BIBLIOGRAPHIES AND GENERAL SURVEYS

A Bibliographies

1562 Binggeli, M-H. RADIOISOTOPES AND IONIZING RADIATIONS IN ENTOMOLOGY. BIBLIOGRAPHIC SERIES No. 9. International Atomic Energy Agency, Vienna. STI/PUB/21/9. 1963. 414p.

Fully annotated bibliography for the 11-year period 1950-1960 which precedes the present 1961-1963 bibliography and follows a basically similar layout. A special feature of the subject index is the citation, alongside each reference, of the relevant radioisotope or radiation employed in the study. An appendix of tabulated summarizing data with supporting references from recent review articles is included.

1563 France. Commissariat à l'Energie Atomique. Centre d'Etudes Nucléaires, Saclay. ISOTOPES, RAYONNEMENTS, AGRICULTURE. BULLETIN BIBLIOGRAPHIQUE.

References and keywords (in French) are presented on applications of radiation and radioisotopes in agriculture. The bulletin is issued monthly, the first number appearing in June 1963.

1564 Henkowitz, I.H. "Bibliography on the Genetics of Drosophila. Part Four". New York, McGraw-Hill Book Company, Inc. 344p. 1963.

The 8305 references in this bibliography cover the literature for the 6-year period 1957-1962 (inclusive). It also includes a number of pre-1957 titles which had not been listed in the earlier parts of the series. The bibliography contains primarily genetics work although some work on morphology, natural history, physiology, and systematics are also included. Nearly all references are directly concerned with Drosophila. Titles are arranged alphabetically according to first author, each reference being designated by a lower-case letter (first author) and a number (numbering starting anew with every new letter of the alphabet). The title index is divided into a general (subject) index, a geographical, and a systematic index.

1565 Klement, A.W., Jr. TERRESTRIAL AND FRESHWATER RADIOECOLOGY. A SELECTED BIBLIOGRAPHY. TID-3910, Division of Biology and Medicine, AEC. Mar. 1962. 79p.

A listing (alphabetically, by senior author) of 1980 references and 50 bibliographies. No abstracts, author index or subject index are given. Numerous references cited here were listed in "Radioisotpes and Ionizing Radiations in Entomology", Bibliographical Series No. 9, International Atomic Energy Agency, Vienna 1963, which covered the period 1950-1960 (inclusive).

1566 Klement, A.W., Jr., Schultz, V. TERRESTRIAL AND FRESHWATER RADIOECOLOGY. A SELECTED BIBLIOGRAPHY. TID-3910 Suppl. 1, Division of Biology and Medicine, AEC. Feb. 1963. 95p.

A listing (alphabetically, by senior author) of over 900 references, including numerous references also covered by the present bibliography. No abstracts, author index or subject index.

1567 Pierce, C.M. THE EFFECTS OF RADIATION AND RADIOISOTOPES ON THE LIFE PROCESSES. AN ANNOTATED BIBLIOGRAPHY. TID-3098. 1963. 736p.

A total of 11 944 annotated references cover the years 1958, 1959 and 1960. An author and a permutated-title subject index are included. Abstracts are reproduced directly from the particular source used.

See also:

1422 Information circular on radiation techniques and their application to insect pests. (International Atomic Energy Agency, Vienna. 1963).

B Surveys. Instruction Manuals.

Comprehensive Project Surveys. Proceedings

1568 Андреев, С.В., Рутенберг, Е.П. ПРИМЕНЕНИЕ РАДИОАКТИВНЫХ ИЗОТОПОВ И ИЗЛУЧЕНИЙ ДЛЯ РЕШЕНИЯ ВОПРОСОВ ЗАЩИТЫ РАСТЕНИЙ, СТЕРИЛИЗАЦИИ И ХРАНЕНИЯ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ПРОДУКТОВ. Стр. 3-13 в сб. "Сборник иностранной сельскохозяйственной информации". М. 1956.

Andreev, S.V., Rutenberg, E.P. Sb. inostrannoi sel'skokh. Inform., Moscow (1956) 3-13.

Use of radioisotopes and radiation in plant protection and the sterilization and conservation of agricultural produce.

1569 Андреев, С.В., Мартенс, Б.К., Молчанова, В.А. ПРИМЕНЕНИЕ РАДИОАКТИВНЫХ ИЗОТОПОВ ПРИ ИЗУЧЕНИИ ВОПРОСОВ ЗАЩИТЫ РАСТЕНИЙ. Стр. 23-35 в сб. "Радиоизотопы и радиация в энтомологии. Труды Симпозиума, Бомбей, 5-9 декабря, 1960". Вена, Международное агентство по атомной энергии. 1962.

Andreev, S.V., Martens, B.K., Molchanova, V.A. THE USE OF RADIOISOTOPES AND RADIATION IN THE FIELD OF PLANT PROTECTION. p. 23-35 in "Radioisotopes and Radiation in Entomology. Proceedings of a Symposium, Bombay, 5-9 December 1960". Vienna, International Atomic Energy Agency. 1962.

A review article. Investigations being carried out in the Soviet Union in the field of plant protection are discussed. Ionizing radiation is used for its effects on microorganisms, crop seeds, and insects. By means of the effects of ionizing radiation on microorganisms, strains of entomopathological fungi (Beauveria bassiana and Aspergillus flavus) of increased virulence have been produced. Sterilizing doses for stored products pests have been worked out and used as the basis for the design of a gamma deinsector. The use of isotopes as tracers has made it possible to follow the dynamics of the movement of insecticides within plants and within the organisms of pests; to make a comparative evaluation of toxic agents having a systemic action; and to ascertain the duration of the toxic characteristics of such agents in plants and agricultural produce, which is very important for defining the safe time-limits for using toxic agents on agricultural crops. Further uses of radioisotopes in labelling toxic chemicals and agricultural pests are also discussed, and their usefulness in studying predator-parasite-host relationships, food cycles, migration and reservoir areas, population size, etc. (Also available in translation, as AEC-tr-5142).

1570 Андреев, С.В., Мартенс, Б.К., Молчанова, В.А., Самойлова, З.И. ИСПОЛЬЗОВАНИЕ РАДИОИЗОТОПОВ И РАДИАЦИИ В БОРЬБЕ С НАСЕКОМЫМИ-ВРЕДИТЕЛЯМИ РАСТЕНИЙ И ЖИВОТНЫХ. Стр. 115-27 в сб. "Применение радиации и радиоизотопов в борьбе с насекомыми—сельскохозяйственными вредителями. Труды Симпозиума, Афины, 22-26 апреля, 1963". Вена, Международное агентство по атомной энергии 1963.

Andreev, S.V., Martens, B.K., Molchanova, V.A., Samoilova, Z.I. USE OF RADIOISOTOPES AND RADIATION IN THE CONTROL OF PLANT AND ANIMAL INSECT PESTS. p. 115-27 in "Radiation and Radioisotopes Applied to Insects of Agricultural Importance. Proceedings of a Symposium, Athens, 22-26 April, 1963". Vienna, International Atomic Energy Agency. 1963.

Radioactive labelling of insects has been extremely promising in bioecology; the labelling of grain pests (Eurygaster integriceps Put., Hadena sordida Skh.) and grain-pest parasites (Meniscus agnatus Crow, Pseudogonia cinerascens Rond.) has provided information about their areas of migration, habitats, sizes of population and the feeding habits. The same technique was used to determine the rate of propagation of the Colorado beetle (Leptinotarsa decemlineata Say), which is subject to quarantine controls; subsequently, an extermination programme was carried out on the basis of the data obtained. It also provides a valuable means of studying the extremely complex problems of parasitism and predaceousness, in particular intermediate feeding cycles and chemotaxis. The feeding areas of field rodents have been mapped out with the help of self labelling, radioactive-bait techniques. The migration of Xenopsylla cheopis and Ceratophyllus fasciatus were studied. Hydrolysis rates of insecticides of the Thiophos and Metaphos type were determined as a function of plant development and physiological state, as well as of environmental conditions, and residue data obtained. The merits of various spraying techniques and doses were also studied. Experiments have shown that ionizing radiations can be used to increase the virulence of insect nosophytes (Beauveria vassiana Unill.) and thus improve the efficiency of microbiological insect-pest-control methods.

Sterilizing doses of γ-rays have been established for a number of insect pests which attack crops and stored products (Calandra granaria L., Acanthoscelides obtectus Say, Pectinophora malvella Hb., Leptinotarsa decemlineota Say, Chloridea obsoleta F.). Also published in JPRS-20425, 11p. (English Translation of a Russian paper).

1571 Atomic Energy Commission, Washington, D.C. FUNDAMENTAL NUCLEAR ENERGY RESEARCH 1962. A SPECIAL REPORT. 1962. 405p.

Includes effects on plant and insect life.

1572 Division of Technical Information, AEC. RESEARCH AND DEVELOPMENT IN PROGRESS. BIOLOGY AND MEDICINE. Issue No. 1. TID-4200. July 1963. 366p.

Approximately 600 AEC-sponsored projects supported by the Division of Biology and Medicine are covered. The publication is divided into two sections. The first section provides a scope note (abstract) and identifying information for each project. The second section consists of Principal Investigator, Contractor, Subject, and Contract Number Indexes.

1573 Division of Technical Information, AEC. RESEARCH AND DEVELOPMENT IN PROGRESS. BIOLOGY AND MEDICINE. ISSUE No. 2. TID-4201. November 1963. 323p.

1574 International Atomic Energy Agency, Vienna and Food and Agriculture Organization of the United Nations, Rome. "The Use of Radioisotopes and Radiation in Entomological Research", International Short Course, 7 October - 30 November 1963. Gainesville, Florida University, Department of Entomology. 1963. 92 p.

A series of lectures by internationally selected scientists covered the following topics: biological effects of ionizing radiation; effects of ionizing radiation on the ability of cells to synthesize DNA; techniques of tissue culture; application of tissue culture; the use of stable isotopes in biological studies; the use of labelled insecticides in the study of insect resistance and comparative metabolism in resistant and susceptible strains; disinfestation of stored foodstuffs by irradiation with particular reference to grain; plant systemic insecticides; factors in radiation of mass cuttings of the screwworm, especially under differing physical and atmospheric conditions; use of the sterile male technique for control of the screwworm; concepts and results with the sterile-male method of insect control; the sterile male technique on various species of tropical fruit flies; radiosensitivity of developing reproductive cells in insects, especially the screwworm; use of radiation for producing mutations in plants; some effects on γ-radiation and chemosterilants on Drosophila melanogaster; the use of radioisotopes in animal nutrition research; chemosterilants as a potential weapon for insect control; the effects of γ-radiation on the soil; immunization experiments with irradiated larvae; immunization experiments on oral lungworm vaccine; field trial of dictol on oral lungworm vaccine (D. viviparus) in cattle; the chemistry of insect chemosterilants; the use of radiation in food preservation; effect of x-ray exposure on the European corn borer; chemosterilants for the control of houseflies; and effects of γ-radiation on body lice. Laboratory instruction included demonstration of autoradiographs; chromosome preparations; distribution of radioactive food among social insects determination of the speed of haemolymph circulation in insects by insected tracers; the effect of temperature on the post-irradiation response of the rice weevil (Sitophilus zeamais); methods for conducting blood surveillance tests; methods of housefly spermathectomy; procedures to determine the effectiveness of residual applications of chemosterilants on glass; and biological half-life of radioisotopes in insects (grasshoppers).

1575 Kansu, A. RADYOIZOTOPLARIN ENTOMOLOJI ALANINDA KULLANILMASI. (Use of radioisotopes in entomology). Yüks. Zir. Enstit. Derg. (1963) 47-72. (In Turkish).

The publication appeared for a seminar. After an introduction the subject matter is broken down into bio-ecological and physiological studies, followed by a discussion of insect control by radiation. Various applications of radioisotopes are described.

1576 Knipling, E.F. THE USE AND LIMITATIONS OF ISOTOPES AND RADIATION STERILITY IN MEETING INSECT PROBLEMS. Int. J. appl. Rad. Isotopes 13 (1962) 417-26.

Uses and limitations of radioisotopes in advancing entomology research and for insect control are reviewed. The possible use of radiomimetic chemicals in lieu of irradiation as a means of inducing sterility in insects, the use of radioisotopes in insect population and dispersal studies, the use of isotopes in insect physiology and biochemical studies, the use of isotopes in studies on resistance to insecticides and hazards to man

associated with the use of insecticides, and the use of isotopes for irradiating insects to produce sexual sterility or to destroy the insects are discussed. (NSA 17: 1963, 1559).

1577* Клечковский, В. ИСПОЛЬЗОВАНИЕ ИЗОТОПОВ И ИЗЛУЧЕНИЙ В СЕЛЬСКОМ ХОЗЯЙСТВЕ. Атомная энергия 4 (1957) 389-470.

Klechkovsky, V. USE OF ISOTOPES AND RADIATION IN AGRICULTURE. Atomnaya Energiya 4 (1957) 389-470.

1578* Kljajić, R. STANJE KORIŠCENJA RADIOIZOTOPA I JONIZUJUCIH ZRAČENJA U ZAŠTITI BILJA. (Present utilization of radioisotopes and ionizing radiations for plant protection). Zašht. Bilja 61 (1960) 89-101. (In Jugoslav. with English summary)

Review article with 75 references.

1579 Lindquist, A.W. NEW WAYS TO CONTROL INSECTS. Pest Control 29, 6 (1961) 9, 11, 12, 14, 16, 18, 19, 36, 38, 40.

Review article, emphasizing such promising control aspects as the sterile male technique, chemosterilants, combined insecticide and chemosterilant treatment, and others.

1580 Pesson, P. TRAVAUX DE RECHERCHES UTILISANT LES ISOTOPES ET LES RAYONNEMENTS NUCLÉAIRES EN ENTOMOLOGIE APPLIQUÉE EN FRANCE ET DANS LES PAYS ASSOCIÉS. p. 297-300 in "Radioisotopes and and Radiation in Entomology. Proceedings of a Symposium, Bombay, 5-9 December 1960". Vienna, International Atomic Energy Agency. 1962.

Dans une première partie, l'auteur passe en revue les travaux, effectués ou en cours en Haute-Volta, en Côte-d'Ivoire, à Bures-sur-Yvette (S. & O.) et à Bondy, qui utilisent des radioisotopes pour le marquage de simulies, de fourmis, d'Apis mellifica et d'Aphis leguminosae, ainsi que les projets de recherches dans les régions tropicales, en Afrique tropicale et en France pour le marquage de Perkinsiella, de trichogrammes, de Locusta migratoria et de certains moustiques ou de leurs prédateurs. Dans la seconde partie, il mentionne les études poursuivies sur la stérilisation des insectes (Apis mellifica, Ephestia kühniella, Calandra granaria, C. oryzae, Trogoderma, Acanthoscelides obtectus, Rhizopertha, Gnathocerus, Tenebrio et Sitotroga cerealella) et l'action cytologique des radiations ionisantes sur les gonades de Calandra granaria. (Auth.)

1581 Qayyum, H.A. THE SCOPE OF THE USE OF RADIOISOTOPES AND RADIATION SOURCES IN ENTOMOLOGY IN PAKISTAN. p. 281-4 in "Radioisotopes and Radiation in Entomology. Proceedings of a Symposium, Bombay, 5-9 December 1960". Vienna, International Atomic Energy Agency. 1962.

The application of radioisotopes and radiation sources in entomological research in Pakistan is discussed. The problems which deserve to be investigated with the help of radioisotopes include a study of the migratory habits of insects such as Sylepta derogata F. (a threat to cotton), Apis dorsata F. and Apis indica F.

1582 Quraishi, M.S. SPOTLIGHT ON CINS* RESEARCH. II. ENTOMOLOGY. Bull. CENTO Inst. nucl. Sci. 2 (1963) 24-8.

Review of work in progress, which includes studies on plant and stored grain pests (Eurygaster integriceps, using Sc^{46}, P^{32} and Ta^{182}; Oxytheria cinctella; radiation effects and lethal doses on Bruchus sp.) and on malarial entomology (Anopheles stephensi, using P^{32}). Insecticides are mentioned but without details of intended studies. The names of the scientists involved in the various projects are given.

* CENTO Institute of Nuclear Science [CENTO - Central Treaty Organization (Teheran)].

1583 Stanković, D. PRESENT STATUS AND THE FUTURE DEVELOPMENT OF RADIOTECHNOLOGY. Tehnika, Belgrade 17 (1962) 137-45.

Review article of the uses of ionizing radiations in Yugoslavia. A variety of problems and methods of investigation are described. Among the topics discussed are the control of stored products infestation and the killing of silkworm pupae.

1584 Strouhal, H.,Ed., Beier, M., Ed. XI. Internationaler Kongress für Entomologie, Wien, 17. bis 25. August 1960. Verhandlungen. Band III (Symposien). Wien, Organisationskomitee des XI. Internationalen Kongresses für Entomologie, Wien 1960. 1962. 348p.

The Proceedings of the Eleventh International Congress of Entomology [cf. RAE-B 52:1964, 105 etc.] conclude with the full text or abstracts of papers read at the 17 symposia that were held; those of the third and fourth of these were published separately.* The symposia of economic interest include [cf.also -A 52: 1964, 338] Symposium II, on the long-range displacement and migration of flying insects; Symposium V, on the host-seeking behaviour of mosquitoes; Symposium VI, on the transmission of disease by ticks and other Acarina; Symposium VII, on arthropods in relation to blood parasites, especially those of wild animals; Symposium XI, on insecticide resistance, and Symposium XVI, on applied acarology. Radioisotope studies contained in Symposia I, II and III are cited elsewhere in this bibliography. The remaining symposia were not available for scanning.

* XI. Internationaler Kongress für Entomologie, Wien 1960. Verhandlungen. Band III. Symposium 3: Chemie der Insekten. Symposium 4: Chemische Verteidigungsmechanismen bei Arthropoden. Pavia, 1960. 293 p.

1585 Viado, G.B. THE FUTURE OF RADIOISOTOPES IN INSECT-CONTROL INVESTIGATIONS IN THE PHILIPPINES. p.287-95 in "Radioisotopes and Radiation in Entomology. Proceedings of a Symposium, Bombay, 5-9 December 1960". Vienna, International Atomic Energy Agency. 1962.

Insect pests of the major and some of the minor crops and the extent of damage they cause in the Philippines are reviewed, in relation to the possible use of radioisotopes for their study and eventual control.

See also:

1 Study and formulation of methods of controlling plant pests and diseases by means of radioisotopes and radiation. (Andreev, 1957).
39 Quelques emplois des radioéléments et des rayonnements en entomologie. (Courtois and Lecomte, 1963).
90 Dispersal and migration. (Schneider, 1962).
412 Radioactive tracer techniques in insect biochemistry. (Winteringham, 1962).
499 Isotope methods. (Smith, 1963).

ADDENDUM

NEMATODES

A Radioisotope Studies

1586 Бодрова, И.М. ОСОБЕННОСТИ ФИЗИОЛОГИЧЕСКИХ ПРОЦЕССОВ И ВЛИЯНИЕ ЭЛЕМЕНТОВ ПИТАНИЯ НА РОСТ И РАЗВИТИЕ РАСТЕНИЙ, ЗАРАЖЕННЫХ ГАЛЛОВОЙ НЕМАТОДОЙ. Стр. 76-88 в сб. "Труды Всесоюзного института защиты растений", №16, 1961. Р. Ж. Биол. №13Г108. 1962.

Bodrova, I.M. FEATURES OF THE PHYSIOLOGICAL PROCESSES AND THE EFFECT OF THE NUTRITIVE ELEMENTS ON THE GROWTH AND DEVELOPMENT OF PLANTS INFECTED WITH GALL NEMATODES. Trudy. vsesoyuz. Inst. Zash. Rast. 16 (1961) 76-88. R. Zh. Biol. No. 13 G108. 1962.

Pot-experiment studies were made on the effect of increased amounts of N, P, and K on the resistance of plants to gall nematodes (Meloidogyne sp.). In plants thus infected, respiration, photosynthesis, and transpiration were more intense than in healthy plants. The intake of P^{32} by the infected plant and its distribution throughout the plant body was slower during the 1st period of development than in healthy plants, regardless of the amounts of N and P furnished in the nutrient solution. Infected plants had a higher content of sugars in the leaves and fruits, which reduced N, especially protein N. The fruit of infected plants contained less dry matter than did those of healthy plants. (BA 42: 1963, 15 551).

1587 Nicholas, W.L., Dougherty, E.C., Hansen, E.L., Holm-Hansen, O., Moses, V. THE INCORPORATION OF ^{14}C FROM SODIUM ACETATE-2- C INTO THE AMINO ACIDS OF THE SOIL-INHABITING NEMATODE, Caenorhabditis briggsae. J. exp. Biol. 37, 3 (1960) 435-43.

The nematode C. briggsae was cultured in a sterile culture medium consisting of a chick embryo extract, a liver extract and sodium acetate-2-C^{14}. Large numbers of worms and their eggs were collected from the cultures and reduced very largely to protein. The protein was hydrolysed and the constituent amino acids studied by chromatography and radioautography. Aspartic acid, glutamic acid, alanine, proline, glycine, serine and cysteic acid were found labelled with C^{14}. In addition to these, the following amino acids were identified in the chromatograms: histidine, lysine, methionine, arginine, threonine, tyrosine, valine and the combined spot for leucine, isoleucine and phenylalanine. The bearing of these results on the nutritional requirements of the nematode is discussed. (Auth.).

B Radiation Studies

1588 Brande, J. van den, Pelerents, C. SOME EFFECTS OF GAMMA RAYS ON MEAL WORMS AND VARIOUS NEMATODES. Soils & Fert. 26, 4 (1963) 276.

Data on the effect of γ- rays on free-living and root nematodes indicate that a minimum dose of 80 000 rad to 60 cm depth would be required for an effect comparable with that of the usual nematocides, making this method of control impracticable.

1589 Fassuliotis, G. OBSERVATIONS ON THE BIOLOGICAL EFFECTS OF IONIZING RADIATIONS ON THE LIFE CYCLE OF Heterodera rostochiensis WOLLENWEBER, 1923. Diss. Abstr. 22, 2 (1961) 401-2.

The biological effects of ionizing radiations were investigated on the golden nematode H. rostochiensis, a parasite of potatoes and tomatoes. The resistant stage, the cyst, containing several hundred embryonated eggs, was irradiated at a dose of 1000 r/min x-rays. Cysts were also irradiated with a Co^{60}-source emitting 670 000 r/h; moist cysts were treated at room temperature with dosages ranging from 5 through to 1280 kr. A delay of larval emergences was noted after 160 kr and above, which also resulted in a significant decrease in total hatch. A differential radiosensitivity among embryonated eggs within the cysts is indicated. No larvae hatched from cysts (maintained at 40°F) after a dose of 640 kr. A disturbance in the normal pattern of motility of emerged larvae in the form of slight jerkiness was first noted after 80 kr. After 20 kr, the infective capacity of the larva is decreased significantly. This trend continues. A few larvae were able

to penetrate after 320 kr. Oviposition was not significantly affected up to 20 kr. After 20, 40 and 80 kr, eggs in females developing from irradiated larvae contained 16, 2 and 0% embryonated eggs. However, no larvae hatched from the 20 and 40 kr females. Viability was not altered in developing females after 6 months-postirradiation-storage at 40°F. Parthenogenesis does not occur in this nematode. There are indications that the presence of sperm is essential for the release and maturation of the oöcytes. The rate of colour changes (white females to brown cysts) is affected by irradiation. A diploid number of 18 chromosomes has been counted in the oöcytes. Chromosome aberrations were found in eggs recovered from females that developed from irradiated larvae. These were in the form of fragments and bridges at anaphase.

1590 Lackey, J.B. RATES, AMOUNTS, NUCLIDE ORIGIN AND EFFECTS OF RADIATION ACQUIRED BY FRESH-WATER AND SALT-WATER MICROORGANISMS UNDER EXPERIMENTAL CONTROL. (Abstr. E1C110). p. 120 in "Research and Development in Progress. Biology and Medicine. Issue No. 1". TID-4200, Division of Technical Information, AEC. July 1963.

The effects of radioactivity from whatever source, radioisotopes or reactor, upon freshwater and marine microscopic organisms, are being evaluated. Among the animals investigated are nematodes. (From abstr.).

1591 Скарбилович, Т.С. ВЛИЯНИЕ ГАММА-ЛУЧЕЙ Co^{60} И ВЫСОКОВОЛЬТНЫХ ИМПУЛЬСОВ ЭЛЕКТРИЧЕСКОГО ТОКА НА ГАЛЛОВУЮ НЕМАТОДУ. Стр. 231-46 в сб. "Труды Всесоюзного института гельминтологии им. Скрябина", т.8. 1960.

Skarbilovich, T.S. p. 231-46 in "Transaction of the Scryabin All-Union Institute of Helminthology. Vol. 8". 1960.

Effect of Co^{60} gamma rays and high-voltage pulses on the gall nematode.

1592* Weischer, G. ACTIVATION AND SENSITIVITY TO IRRADIATION OF THE POTATO ROOT EELWORM. Mitt. biol. BdAnst. Land Forstw., Berlin-Dahlem 98 (1960) 59-65. (In German).

Heterodera rostochiensis larvae from 1-year-old cysts were more resistant to irradiation with Ra than those from 3-month-old cysts. Gonads of larvae activated by root diffusate were much more sensitive to irradiation than those of larvae in anabiosis. The degree of sensitivity seemed to depend mainly on the depth of dormancy, and not on age. (CA 55:1961, 250671).

See also:

1468 Quelques effets des rayons gamma sur la teigne de la farine et sur divers nématodes. (Brande and Pelerents, 1962).

TABLES

TABLE 1

DISPERSAL OF RADIOISOTOPE-MARKED INSECTS

Insect	Label	Average	Maximum	Ref. No.
Aëdes taeniorhynchus	P^{32}	< 4 miles ♀	2 miles ♂ 18 miles ♀	66
Anopheles gambiae	P^{32}, S^{35}	mean flight range: 0.64 mile ♀, 0.52 mile ♂ dispersion 0.98 mile ♀	2.25 miles ♂♀	70
Ceratitis capitata	P^{32}		1400 yd 315 m (after 3 d)	72 95
Chrysomyia sp.	P^{32}		0.5 mile	100
Cnephalia cinerascens	P^{32}		18 - 20 km	82
Dacus oleae	P^{32}		4.3 km ** 2 km *	86 88
Drosophila melanogaster	P^{32}		4.4 miles upwind	101
Eurygaster integriceps	Co^{60}	0.5 - 1 km/d (Aug.)	15 km	89
Eurytoma roddi	P^{32}, S^{35}		4100 ft downwind	97
Flies (including Musca domestica)	P^{32}		330 ft 250 m 0.5 mile	84 68 100
Hadena sordida	P^{32}		3 km ♂ 2 km ♀	82
Haematobia irritans	P^{32}		5 miles	65
Musca domestica (see also flies)	P^{32}		5 miles	65
Nomophila noctuella	mixed fission products		1500 miles	73
Stomoxys calcitrans	P^{32}		1 - 5 miles (5 miles in < 2 h)	65
Wohlfartia magnifica	P^{32}		2000 yd	99
Xenopsylla	S^{35}		100 m	140

* sunny winter's day ** autumn; special conditions

TABLE 2

RADIATION-INDUCED STERILIZATION OF INSECTS

	Insect	Stage	Radiation	Sterilizing Dose	Ref. No.
1.	Acanthoscelides obsoletus (Bean weevil)	A ♀	γ	20 000 rad	1498-9
2.	Aëdes aegypti (Yellow-fever mosquito)	P	γ	11 000 - 18 000 r	1444
3.	Anastrepha ludens (Mexican fruit fly)	$P_{12\,d}$	x	5000 r	811, 1434
4.	Anopheles maculipennis atroparvus	A	x	6000 r	1342
5.	Anopheles quadrimaculatus	$P_{24\,h}$ P A	γ γ γ	12 000 r 8865 - 12 900 r 8865 - 12 900 r	1446 1180 1180
6.	Anthonomus grandis (Boll weevil)	A	γ	15 000 r	774
7.	Attagenus piceus (Black carpet beetle)	♀	γ	slightly < 15 000 rad	1493
8.	Blattella germanica (German cockroach)	N	γ	3200 r	1354
9.	Callosobruchus chinensis	A ♂ emerged overnight	γ	42 000 rad	1235
10.	Carpocapsa pomonella (Codling moth)	P ♂ 1 d before emergence ♀	γ γ	40 000 rad * 25 000 rad **	1463-4 1463-4
11.	Ceratitis capitata (Mediterranean fruit fly)	P P_{mature}	γ γ	10 000 - 13 000 r 10 000 r	1452 1227
12.	Chloridea obsoleta	P ♂	γ	8000 r	1475
13.	Cochliomyia hominivorax (Screwworm)	$P_{5\,d}$ P ♀	γ γ/CO_2 γ/CO_2+air γ/CO_2+air	7500 r 11 000 r 4500 r 5500 - 6200 r	1440 1045 1075 1045
14.	Culex fatigans	P	γ	7700 r	1447
15.	Dacus cucurbitae (Melon fly)	P_{mature}	γ	10 000 r	1227

A = adult; L = larva; N = nymph; P = pupa (suffix indicates age); * 98% sterility ** > 99% sterility

TABLE 2 (cont'd)

	Insect	Stage	Radiation	Sterilizing Dose	Ref. No.
16.	Dacus dorsalis (Oriental fruit fly)	P_{mature}	γ	10 000 r	1227
17.	Dacus oleae (Olive fly)	P P A	γ γ γ	8000 - 12 000 r 11 000 - 15 000 rad 15 000 - 18 000 rad	1459 815 815
18.	Diatraea saccharalis (Sugarcane borer)	$P_{<3d}$ ♂	γ	> 15 000 r	1434
19.	Drosophila melanogaster	L ♂ P ♂ A ♂	γ γ γ	5000 r 10 000 - 20 000 r 2000 r *	1434 1434 1434
20.	Ephestia cautella (Almond moth)	P		> 16 000 rad	805
21.	Ephestia kühniella (Mediterranean flour moth)	P ♂ P_{3d} ♂ P_{6d} ♂ P_{15d} P ♀ P ♂ A ?	γ γ γ γ γ γ γ	60 000 rad > 10 000 rad 30 000 rad 60 000 rad 25 000 rad 45 000 rad 16 000 rad	804 1235 1235 1235, 1468 1237 1237 1499
22.	Gnathocerus comutus	A ?	γ	8000 rad	1498-9
23.	Habrobracon	A ?	Pu^{239}	0.11 - 0.14 μc	1414
24.	Ips confusum (Bark beetle)	A ♀ ?	γ	< 10 000 r	1382
25.	Lasioderma sericorne (Cigarette beetle)	A A ?	γ γ	16 000 rad slightly < 15 000 rad	805 1493
26.	Lucilia sericata (Sheep maggot fly)	P ♂ ♀	γ γ	> 3000 rep 3000 rep	1327 1327
27.	Melolontha vulgaris (White grub)	A	x	(3000 - 5000 r)	1437
28.	Musca domestica (Housefly)	P P	x ?	3000 r 2000 r	812 1450
29.	Paramyelois transitella (Navel orangeworm)	P ♀	γ	50 000 rad	1470

* Effective 10 d after irradiation

TABLE 2 (cont'd)

	Insect	Stage	Radiation	Sterilizing Dose	Ref. No.
30.	Plodia interpunctella (Indian meal moth)	? ?	γ γ	> 16 000 rad 50 000 rad	805 1493
31.	Pyrausta (ostrinia) nubilalis (Corn borer)	A_{1d} ♂	γ	32 000 r	1434, 1473
32.	Rhizopertha dominica (Lesser grain borer)	A	γ	12 000 rad 16 000 rad	1499 805
33.	Sitophilus granarius (Grain weevil)	A A ? A A	γ γ/ temp. γ	≥ 5000 rad 16 000 rad 8000 r 10 000 rad 16 000 rad	1371 1479 761 1498-9 1103, 1228
34.	Sitophilus oryzae (Rice weevil)	A A A	x γ γ	7500 - 10 000 r ≥ 5000 rad 16 000 rad	1256 1371 1228
35.	Sitophilus sasakii	A	γ	15 000 r	1497
36.	Spodoptera exigua (Beet armyworm)	P ♂ P ♀	γ γ	9000 - 11 000 r 5000 r	810 810
37.	Tenebrio molitor (Yellow mealworm)	L	γ	8000 rad	1498-9
38.	Thaumetopoea pithyocampa (Pine processionary moth)	P_{15d}	γ	4000 r	1462
39.	Tribolium (Flour beetle)	A ?	γ	slightly > 12 000 rad	1498-9
40.	Tribolium castaneum (Red rust flour beetle)	A A	x γ	6000 r 16 000 rad*	1372, 1414 772
41.	Tribolium confusum (Confused flour beetle)	A A A	x γ γ	6000 r < 10 000 rad 16 000 rad	1372, 1414 1493 1228
42.	Trogoderma granarium (Khapra beetle)	P ♂ P ♂ P ♀ A ?	γ γ γ γ	15 000 r 16 000 rad 6000 rad 15 000 rad	789 1275 1275 1493

* 90% mortality

TABLE 3

RADIOTRACER STUDIES ON INSECTICIDES [1, 2)]

Data have been assembled in the following categories:

B. BOTANICALS AND DERIVATIVES

C. CHLORINATED ARYL HYDROCARBONS (containing 6 or more chlorines)

D. DDT RELATIVES (diphenyl aliphatics)

F. FUMIGANTS

H. HETEROCYCLIC COMPOUNDS (not to be found elsewhere)

P. PHOSPHORUS-CONTAINING COMPOUNDS

- A. ALIPHATIC DERIVATIVES
- C. ARYL (PHENYL) DERIVATIVES
- H. HETEROCYCLIC DERIVATIVES

R. RADIOMIMETIC AGENTS. CHEMOSTERILANTS

S. SULFONATES

X. CARBAMATES

Z. MISCELLANEOUS

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1) Chemical names and "other designations" for compounds cited in the bibliography are largely based on E.E. Kenaga's "Commercial and Experimental Organic Insecticides" (1963 Revision) in Bull. ent. Soc. Am. 9, 2 (1963) 67-103 (with the exception of Baycid, Iridomyrmecin, malaoxon, metaphos, methyl paraoxon and pentachlorophenol). The chemical categories have been maintained, apart from slight modifications. Two indexes (i) Common and Manufacturers' Names Index, and (ii) Letter-and-Number Index (the latter differing somewhat from the separate Number and Letter Indexes of the article) have also been prepared.

2) The chemical name used in accordance with the principles of Chemical Abstracts nomenclature is generally marked with an asterisk, *.

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis*	Metabolism	Residue determination
BOTANICALS AND DERIVATIVES					
B.1	rotenone (from plant species Derris and Lonchocarpus)	rotenone powder and resins derris cubé	C^{14} (599)	insects C^{14} (495)	
B.2	* pyrethrum (principally from plant species Chrysanthemum cinariaefolium)	pyrethrum pyrethrin I pyrethrin II	pyrethrum C^{14} (598) pyrethrin C^{14} (596-7)	Musca domestica C^{14} (596)	
CHLORINATED ARYL HYDROCARBONS (containing 6 or more chlorines)					
C.1/2	benzene hexachloride * 1,2,3,4,5,6-hexachlorocyclohexane, mixed isomers hexachlorocyclohexane 1,2,3,4,5,6-hexachlorocyclohexane, 99% or more gamma isomer * lindane	BHC HCH 666 gammexane lindane gamma BHC	Isomer determination Cl^{36} α- (532, 1547) δ- (539) Isomerization C^{14} (533)	animals C^{14}, Cl^{36} (540) Cl^{36} (538, 540) rat C^{14}, Cl^{36} (664) cattle Cl^{36} (706) Periplaneta americana C^{14} (534) cuticle penetration C^{14} (534) plants C^{14} (536) rice C^{14} (536-7, 698) girdling experiments, woody plants C^{14} (541)	cattle (meat) C^{14} (706) neutron activation analysis (1550)

* If no other indication

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis	Metabolism	Residue determination
C.3	1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindane * chlordan 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene 1,2,4,5,6,7,10,10-octachloro-4,7,8,9-tetrahydro-4,7-endo-methyleneindane	chlordane Octa-Klor Octachlor Velsicol 1068 1068	C^{14} (526, 529)	Aëdes aegypti C^{14} (526, 529) fungi C^{14} (526, 529) rat C^{14} (526, 529)	
C.4	1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene * heptachlor 1(3a),4,5,6,7,8,8-heptachloro 3a(1),4,7,7a-tetrahydro-4,7-methanoindene 1,4,5,6,7,10,10-heptachloro 4,7,8,9-tetrahydro-4:7 endomethyleneIndene 4,5,6,7,9,10,10-heptachloro 4,7,8,9 tetrahydro-4,7-methanoindene	heptachlor Velsicol 104 E-3314	C^{14} (526, 529)	Aëdes aegypti C^{14} (526, 529) fungi C^{14} (526, 529) rat C^{14} (526, 529)	
C.5	not less than 95% of 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4-endo-exo-5,8-dimethanonaphthalene * aldrin	aldrin compound 118 Octalene HHDN	C^{14} (524, 526, 529, 530)	Aëdes aegypti C^{14} (525-6) fungi C^{14} (525-6) Musca domestica C^{14} (620) Periplaneta americana C^{14}, Cl^{36} (654) rat C^{14} (525-7, 660) Schistocerca gregaria Cl^{36} (621)	film Cl^{36} (720)

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis	Metabolism	Residue determination
C.6	not less than 85% of 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo-exo-5,8-dimethanonaphthalene * dieldrin	dieldrin compound 497 Octalox HEOD		Aëdes aegypti C^{14} (525-6) Anopheles gambiae C^{14} (522) fungi C^{14} (526) mouse Cl^{36} (523) Musca domestica C^{14} (522)	butterfat C^{14} (709)
C.7	* decachlorooctahydro-1,3,4-metheno-2H-,3 cyclobuta [cd] pentalen-2-one decachlorotetracyclo decanone 1,2,3,5,6,7,8,9,10,10-decachloro-tetracyclo (5.2.1.$0^{2,6}$.$0^{3,9}$.$0^{5,8}$)-decane-4-one decachlorotetrahydro-4,7-methanoindeneone 2,3,3a,4,5,6,7,7a,8,8á-decachloro-3a,4,7,7a-tetra-hydro-4,7-methanoinden-1-one	1189 Kepone			milk Cl^{36} (708)
C.8	* 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzo-dioxathiepin 3-oxide	endosulfan Thiodan BIO-5462 Hoe 2671 Malix Niagara 5462		Calandra granaria S^{35} (549) Musca domestica C^{14} (656) Periplaneta americana S^{35} (548)	

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis*	Metabolism	Residue determination
C.9	*1,3,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanophthalan	Telodrin SD 4402 CP-14957	C^{14} (526, 547)	Aëdes aegypti C^{14} (526, 547, 655) fungi C^{14} (526, 547) Laphygma frugiperda C^{14} (653) rat C^{14} (526, 547)	
	DDT RELATIVES				
D.1	dichloro diphenyl trichloroethane *1,1,1-trichloro-2,2-bis-(p-chlorophenyl) ethane	DDT Chlorophenothene	Properties C^{14} (543)	Aëdes aegypti C^{14} (380, 622, 624, 733) Anthonomus grandis C^{14} (628) Blattella germanica C^{14} (207, 627) cattle C^{14} (658, 705-6) Drosophila melanogaster C^{14} (544) Heliothis zea Cl^{36} (626) Musca domestica C^{14} (207, 428) Pectinophora gossypiella C^{14} (623) Pediculus humanus humanus C^{14} (629) Periplaneta americana C^{14} (207, 428) rat C^{14} (545) Salmo salar salar C^{14} (668) Salmo trutta C^{14} (667) soil sorption C^{14} (733-4) Triatoma infestans C^{14} (625)	milk C^{14} (668, 704, 708) neutron activation analysis (1550)

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis	Metabolism	Residue determination
D.2	* 1,1,1-trichloro-2,2-bis-(p-methoxyphenyl) ethane dianisyl trichloroethane	methoxychlor Methoxy DDT DMDT Marlate		cattle C^{14} (704)	milk C^{14} (704) spinach C^{14} (731)
D.3	1,1-bis(p-chlorophenyl) 2,2,2-trichloroethanol * 4,4'-dichloro-α-(trichloromethyl) benzhydrol 1,1,1-trichloro-2-hydroxy-2,2-bis(p-chlorophenyl) ethane	Kelthane FW-293		Drosophila melanogaster C^{14} (544)	
	FUMIGANTS				
F.1	1,2-dibromo-3-chloropropane	Fumazone Nemagon OS 1897			neutron activation analysis (1548)
F.2	methyl bromide * bromomethane	CH_3Br MeBr Meth-O-Gas	C^{14} (511)		packaging material C^{14} (510-11) rice C^{14} (510-11) soybeans C^{14} (510-11) wheat Br^{82} (732)
F.3	sulfuryl fluoride	Vikane	S^{35} (511)	Kalotermes minor S^{35} (517)	analysis S^{35} (511)
F.4	naphthalene			Musca domestica C^{14} (513-6, 635) rat C^{14} (516)	

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis*	Metabolism	Residue determination
F. 5	hydrogen cyanide * hydrocyanic acid	HCN prussic acid (in H_2O)	C^{14} (1551)	Linum usitatissimum C^{14} (508) Schistocerca gregaria C^{14} (505) Sitophilus granarius C^{14} (505-7)	
F. 6	* carbon disulfide carbon bisulfide	CS_2	S^{35} (520)		
F. 7	sulfur dioxide	SO_2		Douglas fir S^{35} (518) spinach S^{35} (519)	
	HETEROCYCLIC COMPOUNDS				
H. 1	* nicotine l-1-methyl-2-(3-pyridyl)-pyrrolidine l-3-(1-methyl-2-pyrrolidyl)-pyridine	Black Leaf (40) nicotine (sulfate)	H^3 (606) C^{14} (601-4) Degradation C^{14} (600)		
	PHOSPHORUS-CONTAINING COMPOUNDS PHOSPHORUS ALIPHATIC DERIVATIVES				
P/A. 1	* O,O,O',O'-tetraethyl S,S'-methylene bisphosphorodithioate [bis(S-diethoxyphosphinothioyl)-mercapto] methane	ethion Nialate Niagara 1240	P^{32} (567)		

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis	Metabolism	Residue determination
P/A. 2	* dimethyl (2,2,2-trichloro-1-hydroxyethyl) phosphonate	Dipterex Bayer L13/59 Dylox Neguvon chlorophos trichlorofon Tugon Dipteres	P^{32} (591)	cattle P^{32} (592, 658, 674, 679) Musca domestica P^{32} (618) poplar P^{32} (697) rabbit P^{32} (658)	
P/A. 3	O,O-dimethyl 2,2-dichlorovinyl phosphate * 2,2-dichlorovinyl dimethyl phosphate	DDVP Herkol Vapona dichlorvos	P^{32} (591)	cattle P^{32} (682) corn P^{32} (682) cotton P^{32} (682) goat P^{32} (682) rabbit P^{32} (683) rat C^{14} (682-3) P^{32} (682)	
P/A. 4	* 3-(dimethoxyphosphinyloxy)-N,N-dimethyl-cis-crotonamide 2-dimethylcarbamoyl-1-methylvinyl dimethyl phosphate dimethyl phosphate of 3-hydroxy N,N-dimethyl-cis-crotonamide	Bidrin SD 3562		Anthonomus grandis C^{14}, P^{32} (619) beans C^{14}, P^{32} (554) cotton C^{14}, P^{32} (619) Heliothis zea C^{14}, P^{32} (619) mammals C^{14}, P^{32} (554)	

TABLE 8 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis*	Metabolism	Residue determination
P/A. 5	* 2-chloro-2-diethylcarbamoyl-1-methylvinyl dimethyl phosphate 1-chloro-1-diethylcarbamoyl-1-propen-2-yl dimethyl phosphate	phosphamidon ML-97 OR-1191 Dimecron	C^{14} (575-6)	beans C^{14} (576)	
P/A. 6	1,2-dibromo-2,2-dichloroethyl dimethyl phosphate	naled DIBROM RE 4355		cattle P^{32} (682) rat P^{32} (682)	
P/A. 7	* O,O-diethyl S-ethylthiomethyl phosphorodithioate O,O-diethyl S-ethylmercaptomethyl dithiophosphate	phorate Thimet L 11/6 AC 3911		barley P^{32} (685) cotton P^{32} (687, 691-2)	cotton P^{32} (724)
P/A. 8	O,O-diethyl O(and S)-2-(ethylthio) ethyl phosphorothioates * mixture of O,O-diethyl S- (and O) 2-(ethylthio) ethyl phosphorothioates mixture of O,O-diethyl S-ethyl-mercaptoethyl thiophosphate and O,O-diethyl O-ethylmercaptoethyl thiophosphate a trialkyl thiophosphate	demeton Systox E-1059 Bayer 8173 mercaptophos	(intermediate) C^{14}, S^{35} (555)	market-gardening produce P^{32} (690) Vitis vinifera P^{32} (695) pineapple S^{35} (696)	P^{32} (717) crops (various) P^{32} (718)
P/A. 9	* O,O-diethyl S-2-(ethylthio)-ethyl phosphorodithioate	Bayer 19639 Di-Syston Ekatine dithiodemeton		cotton P^{32} (694) pineapple S^{35} (696)	

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis	Metabolism	Residue determination
P/A. 10	* O,O-dimethyl dithiophosphate of diethyl mercaptosuccinate O,O-dimethyl S-(1,2-dicarbethoxyethyl) dithiophosphate S-[1,2-bis(ethoxycarbonyl)-ethyl] O,O-dimethyl phosphorodithioate O,O-dimethyl phosphorodithioate ester with diethyl mercaptosuccinate	malathion Malathon 4049	S^{35} (677)	Aëdes aegypti P^{32} (640) Blattella germanica P^{32} (666) cattle P^{32} (676) Culex tarsalis P^{32} (637, 639, 641-2) forest ecosystem S^{35} (677) mouse P^{32} (666) Musca domestica P^{32} (56, 637, 666) Periplaneta americana P^{32} (638, 666) rice P^{32} (699)	milk P^{32} (676)
P/A. 11	O,O-dimethyl thiophosphate of diethyl mercaptosuccinate	malaoxon		Culex tarsalis P^{32} (636, 642)	
P/A. 12	O,O-dimethyl S(N-methylcarbamoylmethyl) phosphorodithioate * S-methylcarbamoylmethyl O,O-dimethyl phosphorodithioate O,O-dimethyl S-α-mercapto-N-methylacetamido dithiophosphate methyl dimethyl dithiophosphoryl acetamide	dimethoate Cygon Rogor AC 12880 ENT 24650 NC-262		Aëdes aegypti P^{32} (646) Anopheles quadrimaculatus P^{32} (646) Anopheles taeniorhynchus P^{32} (646) Aphis fabae P^{32} (565) Blattella germanica P^{32} (556)	beets (sugar-, fodder-) P^{32} (729) olive (fruit) P^{32} (727) peach P^{32} (729)

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis	Metabolism	Residue determination
P/A. 12				cherries P^{32} (729) Chrysomphalus dicytospermi P^{32} (561) citrus plant P^{32} (559) cocoa plant P^{32} (685) cotton P^{32} (560, 688-9, seedling 693) Heliothis zea P^{32} (692) lemon P^{32} (558, 563, 566) mouse P^{32} (557, 666) Musca domestica P^{32} (556) olive (fruit) P^{32} (564) peach P^{32} (562) Periplaneta americana P^{32} (428, 556) pineapple S^{35} (696) potato P^{32} (560) rat P^{32} (557) sheep P^{32} (673)	

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis	Metabolism	Residue determination
P/A. 13	bis(dimethylamino) fluorophosphine oxide * tetramethylphosphorodiamidic fluoride	dimefox DMF Hanane Pestox 14 Terra Sytam		Vitis vinifera ps2 (695)	ps2 (717)
P/A. 14	* octamethylpyrophosphoramide bis(dimethylamino) phosphoric anhydride bis-N, N, N', N'-tetramethylphosphoro-diamidic anhydride tetrakisdimethylaminophosphonous anhydride	schradan OMPA Pestox III Sytam		Chilo suppressalis ps2 (651-2) cotton ps2 (686) Dysdercus koenigii ps1 (582) Leptocorisa varicornis ps1 (651-2) Musca domestica ps2 (651-2) Nephotettix bipunctatus cincticeps ps2 (651) Periplaneta americana ps2 (650-2) Scotinophara lurida ps2 (651-2) sugarcane ps2 (686) Vitis vinifera ps2 (695)	
PHOSPHORUS PHENYL (CARBOCYCLIC) DERIVATIVES					
P/C. 1	O,O-dimethyl O-p-nitrophenyl phosphate	methyl para-oxon		Chilo suppressalis ps2 (643) guinea pig ps2 (643) Periplaneta americana ps2 (643) rabbit ps2 (643) rat ps2 (643) Xylotrupes dichotomus ps2 (643)	cotton ps2 (726)

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Properties	Metabolism	Residue determination
P/C. 2	* O,O-dimethyl O-p-nitrophenyl phosphorothioate O,O-dimethyl O-p-nitrophenyl thiophosphate dimethyl p-nitrophenyl thionophosphate dimethyl p-nitrophenyl phosphorothionate	methyl parathion methyl homologue of parathion Nitrox Bayer E-601 Metron	P^{32} (574)	Chilo suppressalis P^{32} (643) cotton P^{32} (725-6) Blattella germanica P^{32} (584) guinea pig P^{32} (584, 643) Periplaneta americana P^{32} (643) rabbit P^{32} (643) rat P^{32} (584, 643) rice S^{35} (584, 699) Xylotrupes dichotomus P^{32} (643)	cotton P^{32} (725-6)
P/C. 3	O,O-diethyl O-p-nitrophenyl phosphate * diethyl p-nitrophenyl phosphate	para-oxon oxygen analogue of parathion Bayer E-600	P^{32} (573)	frog P^{32} (681) mouse P^{32} (572, 681) Musca domestica P^{32} (645) Periplaneta americana P^{32} (428, 572, 681)	
P/C. 4	O,O-diethyl O-p-nitrophenyl phosphorothioate * parathion O,O-diethyl O-p-nitrophenyl thiophosphate diethyl p-nitrophenyl thionophosphate diethyl p-nitrophenyl phosphorothionate	parathion Alkron Niran Thiophos Amer. Cyan. 3422 Bayer E-605	P^{32} (573-4, 734)	Aëdes aegypti P^{32} (646) Aëdes taeniorhynchus P^{32} (646) Anopheles quadrimaculatus P^{32} (646) cat P^{32} (678, 680)	man P^{32} (678, 716)

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Properties	Metabolism	Residue determination
P/C. 4				Epilachna varivestis P^{32} (644) guinea pig P^{32} (680) mouse P^{32} (572, 679) Musca domestica P^{32} (645) Oncopeltus fasciatus P^{32} (644) Periplaneta americana P^{32} (572) Prodenia eridania P^{32} (644) rabbit P^{32} (678, 680) rat P^{32} (678) Scanninoidea exitiosa P^{32} (644)	
P/C. 5	mixture of parathion and methyl parathion	metaphos		guinea pig P^{32} (680)	
P/C. 6	O,O-diethyl O-(3-methyl-4-methylthiophenyl) thiophosphate	Baycid		rice P^{32} (551)	agricultural products P^{32} (719)
P/C. 7	O,O-dimethyl O-(3-methyl-4-nitrophenyl) phosphorothioate * O,O-dimethyl O-(4-nitro-m-tolyl) phosphorothioate	Folithion Bayer 41831 Sumithion Sumitomo S-1102A	S^{35} (583)	Blattella germanica P^{32} (584) guinea pig P^{32} (584) rat P^{32} (584) rice P^{32} (584)	apples P^{32} (552) oranges P^{32} (552) radishes P^{32} (552) sugar beet P^{32} (552)

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis	Metabolism	Residue determination
P/C. 8	* O,O-dimethyl O-2,4,5-trichlorophenyl phosphorothioate	ronnel Dow ET-57 Dow ET-14 Korlan Nankor Trolene Etrolene Fenchlorphos		Cimex lectularius P^{32} (586) Leucophaea maderae P^{32} (845) rabbit P^{32} (586)	
P/C. 9	* O-4-tert-butyl-2-chlorophenyl O-methyl methylphosphoramidate	Dowco 132 Ruelene		insects P^{32} (849)	milk P^{32} (708) poultry P^{32} (712)
P/C. 10	* O,O-dimethyl O-[4-(methylthio)-m-tolyl]phosphorothioate O,O-dimethyl O-(3-methyl, 4-methylmercaptophenyl) phosphorothioate O,O-dimethyl O-4-(methylmercapto) 3-methylphenyl thiophosphate	Baytex Bayer 29493 S 1752 ENT 25540 Entex Tiguvon Lebaycid fenthion		Anopheles albimanus P^{32} (569) Anthonomus grandis P^{32} (661) Blattella germanica P^{32} (661) cabbage P^{32} (700) cotton P^{32} (569) Culex pipiens quinquefasciatus P^{32} (569) Musca domestica P^{32} (569, 661) Periplaneta americana P^{32} (553) rat P^{32} (553, 661) tea P^{32} (700) turnips P^{32} (723)	beans P^{32} (570, 723) milk P^{32} (661) olives P^{32} (730)

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis	Metabolism	Residue determination
P/C. 11	ethyl ester of O,O-dimethyl-dithiophosphoryl α-phenyl acetic acid * ethyl (dimethoxyphosphinothioylthio) phenylacetate	Dimephenthoate Cidial			P^{32} (721)
P/C. 12	* O-p-(dimethylsulfamoyl) phenyl O,O-dimethyl phosphorothioate	Famophos CL 38023		insects H^3 (568) mammals H^3 (568)	
P/C. 13	* 2-chloro-1-(2,4-dichlorophenyl)-vinyl diethyl phosphate	SD-7859 Compound 4072		cattle P^{32} (675, 707)	milk P^{32} (707)
	PHOSPHORUS HETEROCYCLIC DERIVATIVES				
P/H. 1	O,O-diethyl O-3-chloro-4-methyl-2-oxo-2H-1-benzopyran-7-yl phosphorothioate * O-(3-chloro-4-methylumbelliferone) O,O-diethyl phosphorothioate O,O-diethyl O-(3-chloro-4-methyl-7-coumarinyl) phosphorothioate 3-chloro-4-methylumbelliferone, O,O-diethyl thiophosphate	Bayer 21/199 CO-RAL Muscotox		livestock P^{32} (666) poultry P^{32} (713-4) rat P^{32} (666)	milk P^{32} (708)
P/H. 2	* S-[(5-methoxy-4-oxo-4H-pyran-2-yl) methyl] O,O-dimethyl phosphorothioate 5-methoxy-2 (dimethoxy phosphinylthiomethyl) pyrone 4	endothion Nia 5767 AC-18737 phosphate 100			market-gardening produce S^{35} (690)

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis	Metabolism	Residue determination
P/H. 3	O,O-diethyl O-(2-isopropyl-6-methyl-4-pyrimidyl) thiophosphate * O,O-diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate	diazinon Basudin G-24480		bacterial and protozoan response C^{14} (672) dog P^{32} (671) guinea pig P^{32} (670) Musca domestica P^{32} (631, 666)	
P/H. 4	* O,O-diethyl O-2-pyrazinyl phosphorothioate	EN 18133 Zinophos Nemaphos Cynem			bananas C^{14} (722)
P/H. 5	* O,O-dimethyl S-4-oxo-1,2,3-benzotriazin-3(4H)-ylmethyl phosphorodithioate O,O-dimethyl S-(4-oxo-3H-1,2,3-benzotriazine-3-methyl)-phosphorodithioate O,O-dimethyl-S-(benzaziminomethyl) dithiophosphate S-(3,4-dihydro-4-oxo-1,2,3-benzotriazin-3-ylmethyl) O,O-dimethyl phosphorodithioate benzotriazine derivative of a methyl dithiophosphate 3-(mercaptomethyl) 1,2,3-benzotriazin-4-(3H)-one O,O-dimethyl phosphorothioate	Guthion Gusathion Bayer 17147 17/147 Bayer 9027 AZINPHOS-methyl		cotton P^{32} (725)	cotton P^{32} (725)

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis	Metabolism	Residue determination
P/H. 6	naphthaloximido-O,O-diethyl phosphorothioate * O,O-diethyl O-naphthalimido phosphorothioate	Bayer 22408 ENT 24970		Aëdes aegypti P^{32} (646) Aëdes taeniorhynchus P^{32} (646) Anopheles quadrimaculatus P^{32} (646) cattle P^{32} (662-3, 708) guinea pig P^{32} (663) sheep P^{32} (578) Stomoxys calcitrans P^{32} (662)	milk P^{32} (662, 708)
P/H. 7	phthalimidomethyl O,O-dimethyl phosphorodithioate * O,O-dimethyl S-phthalimidomethyl phosphorodithioate	Imidan Prolate R-1504		insects C^{14} (633)	
P/H. 8	* N-hydroxynaphthalimide diethyl phosphate	Bayer S-940 Bayer 9002 Bayer 25820 ENT-25567		cattle P^{32} (663) guinea pig P^{32} (663)	
	RADIOMIMETIC AGENTS. CHEMOSTERILANTS				
R. 1	* tris(1-aziridinyl) phosphine oxide	tepa aphoxide ENT. 24915 APO		Aëdes aegypti (1180, 1378) Anopheles quadrimaculatus (1180)	
R. 2	* tris[1-(2-methylaziridinyl)] phosphine oxide	metepa metaphoxide ENT. 50008 MAPO methyl aphoxide		Aëdes aegypti P^{32} (737) Anopheles quadrimaculatus P^{32} (737) Culex tarsalis P^{32} (736)	

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis	Metabolism	Residue determination
R.2				Callitroga hominivorax P^{32} (735, 737) mouse P^{32} (736) Musca domestica P^{32} (736-7) Stomyx calcitrans P^{32} (735-7)	
R.3	2,2,4,4,6,6-hexahydro-2,2,4,4,6,6-hexakis(1-aziridinyl)-1,3,5,2,4,6-triazatriphosphorine *2,2,4,4,6,6-hexakis(1-aziridinyl)-2,2,4,4,6,6-hexahydro-1,3,5,2,4,6-triazatriphosphorine hexakis(1-aziridinyl) phosphonitrile	apholate ENT. 26316 SQ 8388 OM 2174		Aëdes aegypti (1180, 1378) Anopheles quadrimaculatus (1180) Drosophila (1169, 1172, 1434)	
R.4	*N-[p-[(2,4-diamino-6-pteridyl)methyl] methylaminobenzoyl] glutamic acid	methotrexate Amethopterin		Aëdes aegypti (1180) Anopheles quadrimaculatus (1180)	
	SULFONATES				
S.1	*p-chlorophenyl p-chlorobenzenesulfonate	ovex CPCBS chlorfenson Chlorfensone Miticide K-101 Ovochlor Ovotran K-6,451 C-854 C-1006 Trichlorfenson		Panonychus citri S^{35} (542) Periplaneta americana S^{35} (542)	

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis	Metabolism	Residue determination
	CARBAMATES				
X.1	2-n-propyl-4-methylpyrimidyl(6) dimethylcarbamate * 6-methyl-2-n-propyl-4-pyrimidinyl dimethylcarbamate 4-methyl-2-propyl-6-pyrimidinyl dimethylcarbamate	Pyramat G 23330	C^{14} (612)		
X.2	1-naphthyl N-methylcarbamate * 1-naphthyl methylcarbamate α-naphthyl N-methylcarbamate	Sevin 7744	C^{14} (612)	Blattella germanica C^{14} (611) Musca domestica C^{14} (606, 610, 611) Oncopeltus fasciatus C^{14} (611) Periplaneta americana C^{14} (610) rat C^{14} (606) beans C^{14} (606) cotton C^{14} (606)	
X.3	* 4-dimethylamino-3,5-xylyl methylcarbamate	Zectran Dowco 139 ENT 25766	C^{14} (612)		
X.4	* 4-(methylthio)-3,5-xylyl methylcarbamate	Bayer 37344 Bayer H-321 Bayer 9026 ENT-25726	C^{14} (612)		
X.5	* o-isopropoxyphenyl methylcarbamate 2-isopropoxyphenyl methylcarbamate	Bayer 9010 Bayer 39007 Bayer H-5812315	C^{14} (612)		

TABLE 3 (cont'd)

	Chemical name	Other designations for chemical and its compositions	Synthesis*	Metabolism	Residue determination
	MISCELLANEOUS COMPOUNDS				
Z.1	As^{74} As^{76}	arsenic	As^{74} (614)	insects As^{74} (494) insects As^{76} (494)	
Z.2	sulfur		S^{35} (615) Properties S^{35} (616)		
Z.3		Iridomyrmecin	C^{14} (526, 634)	Aëdes aegypti C^{14} (526, 634) cattle (beef liver) C^{14} (526, 634) fungi C^{14} (526) rat C^{14} (526, 634)	
Z.4		pentachlorophenol	Cl^{36} (546)		

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SUBJECT INDEX

* Due to the bulk of literature available applications of C^{14} have not been summarized separately.

* Due to bulk of pertinent references not summarized separately but mentioned with each relevant study

* Due to their large number, other pertinent references have not been summarized here. The use of H^3 is, however, indicated throughout for each relevant study

* Only radiological applications have been grouped together. Due to bulk of pertinent references other x-ray applications are not summarized separately but the use of x-rays is indicated with each relevant study.

(i) COMMON AND MANUFACTURERS' NAMES INDEX

Name	Chemical classification code
aldrin	C.5
Alkron	P/C.4
Amethopterin	R.4
apholate	R.3
aphoxide	R.1
arsenic	Z.1
Azinophos methyl	P/H.5
Basudin	P/H.3
Baycid	P/C.6
Baytex	P/C.10
Bidrin	P/A.4
Black Leaf 40	H.1
chlordane	C.3
chlorfenson	S.1
Chlorfensone	S.1
Chlorophenothene	D.1
chlorophos	P/A.2
Cidial	P/C.11
CO-RAL	P/H.1
cubé	B.1
Cygon	P/A.12
Cynem	P/H.4
demeton	P/A.8
derris	B.1
diazinon	P/H.3
DIBROM	P/A.6
dichlorvos	P/A.3
dieldrin	C.6
Dimecron	P/A.5
dimefox	P/A.13
Dimephenthoate	P/C.11
dimethoate	P/A.12
Dipteres	P/A.2
Dipterex	P/A.2
Di-Syston	P/A.9
dithiodemeton	P/A.9
Dylox	P/A.2
Ekatine	P/A.9
endosulfan	C.8
endothion	P/H.2
Entex	P/C.10
ethion	P/A.1
Etrolene	P/C.8
Famophos	P/C.12
Fenchlorphos	P/C.8
fenthion	P/C.10
Folithion	P/C.7
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Herkol	P/A.3
Imidan	P/H.7
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methyl aphoxide	R.2
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methyl parathion	P/C.2
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Nemaphos	P/H.4
Nialate	P/A.1
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Octa-Klor	C.3
Octalox	C.6
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Ovochlor	S.1
Ovotran	S.1
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parathion	P/C.4
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Pestox 14	P/A.13
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phosphamidon	P/A.5
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pyrethrin II	B.2
pyrethrum	B.2
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Tiguvon	P/C.10
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Trolene	P/C.8
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Zectran	X.3
Zinophos	P/H.4

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AC 18737	P/H. 2	G-23330	X. 2
APO	R. 1	G-24480	P/H. 3
Amer. Cyanamide 3422	P/C. 4	HCH	C. 12
Bayer 8173	P/A. 8	HCN	F. 5
Bayer 9002	P/H. 8	Bayer H-321	X. 4
Bayer 9010	X. 5	Bayer H-5812315	X. 5
Bayer 9026	X. 4	HEOD	C. 6
Bayer 17147	P/H. 5	HHDN	C. 5
Bayer 19639	P/A. 9	Hoe 2671	C. 8
Bayer 22408	P/H. 8	K-6,451	S. 1
Bayer 25820	P/H. 8	L 11/6	P/A. 7
Bayer 29493	P/C. 10	Bayer L13/59	P/A. 2
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Bayer 39007	X. 5	ML-97	P/A. 5
Bayer 41831	P/C. 7	NC-262	P/A. 12
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gamma BHC	C. 1, 2	Niagara 5462	C. 8
BIO 5462	C. 8	OM-2174	R. 3
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C-1006	S. 1	OR-1191	P/A. 5
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CP-14957	C. 9	R-1504	P/H. 7
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DMDT	D. 2	Sumitomo S-1102A	P/C. 7
DMF	P/A. 13	SD 3562	P/A. 4
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Dowco 139	X. 3	SD 7859	P/C. 13
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E-3314	C. 4	Compounds identified	
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ENT 24970	P/H. 6	1189	C. 7
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ENT 25726	X. 4	7744	X. 2
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ENT 50003	R. 2	Compound 497	C. 6
Dow ET-14	P/C. 8	Compound 4072	P/C. 13

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