira roach see <u>Leucophaea maderae</u>	M.	
<u>Leucophaea maderae</u> (Madeira roach)			<u>Malariae telchium</u>		
DDT	C ¹⁴	477	see Flea		
Piperonyl butoxide	C ¹⁴	676	Malathion		
	C ¹⁴	677	Labelled bait		66
	St ⁸⁹	281	Metabolism	p ³²	574
Ronnel	p ³²	599		p ³²	587
Lindane	C ¹⁴	454		p ³²	745
	Cl ³⁶	431		p ³²	565
<u>Liosomaphis abietina</u> (Sitka spruce louse)	p ³²	26		p ³²	566
				p ³²	568
Locusts				p ³²	509
<u>Locusta</u>				p ³²	768
- <u>migratoria</u>	p ³²	362		p ³²	736
	x	1315		p ³²	723
- <u>pardalina</u>	p ³²	362		p ³²	570
<u>Schistocerca gregaria</u>				p ³²	569
Labelling	p ³²	381		p ³²	583
Metabolism	C ¹⁴	144		p ³²	564
	C ¹⁴	145			
	C ¹⁴	146	Manganese, radioisotopes of	Mn ⁵² , ⁵⁴ , ⁵⁶	248
	C ¹⁴	213			
	C ¹⁴	137	Mass rearing or tagging		
	C ¹⁴	237	Bees	p ³²	365
Chlorobenzene metabolism	C ¹⁴	459	Flies (<u>Simulium</u> spp)	p ³²	334
	C ¹⁴	457	(<u>Calliphora</u>)		347
	C ¹⁴	458	(<u>Callitroga</u>)		1489
			Mosquitoes	p ³²	346
				p ³²	112
				p ³²	110
Locust borer			Mealworm (yellow)		
see <u>Megacyllene robiniae</u>			see <u>Tenebrio molitor</u>		
Lone star tick			Mealybug		
see <u>Amblyomma americanum</u>			see <u>Pseudococcus njalensis</u>		
<u>Lucanus cervus</u> (stag beetle)	p ³²	295	<u>Megacyllene robiniae</u> (locust borer)	I ¹³¹	293
	p ³²	296	<u>Melanoplus</u>		
<u>Lucilia</u> spp	p ³²	77	see Grasshopper		
- <u>cuprina cuprina</u>	p ³²	336	<u>Melanotus</u>	Co ⁶⁰	357
	I ¹³¹ , (Ca ⁴⁵), p ³²	78	- <u>communis</u>	Co ⁶⁰	63
	p ³²	84	<u>Meloidogyne</u>		
	γ	1470	see Nematode, root-knot -		
- <u>sericata</u>	p ³²	74	<u>Melolontha vulgaris</u>	p ³²	297
	p ³²	335		p ³²	296
	I ¹³¹ , (Ca ⁴⁵), p ³²	78	Metasystox	p ³²	650
	γ	1500	Methylsystox	p ³²	645
	p ³²	258	see also Systox		
	p ³²	84	<u>Metriocnemus hygroptericus</u>	p ³²	218
Louse (human body-)			Milkweed bug		
see <u>Pediculus humanus humanus</u>			see <u>Oncopeltus fasciatus</u>		
<u>Lycus</u>			Mites		
- <u>brunneus</u>	γ	1245	<u>Acarus siro</u> (flour mite)	B	1515
	γ	1246	<u>Caloglyphus mycophagus</u>	γ	894
	γ	1126		γ	895
	γ	1507	<u>Fuscuropoda marginata</u>	γ	895
- <u>planicollis</u>	γ	1252	<u>Metatetranychus citri</u>	p ³²	641
<u>Lygus</u>				p ³²	657
- <u>oblineatus</u>	p ³²	33	Parasite (mite-cockroach)	p ³²	808
	p ³²	34		p ³²	130
	Ce ¹⁴⁴ , Ag ¹¹⁰ , p ³²	36	<u>Pimeliaphilus podapoliphagus</u>	p ³²	130
- <u>rugulipennis</u> (wheat bug)	C ¹⁴	35	Predator-prey (Mite-mite)	γ	2
	C ¹⁴	356			

Predator-prey (mite-mite)	y	895	- <u>communis</u>	p ³²	61
<u>Rhizoglyphus</u> sp.	y	2		p ³²	110
<u>Tetranychus</u>				p ³²	39
- <u>bimaculatus</u>	p ³²	301		p ³²	40
- <u>urticae</u> (spider mite)	p ³²	408	DDT	C ¹⁴	466
<u>Monomorium pharaonis</u>			- <u>dorsalis</u>	p ³²	348
see Ants			- <u>excrucians</u>	p ³²	61
<u>Mormonella vitripennis</u>			- <u>flavescens</u>	p ³²	348
	x	1089		p ³²	115
	x	1090	- <u>nigromaculis</u>	p ³²	118
	x	1091		p ³²	119
	x	1055	Paraxon	p ³²	731
	x	835	- <u>pullatus</u>	p ³²	61
	x	1056	- <u>solicitans</u>	p ³²	108
	x	1092	- <u>spencerii</u>	p ³²	348
	x	1057	- <u>sticticus</u>	p ³²	374
	x	1064	DDT	C ¹⁴	466
	x	836	- <u>taeniorhynchus</u>		
	x	1094	dispersal	p ³²	111
	x	1184		p ³²	108
	x	875		p ³²	113
	x	1294	toxicity	p ³² , C ¹⁴	737
	x	985		C ¹⁴	490
	x	876		C ¹⁴	491
	n	836			723
	n th	835	- <u>togol</u>	x	872
	n th	836	- <u>trichurus</u>	p ³²	129
		832		p ³²	120
Review (general)			<u>Anopheles</u>		
Mosquitoes			- <u>gambiae</u>		
<u>Aedes</u>			Aldrin	C ¹⁴	436
- <u>aegypti</u>	p ³²	272	BHC	C ¹⁴	442
Disease vector	p ³²	384	double-labelling	S ³⁵ , p ³²	771
	S ³⁵ , p ³²	405	- <u>Kerteszia</u> spp	Th	343
	x	1333		Th	107
	Sr ⁸⁹ , p ³²	345		Th	344
Metabolism	p ³²	271	- <u>quadrimaculatus</u>	p ³²	272
	p ³²	250			1116
	I ¹³¹	293	toxicology	p ³² , C ¹⁴	737
	p ³²	136		C ¹⁴	490
	p ³²	138		C ¹⁴	491
Radiation effects	x	1333		C ¹⁴	492
	x	1081	<u>Armigeres obturans</u>	p ³²	258
		384	<u>Culex</u>	p ³²	349
Radiolotopes (ingested)	Na ²⁴	308	- <u>molestus</u>	p ³²	253
	p ³²	405	- <u>pipiens</u>	p ³²	306
	p ³²	109		p ³²	272
	p ³²	250		x	1018
	p ³²	345		x	949
	p ³²	713	- <u>(pipiens) fatigans</u>	p ³²	626
	S ³⁵	405	Disease vector	p ³²	404
	Sr ⁸⁹	109		Sr ⁸⁹ , p ³²	345
	Sr ⁸⁹	345		p ³²	258
	I ¹³¹	293		x	1016
	Ce ¹⁴⁴	387		x	1050
Review		109			723
		723	- <u>pipiens pallens</u>	x	872
Toxicity	C ¹⁴	735	- <u>pipiens pipiens</u>		
	C ¹⁴	491			
	C ¹⁴	492			
- <u>campestris</u>	p ³²	348			
				Sr ⁹⁰ , Ru ¹⁰⁶ , Cs ¹³⁷ , Ce ¹⁴⁴	267
				Sr ⁹⁰ , Ru ¹⁰⁶ , Cs ¹³⁷ , Ce ¹⁴⁴	266

- <u>pipiens pipiens</u>	Sr ⁹⁰ , Ru ¹⁰⁶ , Cs ¹³⁷ , Ge ¹⁴⁴	268	Resistance	Br ⁸²	498
- <u>quinquefasciatus</u>	p ³²	374		Cl ³⁶	494
	p ³²	563		S ³⁵	437
<u>Phorophora</u>			Insecticides, effects of -		
- <u>confinnis</u>	p ³²	114	Acethion	p ³²	541
- <u>discolor</u>	p ³²	114	BHC	Cl ¹⁴	440
Radiation effects	γ	1116		Cl ¹⁴	441
	γ	1153		Cl ¹⁴	443
	γ	1081		Cl ³⁶ , Cl ¹⁴	439
	x	872		Cl ¹⁴	444
	x	1333		Cl ¹⁴	448
	x	1018	Co-Ral	p ³²	519
	x	1016	Diazinon	p ³²	786
	x	949		p ³²	568
	x	1050		p ³²	541
			DDT	Cl ¹⁴	479
Mud dauber				Cl ¹⁴	469
see <u>Sceliphron cementarium</u>				Cl ¹⁴	478
<u>Murgantia histrionica</u> (squash bug)	p ³²	319		Br ⁸²	493
<u>Musca domestica</u> (housefly)				Cl ¹⁴	470
Aspetic conditions and tagging		323		Cl ¹⁴	488
Bait	p ³²	66		Cl ¹⁴	474
Disease vector	p ³²	86		Cl ¹⁴	475
Dispersal	p ³²	74		Cl ¹⁴	485
	p ³²	90		Cl ¹⁴	728
	p ³²	80		Cl ¹⁴	467
	p ³²	116		Cl ¹⁴	471
	Fe ⁵⁹ , Ca ⁴⁵ , p ³²	78	DDVP	p ³²	557
	p ³²	79	Dieldrin		434
	p ³²	83		S ³⁵	437
	p ³²	82		Cl ¹⁴ , S ³⁵ , Cl ³⁶ , Br ⁸²	723
	p ³²	72	Dimethoate	p ³²	541
	p ³²	85		p ³²	566
	p ³²	87	Dipterex	p ³²	556
	p ³²	89		p ³²	557
	p ³²	84	Endrin	Cl ¹⁴	498
Tagging techniques	Ca ⁴⁵ , p ³²	347	Isodrin	Cl ¹⁴	498
	p ³²	349	Lindane	Cl ³⁶	685
Insect biochemistry and	p ³²	310	Malathion	p ³²	568
insecticide metabolism	p ³²	734		p ³²	734
	p ³²	311	Parathion	p ³²	541
	p ³² , Cl ¹⁴	783	methyl -	p ³²	568
	S ³⁵	279	methyl -	p ³²	734
	Fe ⁵⁹	293	Pyrethrins and related compounds	Cl ¹⁴	671
	Cl ¹⁴	727		Cl ¹⁴	675
	Cl ¹⁴	467		Cl ¹⁴	679
	S ³⁵	251		Cl ¹⁴	670
	S ³⁵ , Cl ¹⁴	187		Cl ¹⁴	672
	Cl ¹⁴	193	Sevin	Cl ¹⁴	703
	Cl ¹⁴	232		Cl ¹⁴	704
	Cl ¹⁴	657	Radiation effects	p ³²	335
	p ³²	156		p ³²	246
	H ³	238		Sr ⁹⁰	402
	Cl ¹⁴	239			1069
	Cl ¹⁴	244		γ	888
	Cl ¹⁴	245			1296
	p ³²	312	Tagging	p ³²	336
	p ³²	495		p ³²	341
Resistance	Cl ³⁶	431		p ³²	347
	p ³²	734	<u>Muscina stabulans</u>	p ³²	85

Myzus

see Aphid

N.

Nematodes		1569
	γ	1574
<u>Dirylenchus destructor</u>	γ	1577
Golden nematode, see below		
<u>Heterodera</u>		
- <u>rostochiensis</u>	x	1572
	p ³²	1566
	β, γ	1576
	γ	1570
	γ	1571
- <u>schachtii</u>	β, γ	1576
<u>Meloidogyne incognita acrita</u>	p ³²	1556
	p ³²	1557
- <u>javanica</u>	p ³²	1568
<u>Panagrellus silusiae</u>	x	1575
<u>Rhabditis</u> spp		1577
Root-knot nematode		
see <u>Meloidogyne</u>		
<u>Tylenchorhynchus claytoni</u>	γ, x	1573
	γ, x	1575
<u>Neodiprion sertifer</u>	x	1560
<u>Neoparasitidae</u>	γ	2
Nicotine	C ¹⁴	

Analytical studies

Biogenesis and synthesis

Metabolism

NKUF-101

O.

<u>Oncopeltus fasciatus</u> (milk weed bug)		
DDT	C ¹⁴	471
Sevin	C ¹⁴	704
<u>Onthophagus texanus</u>	γ	1141
<u>Ophyra</u>		
- <u>aenescens</u>	p ³²	84
- <u>leucostoma</u>	p ³²	84

Organophosphorus insecticides

For individual insecticides, see

Amiton

Co-Ral

Delnav

Diazinon

Dimethoate

Dipterex

Di-Syston

Guthion (Gusathion)

Malathion

Parathion

Phorate (Thimet)

Phosdrin

Ronnel

Schradan

Systox (Deimeton)

TEPP

Thiodan

(See also Part I, IL D.)

<u>Oxosis argentatus</u> (leaf hopper)	p ³²	32
<u>Oryzaephilus surinamensis</u> (saw-toothed grain beetle)		

893

664

δ 1515

P.

<u>Pachycrepoides dubius</u>	x	1090
	x	1092

Panagrellus silusiae

see Nematodes

<u>Panaxia dominula</u>	S ³⁵	124
Paraaxon	p ³²	733
	p ³²	571
	p ³²	731

Parathion

Application and metabolism

	p ³²	581
	p ³²	733
	S ³⁵	577
	p ³²	583
	p ³²	582
	p ³²	576
	S ³⁵ , p ³²	805
	S ³⁵ , p ³²	572
	p ³²	573
	p ³²	584
	S ³⁵ , p ³²	574
	p ³²	580
	p ³²	665
	p ³²	571
	S ³⁵	412
	p ³²	541
	p ³²	568
	S ³⁵ , p ³²	384
	S ³⁵ , p ³²	575
	S ³⁵	578

Synthesis

Synthesis	p ³²	586	Systox	p ³²	640
	S ³⁵ , p ³²	585	TEPP	p ³²	653
	p ³²	665		p ³²	733
- methyl	S ³⁵ , p ³²	574	Toxicity studies		
	p ³²	665		C ¹⁴	464
	p ³²	588		C ¹⁴	499
	p ³²	570		p ³²	307
	p ³²	665		p ³²	277
		307		C ¹⁴	500
	p ³²	736		C ¹⁴	166
		587	<u>Phaenicia</u> spp		
<u>Pectinora malvella</u> (cotton moth)	x	1124	see <u>Lucilia</u>		
<u>Pediculus humanus humanus</u> (human body louse)	C ¹⁴	486	Phorate	p ³²	593
	γ	888		p ³²	594
<u>Periplaneta americana</u>	p ³²	733		p ³²	592
Biochemistry and metabolism	p ³²	273	(Earlier work, listed under "Thimet")		
	p ³²	142		p ³²	589
	p ³²	307		p ³²	595
	i ¹³¹	293		p ³²	590
	Br ⁸² , i ¹³¹	294		p ³²	755
	C ¹⁴	330	<u>Phormia</u>	p ³²	90
	C ¹⁴	234	- <u>regina</u>	p ³²	74
	C ¹⁴	143		p ³²	81
	p ³²	331		C ¹⁴	193
	C ¹⁴	151		p ³²	84
	C ¹⁴	147		C ¹⁴	194
	C ¹⁴	232	- <u>terraenovae</u>	p ³²	85
	p ³²	166	Phosdrin	p ³²	596
	C ¹⁴	241		p ³²	746
	S ³⁵	276		p ³²	597
	p ³²	148		p ³²	598
	p ³²	149	Phosphoric esters	p ³²	508
Dispersal	p ³²	69	Phosphorus, radioisotope of	p ³²	
	p ³²	68	Due to the very extensive use which has been made of p ³² , relevant papers have been classed according to subject		
Insecticides			<u>Phyllocnistis labyrintella</u>	p ³²	372
Acethion	p ³²	541	<u>Phyllodromia germanica</u>	p ³²	297
Bayer 25141	p ³²	656		p ³²	296
	p ³²	657	<u>Pieris</u>		
Compound 2046	p ³²	659	- <u>brassicae</u>	C ¹⁴	231
DDT	C ¹⁴	464	- <u>napi</u>	C ¹⁴	231
	C ¹⁴	487	- <u>rapae</u>	C ¹⁴	231
	C ¹⁴	471		γ	1299
DDVP	p ³²	554	<u>PimeHaphilus podapolipopagus</u>	Ca ⁴⁵	1299
Delnav	p ³²	520	<u>Pinus radiata</u>	p ³²	757
(DFP)	p ³²	527	Piperonyl butoxide		
Diazinon	p ³²	541		C ¹⁴	676
Dimethoate	p ³²	541		C ¹⁴	677
Dipterex	p ³²	554	<u>Pissodes strobi</u>	Co ⁶⁰	101
Malathion	p ³²	567		Sc ⁴⁶	99
	p ³²	566			110
	p ³²	509		γ	39
Parathion	p ³²	581		p ³²	39
	p ³²	582	<u>Plasmodium gallinaceum</u>	p ³²	384
	p ³²	733		S ³⁵ , p ³²	405
	S ³⁵ , p ³²	805		p ³²	403
	p ³²	541	<u>Plodia interpunctella</u> (Indian meal moth)	β	1515
- methyl	p ³²	588			409
Pyrethrins and related compounds	C ¹⁴	671			
	C ¹⁴	680			
	C ¹⁴	668			
	C ¹⁴	669			

Plum curculio			DDT		466
see <u>Conotrachelus nenuphar</u>					474
<u>Podisma sapporensis</u>					486
see Grasshopper					493
Polonium	Po ²¹⁰	920			494
Grasshopper		921	Endrin		498
<u>Habrobracon</u>		922	Malathion		563
<u>Popillia japonica</u>	S ³⁵	270			568
<u>Porthetria dispar</u> (gypsy moth)		944	Review		718
Potassium, radiolotope of	K ⁴²	303			721
Potassium cyanide (KCN)	C ¹⁴	419			736
Praesiodimium	R ¹⁴⁴				568
see Cerium					413
<u>Prodenja eridania</u> (Southern armyworm)		1291			430
	P ³²	590			431
	C ¹⁴	326	<u>Rhagoletis</u>		
<u>Proisomota minuta</u>	γ	1432	see Fruit Fly		
<u>Propylea quatuordecimpunctata</u>	Ta ¹⁸²	60	<u>Rhizoglyphus</u> sp		
<u>Pteronarcys</u> (stone fly)	p ³²	42	see Mites		
<u>Pinus hirtellus</u>	C ¹⁴	360	<u>Rhyzopertha dominica</u> (lesser grain borer)	γ	1252
<u>Pseudococcus</u>				γ	1253
- <u>brevipes</u>	C ¹⁴	139		x	1541
- <u>nialensis</u>	p ³²	37			1128
	p ³²	104	<u>Rhodnius prolixus</u>	p ³²	296
	St ⁹⁰ , p ³²	106		x	1300
	p ³²	38		x	1301
	p ³²	105		x	1302
<u>Psocoptera</u> (book lice)	β	1515		x	1368
Puffs	H ³	215		x	1369
	p ³²	218	<u>Rhyazonia buoliana</u>	Co ⁶⁰	123
	H ³ , C ¹⁴	216	<u>Rhynchosciara angelae</u>	H ³	215
	H ³	227		C ¹⁴ , H ³	216
	H ³ , C ¹⁴ , S ³⁵	226		H ³	375
	H ³	375	Rice moth		
	x	375	see <u>Corcyra cephalonica</u>		
<u>Pyrausta nubilalis</u>	C ¹⁴	477	<u>Romalea microptera</u>		
Pyrazoxon	p ³²	511	see Grasshopper		
Pyrethrins	C ¹⁴	675	Rommel	p ³²	601
	C ¹⁴	671		p ³²	599
	C ¹⁴	678	Root-knot nematode		
	C ¹⁴	673	see Nematode		
	C ¹⁴	674	Root maggot fly		
Pyrethroids	C ¹⁴	679	see <u>Hylemyia</u> spp		
Pyrethrum		671	Rotenone		307
	C ¹⁴	669		C ¹⁴	708
			Rubidium	Rb ⁸⁶	352
R.				Rb ⁸⁶	354
Radium	Ra ²²⁶		Ruthenium	Ru ¹⁰⁶	266
Labelling		58		Ru ¹⁰⁶	268
		59			
Resistance (insecticide*) to					
BHC		439	<u>Sarcophaga</u>		
		440	- <u>bullata</u>	p ³²	84
		441	- <u>crassipallus</u>	C ¹⁴	671
		442	- <u>suaeta</u>	I ¹³¹ , Ca ⁴⁶ , p ³²	78
		443		p ³²	84
		444	Sarin	p ³²	540
		445	Sawflies		
		448	see Tenthredinidae		

Saw-toothed grain beetle				1233
see <u>Oryzaephilus surinamensis</u>				1234
<u>Sceliphron cementarium</u>	I ¹³¹	293		1235
Scandium	Sc ⁴⁶			1331
<u>Dendroctonus engelmanni</u>		354		1072
<u>Pissodes strobi</u>		99		1332
<u>Schistocerca gregaria</u>				328
see Locusts				939
Schradan				209
Analytical studies	p ³²	615	<u>Attacus ricini</u>	C ¹⁴
	p ³²	613	<u>Antherae pernyi</u> (Chinese oak silkworm)	S ³⁵
	p ³²	614		p ³²
	p ³²	619		p ³²
	p ³²	639		p ³²
	p ³²	625		C ¹⁴
	p ³²	628	<u>Bombyx mori</u>	
	p ³²	621	see under B.	
Biochemistry and metabolism	p ³²	623	<u>Cecropia</u>	C ¹⁴
	p ³²	609		C ¹⁴
	p ³²	610		p ³²
	p ³²	750		C ¹⁴
	p ³²	616	SANUSH* No. 111	
	p ³²	606	(*) Central Asian Sericulture Institute	
	p ³²	612		1558
	p ³²	617	Silver, radioisotope of	Ag ¹¹⁰
Schradan analogue	p ³²	751	<u>Dendroctonus engelmanni</u>	
Synthesis	p ³²	611	<u>Lygus oblineatus</u>	
Toxicity studies	p ³²	609	<u>Simulium</u> spp	p ³²
	p ³²	750		p ³²
	p ³²	626	Sitka spruce louse	
<u>Sciara coprophila</u>	x	1181	see <u>Liosomaphis abietina</u>	
	x	1392	<u>Sitophilus</u> (see also <u>Calandra</u>)	
Screwworm			- <u>granarius</u>	
see <u>Callitroga</u>			Insecticides	
<u>Setaria digitata</u>	p ³²	258	DDT	C ¹⁴
Sevin			HCN	C ¹⁴
Metabolism	C ¹⁴	703	Radiation effects	B
	C ¹⁴	704		B
Synthesis	C ¹⁴	706		B
Silkworm	x	1042		B
		364		B
Genetics		939		B
		961		B
	x	1043		B
	x	1044		Y
	x	1403		Y
	x	997		Y
	Y	1556		Y
	x	1213		x
	x	1236		x
	x	1073		
Killing (cocoon stage)		1255	- <u>oryza</u>	B
		1238		Y
		1555		Y
Metabolism	C ¹⁴	229		Y
	S ³⁵	197		Y
Radio-sensitivity		1230		x
		1231	<u>Sitotroga cerealella</u>	B
		1232		B
		901		x

Sodium, radioisotope of	Na ²⁴		Thiodan		655
<u>Aedes</u>		308	Insect metabolism		
Southern armyworm			Roaches		247
see <u>Prodenia eridania</u>					278
Spices	γ	1513			276
	γ	1128	Silkworm		168
Squash bug					257
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Stag beetle			Various		124
see <u>Lucanus cervus</u>					405
Stem borer	x	1543			369
Sterile male technique					383
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Strontium, radioisotopes of					279
	Sr ⁸⁹				251
<u>Conotrachelus nenuphar</u>		370			167
		369			373
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		383			270
		830	Techniques		329
Mosquitoes		109			773
		345	Double labelling		771
		268	Systox		
Roaches		402	Analysis	p ³²	638
		281		p ³²	637
		337		p ³²	634
	Sr ⁹⁰			p ³²	643
<u>Habrobracon</u>		400		p ³²	636
Mosquitoes		266		p ³²	645
		267		p ³²	850
<u>Pseudococcus njalensis</u>		106		p ³²	754
Termites (protection against)		1562	Biochemistry and metabolism	S ³⁵ , p ³²	631
Wireworms				S ³⁵	756
Sulphur, radioisotope of	S ³⁵			S ³⁵	630
Insecticides				p ³²	623
Elemental sulphur		710		p ³²	507
		711		p ³²	641
CS ₂ ³⁵		428		p ³²	646
S ³⁵ O ₂		425		p ³²	651
Dieldrin		437		p ³²	635
Di-Syston (Bayer 19639)		558		p ³²	640
EPTC-S ³⁵		705		p ³²	645
NIUF-101		585		p ³²	755
		574		C ¹⁴	633
Parathion		575	Toxicity	S ³⁵ , p ³²	631
		805		S ³⁵	732
		578		p ³²	753
		577		p ³²	632
		572			
		585			
		574	<u>Tabanidae</u>	p ³²	342
		412	Tantalum, radioisotope of	Ta ¹⁸²	59
Systox		631			371
		756			60
		732	Tedion	S ³⁵	502
		630		S ³⁵	503
		639	<u>Tendipes plumosus</u>	C ¹⁴	45
Tedion		702	see also <u>Chironomus</u>	x	948
		503			

TEPP (tetraethyl pyrophosphate)	p ³²	653	- <u>confusum</u>		
	p ³²	733		β	1515
	p ³²	654		γ	1252
<u>Tenebrionides mauritanicus</u> (cadelle beetle)		1515		γ	1530
<u>Tenebrio molitor</u> (yellow meal worm)				γ	1524
Labelling	p ³²	319		γ	1275
	p ³²	280		x	893
Radiation effects	β	1515		x	1357
	x	855		x	1419
	x	856		x	1151
	x	1376			1521
	x	1297			1291
		893	Labelling	p ³²	1128
<u>Tenthredinidae</u> (saw fly)	x	1560		C ¹⁴	128
Termites				p ³²	232
Wood protection	Sr ⁹⁰	1562	Radiation effects	β	657
Labelling	p ³²	57	<u>Trichogramma</u> spp	p ³²	1525
	p ³²	359	- <u>fasciatum</u>	p ³²	135
	p ³²	51	<u>Trimerotropis maritima</u>	p ³²	127
<u>Tetranychus</u>			see Grasshopper		
see Mites			<u>Tritium</u>	H ³	
<u>Thermobia domestica</u>	γ	888	<u>Blattella germanica</u>		243
Thimet			<u>Bombyx mori</u>		221
see Phorate			Chironomids		215
Thiodan	C ¹⁴	501			226
	S ³⁵	656			375
Thiophos	p ³²	579			216
see Parathion			<u>Drosophila</u>		227
Thorium	Th				220
BHC		438			222
		456	<u>Musca domestica</u>		238
Mosquitoes		343	Spider mite		318
		107	<u>Trogoderma</u>		
		344	- <u>granarium</u>	γ	1112
Thrips			- <u>sternale</u>	γ	1278
<u>Heliothrips haemorrhoidalis</u>	p ³²	624	- <u>versicolor</u>	γ	293
	p ³²	641	Tsetse fly		1495
<u>Thrips tabaci</u>	C ¹⁴	320	see also <u>Glossina</u>	γ	1496
	p ³²	41	Trolene	p ³²	600
<u>Tibicen</u> spp (cicada)	I ¹³¹	293	<u>Tylenchorhynchus claytoni</u>		
<u>Tipula</u>			see Nematodes		
- <u>maxima</u>	γ	305	<u>Tyroglyphus farinae</u>	γ	1150
- <u>paludosa</u> (crane fly)	K ⁴²	303	<u>Tyrophagus putrescentiae</u> (grain mite)	x	1123
<u>Triatoma</u> spp	p ³²	296			
- <u>infestans</u>	Th	456	V.		
- <u>protracta</u>	Ce ¹⁴⁴	367	<u>Vanessa io</u>	p ³²	297
<u>Tribolium</u> spp	β	1342		p ³²	296
	γ	615	<u>Vespidae</u> spp	Mn ⁵² , ⁵⁴ , ⁵⁶	248
	γ	1253	Virus		
- <u>castaneum</u>	β	1343	Insect -		314
	β	776			1314
- <u>confusum</u>	x	1151			1317
					315
	β	1419			316
	β	1357	Insect vector of -		407
	β	1240			320
	β	1239			32
	β	1242			
	β	1340			

Walnut husk fly		
see <u>Rhagoletis suavis completa</u>		
Wax moth (greater)		
see <u>Galleria mellonella</u>		
Wheat bulb fly		
see <u>Leptohylemyia coarctata</u>		
Wheat bug		
see <u>Dolycoris baccarum</u>		
<u>Lygus rugulipennis</u>		
Wireworm	Co ⁶⁰	350
	Co ⁶⁰	125
	Co ⁶⁰	358
		121
	Co ⁶⁰	357
	Co ⁶⁰	788
	Co ⁶⁰	789
	Co ⁶⁰	63
Wood		
Protection problems	Sr ⁹⁰	1562
	.	1561
	γ	1126
Infestation	γ	1126
	γ	1246
	γ	1507
	γ	1245
<u>Wuchereria bancrofti</u>	P ³²	404
	Sr ⁹⁰ , P ³²	345
	P ³²	258
X.		
<u>Xestobium rufovillosum</u> (death	γ	1126
watch beetle)	γ	1246
	γ	1245
Y.		
Yttrium	Y ⁹¹	395
		337
Z.		
Zinc, radiolotope of	Zn ⁶⁵	337
<u>Blattella germanica</u> , <u>Musca</u>		337
<u>domestica</u>		
<u>Conotrachelus nenuphar</u>		370
		369
<u>Corcyra cephalonica</u>		304
Zirconium	Zr ⁹⁵	808

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INTERNATIONAL
ATOMIC ENERGY AGENCY
VIENNA, 1963

PRICE: US \$8.00

Austrian Schillings 168,-
(£2.8.0; F.Fr. 32,-; DM 28,-)