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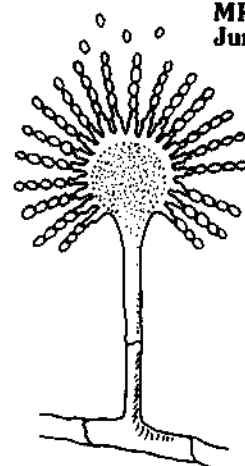
MP-1379  
June 1978

# Selected Bibliography of the Phenoxy Herbicides

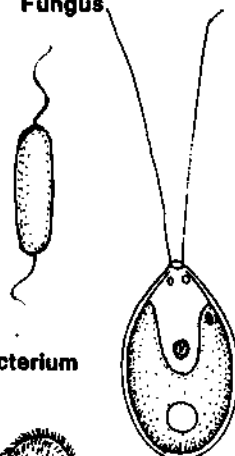
## V. Interrelations with Microorganisms

The Texas Agricultural Experiment Station, Neville P. Clarke, Director,  
The Texas A&M University System, College Station, Texas

In cooperation with Federal Research—Science  
and Education Administration, U.S. Department of Agriculture



Fungus



Bacterium

Alga



Protozoan



Virus

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SELECTED BIBLIOGRAPHY OF THE  
PHENOXY HERBICIDES

V. Interrelations With Microorganisms

J. D. Diaz-Colon and R. W. Bovey\*

Introduction

This is the fifth publication in the series of "Selected Bibliographies of the Phenoxy Herbicides." Four previous bibliographies regarding fate, dioxin, toxicology, and ecology were published during 1976, 1977, and 1978.

The extensive use of pesticides in modern agriculture makes it imperative to increase our knowledge regarding their activities in the environment. Since microorganisms are part of the ecological system, it is important to know their behavior when pesticides are present on different ecosystems. Therefore, this publication on the phenoxy herbicides deals with two important aspects: Part A - Herbicide Effects on Microorganisms and Part B - Effects of Microorganisms on Herbicides.

The two parts consist of references listed in alphabetical order according to senior author's name. A subject numerical index, consisting of three sections, is provided for each part. Each section is identified by a Roman numeral.

Section I contains research papers. Scientific names of microorganisms are listed alphabetically under their respective groups (Fungi, Bacteria, Algae, Protozoa, Viruses). Section II includes reviews dealing with the information from the preceding section. Section III deals with informative nontechnical papers.

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\* Respectively, agricultural research technician and research agronomist, Federal Research, Science and Education Administration, U.S. Department of Agriculture, and The Texas Agricultural Experiment Station (Department of Range Science).

Each Arabic numeral on the subject indexes identifies a reference in their respective author's alphabetical lists. For references published in languages other than English, the abbreviated form of the particular language is enclosed in parentheses after the title. A list of the abbreviated and complete names of languages and a list of the abbreviated and complete names of periodicals, together with their countries and cities of origin, are also provided. If English abstracts for the references are available, the abstract sources are included after the listed reference.

List of Abbreviated Sources

ACS Symp. Ser.	American Chemical Society, Symposium Series (Washington, D.C.)
Acta Agric. Scan.	Acta Agriculturae Scandinavica (Stockholm, Sweden)
Acta Microbiol. Acad. Sci. Hung.	Acta Microbiologica Academiae Scientiarum Hungaricae (Budapest, Hungary)
Acta Microbiol. Pol., Ser. B	Acta Microbiologica Polonica. Series B, Microbiologica Applicata (Warsaw, Poland)
Advan. Agron.	Advances in Agronomy (New York, N.Y.)
Advan. Appl. Microbiol.	Advances in Applied Microbiology (New York, N.Y.)
Advan. Chem. Ser.	Advances in Chemistry Series (Washington, D.C.)
Agrartud. Egy. Kozl.	Agrartudományi Egyetem Közleményei Godollo (Budapest, Hungary)
Agrartud. Egy. Mezogazd. Karanak Kozl.	Agrartudományi Egyetem Mezőgazdaságtudományi Karanak, Közleményei (Budapest, Hungary)
Agrartud. Kozl.	Agrartudományi Közlemények (Budapest, Hungary)
Agric. Res. Rev.	Agricultural Research Review (Cairo, Egypt)
Agrochimica	Agrochimica (Pisa, Italy)
Agron. J.	Agronomy Journal (Madison, Wisc.)
Alexandria J. Agric. Res.	Alexandria Journal of Agricultural Research (Alexandria, Egypt)
Allionia	Allionia (Turin, Italy)
Am. Chem. Soc., Abstr. Pap., Nat. Meet., Pestic. Chem. Sec.	American Chemical Society, Abstracts of Papers of the National Meetings, Pesticides Chemistry Section (Washington, D.C.)
Am. Inst. Chem. Eng., Symp. Ser.	American Institute of Chemical Engineering, Symposium Series (New York, N.Y.)
Am. J. Bot.	American Journal of Botany (Lawrence, Kans.)
Am. Soc. Microbiol., Abstr., Meet.	American Society for Microbiology, Abstracts of the Annual Meeting (Washington, D.C.)

- An. Inst. Cercet. Cult.  
Cartofului Sfeclei Zahar,  
Brazov
- Ann. Appl. Biol.
- Ann. Bot. (London)
- Ann. N.Y. Acad. Sci.
- Ann. Phytopathol. Soc. Jpn.
- Annu. Rev. Microbiol.
- Antonie van Leeuwenhoek
- Appl. Microbiol.
- Arch. Environ. Contam. Toxicol.
- Arch. Microbiol.
- Arch. Mikrobiol.
- Arch. Phytopathol. Pflanzenschutz
- Arkansas Agric. Exp. Stn., South.  
Coop. Ser. Bull.
- Bacteriol. Proc.
- Bacteriol. Rev.
- Biochem. J.
- Biol. Nauki (Moscow)
- Biologico
- Biol. Plant.
- Biol. Sol.
- Biol. Zentralbl.
- Anale Institutul de Cercetari pentru  
Cultura Cartofului si Sfeclei de  
Zahar, Brazov  
(Brazov, Rumania)
- Annals of Applied Biology  
(London, England)
- Annals of Botany (London)  
(London, England)
- Annals of the New York Academy of  
Science  
(New York, N.Y.)
- Annals of the Phytopathological  
Society of Japan  
(Tokyo, Japan)
- Annual Review of Microbiology  
(Palo Alto, Calif.)
- Antonie van Leeuwenhoek. Journal  
of Microbiology and Serology  
(Amsterdam, Netherlands)
- Applied Microbiology  
(Baltimore, Md.)
- Archives of Environmental Contami-  
nation and Toxicology  
(New York, N.Y.)
- Archives of Microbiology  
(New York, N.Y.)
- Archiv fuer Mikrobiologie  
(Berlin, Germany)
- Archiv fuer Phytopathologie und  
Pflanzenschutz  
(Berlin, Germany)
- Arkansas Agricultural Experiment  
Station, Southern Cooperative  
Series Bulletin  
(Fayetteville, Ark.)
- Bacteriological Proceedings  
(Ann Arbor, Mich.)
- Bacteriological Reviews  
(Baltimore, Md.)
- Biochemical Journal, The  
(London, England)
- Biologicheskie Nauki (Moscow)  
(Moscow, USSR)
- Biologico  
(Sao Paulo, Brazil)
- Biologia Plantarum  
(Prague, Czechoslovakia)
- Biologie du Sol  
(Paris, France)
- Biologisches Zentralblatt  
(Leipzig, E. Germany)



- Bitki Koruma Bul. Bitki Koruma Bulteni  
(Ankara, Turkey)
- Bol. R. Soc. Esp. Hist. Nat. Boletin de la Real Sociedad Espanola  
de Historia Natural  
(Madrid, Spain)
- Bot. Gaz. Botanical Gazette  
(Chicago, Ill.)
- Br. Ecol. Soc. Symp. British Ecological Society Sympos-  
ium  
(Sivausea, England)
- Br. Phycol. J. British Phycological Journal  
(London, England)
- Bull. Coll. Agric. Utsunomiya Univ. Bulletin of the College of Agri-  
culture, Utsunomiya University  
(Utsunomiya, Japan)
- Bull. Environ. Contam. Toxicol. Bulletin of Environmental Contamina-  
tion and Toxicology  
(New York, N.Y.)
- Bull. Ga. Acad. Sci. Bulletin of the Georgia Academy of  
Science  
(Athens, Ga.)
- Bull. Nat. Inst. Agric. Sci.,  
Ser. C. Bulletin of the National Institute  
of Agricultural Sciences, Series  
C: Plant Pathology and Entomology  
(Tokyo, Japan)
- Can. J. Microbiol. Canadian Journal of Microbiology  
(Ottawa, Canada)
- Can. J. Plant Sci. Canadian Journal of Plant Science  
(Ottawa, Canada)
- Cesk. Hyg. Ceskoslovenska Hygiena  
(Prague, Czechoslovakia)
- Chem. Abstr. Chemical Abstracts  
(Columbus, Ohio)
- Chem. Pharm. Bull. Chemical and Pharmaceutical Bul-  
letin  
(Tokyo, Japan)
- Chem. Technol. Chemical Technology  
(Washington, D.C.)
- Chimia Chimia  
(Aarau, Switzerland)
- Citrus Grow. Citrus Grower  
(Orlando, Fla.)
- Contrib. Boyce Thompson Inst. Contributions from Boyce Thompson  
Institute  
(Yonkers, New York, N.Y.)
- Contrib. Ist. Rec. Agrar. Milan Contributi, Istituto di Recerche  
Agrarie, Milan  
(Milan, Italy)
- Crit. Rev. Microbiol. Critical Reviews in Microbiology  
(Cleveland, Ohio)
- Crop Sci. Crop Science  
(Madison, Wisc.)

- C. R. Seances Acad. Agric. Fr.  
 Curr. Sci.  
 Diss. Abstr. Int.  
 Dokl. Akad. S-Kh. Nauk Bolg.  
 Dokl. Biol. Sci. - En. Transl.  
 Down Earth  
 Environ. Chem.  
 Environ. Entomol.  
 Environ. Qual. Saf.  
 Erwerbsobstbau  
 Health Aspects Pestic.  
 Hyac. Control J.  
 Indian J. Agric. Sci.  
 Indian J. Exp. Biol.  
 Indian J. Hortic.  
 Indian J. Microbiol.  
 Indian J. Mycol. Plant Pathol.  
 Indian J. Weed Sci.  
 Indian Phytopathol.  
 Ind. Veg. Manage.
- Comptes Rendus des Seances de  
 l'Academie d'Agriculture de  
 France  
 (Paris, France)  
 Current Science  
 (Bangalore, India)  
 Dissertation Abstracts International  
 (Ann Arbor, Mich.)  
 Doklady Akademii Sel'skokhozyaist-  
 vennykh Nauk v Bolgarii  
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 Doklady Biological Sciences -  
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 (New York N.Y.)  
 Down to Earth  
 (Midland, Mich.)  
 Environmental Chemistry  
 (London, England)  
 Environmental Entomology  
 (College Park, Md.)  
 Environmental Quality and Safety  
 (Stuttgart, Germany)  
 Erwerbsobstbau, Der  
 (Berlin, Germany)  
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 stract Bulletin  
 (Chamblee, Ga.)  
 Hyacinth Control Journal  
 (Fort Lauderdale, Fla.)  
 Indian Journal of Agricultural Sci-  
 ences  
 (New Delhi, India)  
 Indian Journal of Experimental  
 Biology  
 (New Delhi, India)  
 Indian Journal of Horticulture  
 (New Delhi, India)  
 Indian Journal of Microbiology  
 (Baroda, India)  
 Indian Journal of Mycology and  
 Plant Pathology  
 (Udaipur, India)  
 Indian Journal Weed Science  
 (Hissar, India)  
 Indian Phytopathology  
 (New Delhi, India)  
 Industrial Vegetation Management  
 (Dow Chemical Co., Midland,  
 Mich.)

- Int. Rice Comm., Newsl.  
 Izv. Akad. Nauk SSSR, Ser. Biol.  
 Izv. Timiryazevsk. Skh. Akad.  
 J. Agric. Food Chem.  
 J. Agric. Sci.  
 J. Agric. Univ. P.R.  
 J. Am. Soc. Agron.  
 J. Am. Water Works Assoc.  
 J. Anim. Sci.  
 J. Bacteriol.  
 J. Cell. Physiol.  
 J. Chem. Soc.  
 J. Environ. Qual.  
 J. Exp. Bot.  
 J. For.  
 J. Gen. Appl. Microbiol.  
 J. Gen. Microbiol.  
 J. Indian Soc. Soil Sci.  
 J. Invertebr. Pathol.  
 J. Phycol.  
 Jpn. J. Bot.
- International Rice Commission, News-  
 letter  
 (Bankoy, Thailand)  
 Izvestiya Akademii Nauk SSSR, Seriya  
 Biologicheskaya  
 (Moscow, USSR)  
 Izvestiya Timiryazevskoi Sel'skok-  
 hozyaistvennoi Akademii  
 (Moscow, USSR)  
 Journal of Agriculture and Food  
 Chemistry  
 (Washington, D.C.)  
 Journal of Agricultural Science  
 (Cambridge, England)  
 Journal of Agriculture of the Uni-  
 versity of Puerto Rico  
 (Rio Piedras, Puerto Rico)  
 Journal of the American Society of  
 Agronomy  
 (Geneva, N.Y.)  
 Journal of the American Water Works  
 Association  
 (New York, N.Y.)  
 Journal of Animal Science  
 (Champaign, Ill.)  
 Journal of Bacteriology  
 (Baltimore, Md.)  
 Journal of Cellular Physiology  
 (Philadelphia, Pa.)  
 Journal of the Chemical Society  
 (London, England)  
 Journal of Environmental Quality  
 (Madison, Wisc.)  
 Journal of Experimental Botany  
 (London, England)  
 Journal of Forestry  
 (Washington, D.C.)  
 Journal of General and Applied Micro-  
 biology  
 (Tokyo, Japan)  
 Journal of General Microbiology  
 (Elstree, England)  
 Journal of the Indian Society of  
 Soil Science  
 (New Delhi, India)  
 Journal of Invertebrate Pathology  
 (New York, N.Y.)  
 Journal of Phycology  
 (New York, N.Y.)  
 Japanese Journal of Botany  
 (Tokyo, Japan)



Mutat. Res.	Mutation Research (Amsterdam, Netherlands)
Mycologia	Mycologia (Bronx, N.Y.)
Nature	Nature - London (London, England)
Naturwissenschaften	Naturwissenschaften, Die (Berlin, Germany)
N.Dak. Farm Res.	North Dakota Farm Research (Fargo, N. Dak.)
New Phytol.	New Phytologist (London, England)
New Sci.	New Scientist (London, England)
Pamiet. Pulawski	Pamiętnik Pulawski (Warsaw, Poland)
Parasitica	Parasitica (Gembloux, Belgium)
Pestic. Abstr.	Pesticides Abstracts (Washington, D.C.)
Pestic. Biochem. Physiol.	Pesticide Biochemistry and Physiology (New York, N.Y.)
Pesticides	Pesticides (Bombay, India)
Pestic. Sci.	Pesticide Science (London, England)
Phyton-ØYTON	Phyton - ØYTON (Buenos Aires, Argentina)
Phytopathology	Phytopathology (St. Paul, Minn.)
Plant Cell Physiol.	Plant and Cell Physiology (Tokyo, Japan)
Plant Dis. Rep.	Plant Disease Reporter, The (Washington, D.C.)
Plant Physiol.	Plant Physiology (Kutztown, Pa.)
Plant Sci. Lett.	Plant Science Letters (Amsterdam, Netherlands)
Plant Soil	Plant and Soil (The Hague, Netherlands)
Pochvoved. Agrokhim.	Pochvovedenie i Agrokhimiya (Kharkov, USSR)
Pochvovedenie	Pochvovedenie (Moscow, USSR)
Pochvozn. Agrokhim.	Pochvoznanie i Agrokhimiya (Sofia, Bulgaria)
Proc. Am. Soc. Hortic. Sci.	Proceedings of the American Society for Horticultural Science (St. Joseph, Mich.)

- Proc. Ark. Acad. Sci. Proceedings of the Arkansas Academy of Science  
(Fayetteville, Ark.)
- Proc. Br. Weed Control Conf. Proceedings of the British Weed Control Conference  
(Droitwich, Worcestershire, England)
- Proc. Eur. Weed Res. Council, Symp. Herbic.-Soil Proceedings of the European Weed Research Council, Symposium on Herbicides-Soil  
(Oxford, England)
- Proc. Fla. State Hortic. Soc. Proceedings of the Florida State Horticultural Society  
(Lake Alfred, Fla.)
- Proc. Indian Acad. Sci. Proceedings of the Indian Academy of Sciences  
(Bangalore, India)
- Proc. Int. Congr. Biochem. Proceedings of the International Congress of Biochemistry  
(Bethesda, Md.)
- Proc. La. Acad. Sci. Proceedings of the Louisiana Academy of Sciences  
(Monroe, La.)
- Proc. North Cent. Weed Control Conf. Proceedings of the North Central Weed Control Conference  
(Omaha, Nebr.)
- Proc. Northeast. Weed Control Conf. Proceedings of the Northeastern Weed Control Conference  
(Farmingdale, N.Y.)
- Proc. Pa. Acad. Sci. Proceedings of the Pennsylvania Academy of Science  
(Easton, Pa.)
- Proc. R. Soc., Ser. B Proceedings of the Royal Society, Series B  
(London, England)
- Proc. S.D. Acad. Sci. Proceedings of the South Dakota Academy of Science  
(Vermillion, S. Dak.)
- Proc. Soc. Exp. Biol. Med. Proceedings of the Society for Experimental Biology and Medicine  
(New York, N.Y.)
- Proc. Soil Sci. Soc. Am. Proceedings of the Soil Science Society of America  
(Madison, Wis.)
- Purdue Univ. Water Resour. Res. Cent., Tech. Rep. Purdue University Water Resources Research Center, Technical Report  
(W. Lafayette, Ind.)
- Rep., Rothamsted Exp. Stn., Harpenden, Engl. Report, Rothamsted Experimental Station, Harpenden, England  
(Harpenden, England)
- Residue Rev. Residue Reviews  
(New York, N.Y.)

- Rev. Ind. Agric. Tucuman  
 (San Miguel de Tucuman, Argentina)
- Rocz. Glebozn.  
 (Warsaw, Poland)
- Rocz. Nauk Roln., Ser. H  
 (Warsaw, Poland)
- S. Afr. J. Agric. Sci.  
 (Pretoria, South Africa)
- Science  
 (Washington, D.C.)
- Soc. Appl. Bacteriol. Symp. Ser.  
 Society for Applied Bacteriology  
 Symposium Series  
 (London, England)
- Soil Biol. Biochem.  
 Soil Biology and Biochemistry  
 (Oxford, England)
- Soil Sci.  
 Soil Science  
 (Baltimore, Md.)
- Soil Sci. Plant Nutr.  
 Soil Science and Plant Nutrition  
 (Tokyo, Japan)
- Sugar Bull.  
 Sugar Bulletin  
 (New Orleans, La.)
- Sven. Bot. Tidskr.  
 Svensk Botanisk Tidskrift  
 (Stockholm, Sweden)
- Swed. J. Agric. Res.  
 Swedish Journal of Agricultural Research  
 (Stockholm, Sweden)
- Symp. Biol. Hung.  
 Symposia Biologica Hungarica  
 (Budapest, Hungary)
- Tea Q.  
 Tea Quarterly  
 (Talawakele, Ceylon)
- Tex. J. Sci.  
 Texas Journal of Science  
 (Austin, Tex.)
- Trans. Am. Fish. Soc.  
 Transactions of the American Fisheries Society  
 (Washington, D.C.)
- Trib. CEBEDEAU  
 Tribune du CEBEDEAU  
 (Liege, Belgium)
- Tr. Kamenets-Podol'sk. Skh. Inst.  
 Trudy Kamenets-Podol'skogo Sel'skokhozyaistvennogo Instituta  
 (Kamenets-Podolskii, USSR)
- Turf Sport  
 Turf for Sport  
 (Berkshire, England)
- Univ. Rural Pernambuco, Comun. Tec.  
 Universidade Rural de Pernambuco, Comunicado Tecnico  
 (Recife, Brazil)
- U.S. Dep. Agric., Agric. Res. Serv., ARS  
 U.S. Department of Agriculture, Agricultural Research Service, ARS  
 (Washington, D.C.)

- U.S. Dep. Agric., Yearb. Agric.
- U.S. Fish Wildl. Serv., Bur. Sp. Fish. Wildl., Spec. Sci. Rep., Wildl.
- U.S. Fish Wildl. Serv., Cir.
- U.S. For. Serv., Pac. Northwest For. Range Exp. Stn., Res. Notes
- U.S.N.T.I.S., AD Rep. or PB Rep.
- Vestn. Skh. Nauki
- Vestn. Skh. Nauki Kaz.
- Virology
- Visn. Sil's'Kogospod. Nauki
- Wasserwirtsch.-Wassertech.
- Water Res.
- Water Resour. Bull.
- Water Resour. Res. Inst., Clemson Univ., Rep.
- Weed Abstr.
- Weed Res.
- Weeds
- Weed Sci.
- Weed Sci. Soc. Am., Abstr., Meet.
- Z. Allg. Mikrobiol.
- U.S. Department of Agriculture, Yearbook of Agriculture (Washington, D.C.)
- U.S. Fish and Wildlife Service, Bureau of Sports Fisheries and Wildlife, Special Scientific Report, Wildlife (Washington, D.C.)
- U.S. Fish and Wildlife Service, Circular (Washington, D.C.)
- U.S. Forest Service, Pacific Northwest Forest and Range Experiment Station, Research Notes (Portland, Oreg.)
- U.S. National Technical Information Service, AD Report or PB Report (Springfield, Va.)
- Vestnik Sel'skokhozyaistvennoi Nauki (Moscow, USSR)
- Vestnik Sel'skokhozyaistvennoi Nauki Kazakhstana (Alma Ata, USSR)
- Virology (New York, N.Y.)
- Visnik Sil's'Kogospodars'koi Nauki (Kiev, USSR)
- Wasserwirtschaft-Wassertechnik (Berlin, Germany)
- Water Research (Oxford, England)
- Water Resources Bulletin (Urbana, Ill.)
- Water Resources Research Institute, Clemson University, Report (Clemson, S.C.)
- Weed Abstracts (Oxford, England)
- Weed Research (Oxford, England)
- Weeds (Champaign, Ill.)
- Weed Science (Champaign, Ill.)
- Weed Science Society of America, Abstracts, Meetings (Champaign, Ill.)
- Zeitschrift fuer Allgemeine Mikrobiologie. Morphologie, Physiologie, Genetik und Oekologie der Mikroorganismen (Berlin, Germany)



Zentralbl. Bakteriол. Parasitenkd.  
Infektionskr., Abt. 2

Zesz. Nauk. Akad. Roln.  
Szczecinіe

Z. Pflanzenkr. Pflanzenschutz

Zentralblatt fuer Bakteriologie,  
Parasitenkunde und Infektions-  
krankheiten, Abteilung 2  
(Jena, E. Germany)

Zeszyty Naukowe, Akademia Rolnicza  
w Szczecinіe  
(Szczecin, Poland)

Zeitschrift fuer Pflanzenkrank-  
heiten und Pflanzenschutz  
(Stuttgart, Germany)

Language Abbreviation

Bg - Bulgarian

Cs - Czech

De - German

Es - Spanish

Fr - French

Hu - Hungarian

It - Italian

Ja - Japanese

Nl - Dutch

Pl - Polish

Pt - Portuguese

Ro - Romanian

Ru - Russian

Th - Thai

Tr - Turkish

Uk - Ukrainian

Part A

Herbicide Effects on Microorganisms

Subject Index

## I. Research Papers - Herbicide Effects on Microorganisms

## A. 2,4-D (2,4-dichlorophenoxy)acetic acid

1. Effects on Fungi

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<i>Bacillus lentus</i> .....	227
<i>Bacillus licheniformis</i> .....	227
<i>Bacillus megaterium</i> .....	227
<i>Bacillus polymyxa</i> .....	227
<i>Bacillus pumilus</i> .....	227
<i>Bacillus sphaericus</i> .....	227
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<i>Escherichia coli</i> .....	227
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<i>Pseudomonas aeruginosa</i> .....	227
<i>Pseudomonas fluorescens</i> .....	238
<i>Pseudomonas marginalis</i> .....	227
<i>Pseudomonas pisi</i> .....	227
<i>Pseudomonas tabaci</i> .....	227
<i>Rhizobium japonicum</i> .....	147
<i>Rhizobium lupini</i> .....	147
<i>Rhizobium meliloti</i> .....	147
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<i>Salmonella pullorum</i> .....	227
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<i>Sarcina lutea</i> .....	238
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<i>Haematococcus lacustris</i> .....	56
<i>Hormidium barlowii</i> .....	56
<i>Hormidium flaccidum</i> .....	56
<i>Hormidium stoechidium</i> .....	56
<i>Mesotaenium caldariorum</i> .....	56
<i>Scenedesmus quadricauda</i> .....	56
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FUNGI (scientific names not given) .....	165
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1. Effects on Fungi

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<i>Helminthosporium victoriae</i> .....	45
<i>Phytophthora parasitica</i> .....	45
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2. Effects on unidentified Groups ..... 116

## G. 2,4-DP [2-(2,4-dichlorophenoxy)propionic acid]

1. Effects on Fungi

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<i>Gaeumannomyces graminis</i> .....	204
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<i>Chlorella pyrenoidosa</i> .....	56
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<i>Coccomyxa subellipsoidea</i> .....	56
<i>Haematococcus lacustris</i> .....	56
<i>Hormidium barlowii</i> .....	56
<i>Hormidium flaccidum</i> .....	56
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<i>Mesotaenium caldariorum</i> .....	56
<i>Scenedesmus quadricauda</i> .....	56
<i>Spongiochloris excentrica</i> .....	56
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4. Effects on unidentified Groups ....., 111

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<i>Ascochyta pisi</i> .....	238
<i>Aspergillus fumigatus</i> .....	289
<i>Aspergillus niger</i> .....	87, 149, 238, 253, 289
<i>Botrytis cinerea</i> .....	238
<i>Candida albicans</i> .....	238
<i>Candida pulcherrima</i> .....	238
<i>Cercospora arachidicola</i> .....	45
<i>Cercospora herpotherioides</i> .....	204
<i>Corticium solani</i> .....	238
<i>Eurotium</i> sp. ....	298
<i>Fusarium avenaceum</i> .....	145
<i>Fusarium conglutinans</i> .....	238
<i>Fusarium culmorum</i> .....	145, 298
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<i>Fusarium oxysporum</i> .....	45
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<i>Gaeumannomyces graminis</i> .....	204
<i>Gibberella zeae</i> .....	238
<i>Helminthosporium oryzae</i> .....	236
<i>Helminthosporium sativum</i> .....	238
<i>Helminthosporium victoriae</i> .....	45
<i>Microsporium canis</i> .....	238
<i>Mucor hiemalis</i> .....	238
<i>Neurospora sitophila</i> .....	238
<i>Ophiobolus graminis</i> .....	298
<i>Penicillium chrysogenum</i> .....	238
<i>Penicillium glaucum</i> .....	289
<i>Penicillium notatum</i> .....	238
<i>Phytophthora parasitica</i> .....	45, 238
<i>Pyrenophora avenae</i> .....	238
<i>Pythium debaryanum</i> .....	238
<i>Rhizopus stolonifer</i> .....	238, 298
<i>Saccharomyces acidifaciens</i> .....	238
<i>Saccharomyces cerevisiae</i> .....	238
<i>Saccharomyces fragilis</i> .....	238
<i>Sclerotium rolfsii</i> .....	45
<i>Trichoderma viride</i> .....	238, 298
<i>Trichophyton sulphureum</i> .....	238
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<i>Aerobacter aerogenes</i> .....	238
<i>Agrobacterium radiobacter</i> .....	136
<i>Agrobacterium tumefaciens</i> .....	238
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<i>Azotobacter beijerinckii</i> .....	136
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<i>Bacillus mycoides</i> .....	136
<i>Bacillus subtilis</i> .....	124, 136, 238
<i>Bacterium aerogenes</i> .....	136
<i>Bacterium coli</i> .....	136
<i>Bacterium prodigiosum</i> .....	136, 217
<i>Brevibacterium linens</i> .....	251
<i>Cellvibrio</i> sp. ....	136
<i>Corynebacterium</i> sp. ....	137, 238
<i>Cytophaga</i> sp. ....	136
<i>Escherichia coli</i> .....	217
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<i>Nitrobacter</i> sp. ....	123, 274
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<i>Nocardia corallina</i> .....	136
<i>Nocardia globerula</i> .....	251
<i>Nocardia rubropertincta</i> .....	251
<i>Nocardia</i> sp. ....	238
<i>Proteus vulgaris</i> .....	217
<i>Pseudomonas aeruginosa</i> .....	124, 217
<i>Pseudomonas fluorescens</i> .....	87, 124, 238
<i>Pseudomonas pyocyanea</i> .....	136
<i>Rhizobium japonicum</i> .....	147
<i>Rhizobium leguminosarum</i> .....	104, 136, 275
<i>Rhizobium lupini</i> .....	136, 147
<i>Rhizobium meliloti</i> .....	104, 136, 147, 205, 275
<i>Rhizobium phaseoli</i> .....	275
<i>Rhizobium</i> sp. ....	207
<i>Rhizobium trifolii</i> .....	83, 84, 85, 104, 136, 275
<i>Salmonella marcescens</i> .....	37
<i>Salmonella typhimurium</i> .....	37
<i>Sarcina lutea</i> .....	238
<i>Serratia marcescens</i> .....	37
<i>Streptomyces griseus</i> .....	136, 238
<i>Streptomyces scabies</i> .....	238
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<i>Aulosira</i> sp. ....	59
<i>Calothrix elenkinii</i> .....	59
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<i>Chlamydomonas</i> sp. ....	57
<i>Chlamydomonas subangulosa</i> .....	238
<i>Chlorella pyrenoidosa</i> .....	89, 150
<i>Chlorella</i> sp. ....	57
<i>Chlorococcum</i> sp. ....	57
<i>Chlorogloea fritschii</i> .....	59
<i>Cylindrospermum muscicola</i> .....	59
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<i>Dictyococcus terrestris</i> .....	238
<i>Hantzschia</i> sp. ....	57
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<i>Phytoconis</i> sp. ....	57
<i>Scytonema</i> sp. ....	57
<i>Spongiochloris</i> sp. ....	57
<i>Stichococcus bacillaris</i> .....	89, 150
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<i>Tolypothrix</i> sp. ....	57
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4. <u>Effects on unidentified Groups</u> .....	25, 74, 110, 129, 256, 282
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I. MCPB {4-[(4-chloro-*o*-tolyl)oxy]butyric acid, (4-(2-methyl-4-chloro-*phenoxy*)butyric acid)}

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<i>Alternaria solani</i> .....	238
<i>Aphanomyces euteiches</i> .....	122
<i>Armillaria mellea</i> .....	238
<i>Ascochyta pisi</i> .....	238
<i>Aspergillus niger</i> .....	87, 149, 238, 253
<i>Botrytis cinerea</i> .....	238
<i>Candida albicans</i> .....	238
<i>Candida pulcherrima</i> .....	238
<i>Cladosporium cladosporioides</i> .....	174
<i>Clonostachys araucaria</i> .....	174
<i>Fusarium nivale</i> .....	238
<i>Fusarium oxysporum</i> f. <i>lycopersici</i> .....	238
<i>Gibberella zeae</i> .....	238
<i>Helminthosporium sativum</i> .....	238
<i>Microsporium canis</i> .....	238
<i>Mucor hiemalis</i> .....	238
<i>Mucor racemosus</i> .....	174
<i>Neurospora sitophila</i> .....	238
<i>Penicillium chrysogenum</i> .....	238
<i>Penicillium notatum</i> .....	238
<i>Phytophthora parasitica</i> .....	238
<i>Pyrenophora avenae</i> .....	238
<i>Pythium debaryanum</i> .....	238
<i>Rhizopus stolonifer</i> .....	238
<i>Saccharomyces acidifaciens</i> .....	238

## MCPB - Fungi (Cont'd)

<i>Saccharomyces cerevisiae</i> .....	238
<i>Saccharomyces fragilis</i> .....	238
<i>Trichoderma viride</i> .....	174, 238
<i>Trichophyton sulphureum</i> .....	238
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2. Effects on Bacteria

<i>Aerobacter aerogenes</i> .....	238
<i>Agrobacterium tumefaciens</i> .....	238
<i>Bacillus subtilis</i> .....	238, 239
<i>Corynebacterium</i> sp. ....	238
<i>Escherichia coli</i> .....	239
<i>Flavobacterium</i> sp. ....	146
<i>Nocardia</i> sp. ....	238
<i>Pseudomonas fluorescens</i> .....	87, 238
<i>Rhizobium japonicum</i> .....	147
<i>Rhizobium lupini</i> .....	147
<i>Rhizobium meliloti</i> .....	147
<i>Rhizobium trifolii</i> .....	83, 84, 85
<i>Salmonella typhimurium</i> .....	5, 36, 239
<i>Sarcina lutea</i> .....	238
<i>Serratia marcescens</i> .....	36
<i>Streptomyces griseus</i> .....	238
<i>Streptomyces scabies</i> .....	238
<i>Streptomyces</i> sp. ....	238
BACTERIA (scientific names not given) .....	307

3. Effects on Algae

<i>Chlamydomonas globosa</i> .....	89, 150
<i>Chlamydomonas subangulosa</i> .....	238
<i>Chlorella pyrenoidosa</i> .....	89, 150
<i>Dictyococcus terrestris</i> .....	238
<i>Stichococcus bacillaris</i> .....	89, 150

J. MCPB (Mecoprop) {2-(4-chloro-2-methylphenoxy)propionic acid,  
2-[(4-chloro-o-tolyl)oxy]propionic acid}1. Effects on Fungi

<i>Aspergillus nidulans</i> .....	12
<i>Gaeumannomyces graminis</i> .....	203
<i>Saccharomyces cerevisiae</i> .....	209, 210

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<i>Azotobacter chroococcum</i> .....	283
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<i>Escherichia coli</i> .....	239
<i>Rhizobium japonicum</i> .....	147
<i>Rhizobium lupini</i> .....	147
<i>Rhizobium meliloti</i> .....	147
<i>Salmonella typhimurium</i> .....	5, 239

3. Effects on unidentified Groups ..... 27, 100, 102, 111

K. 2,4,5-T (2,4,5-trichlorophenoxy)acetic acid

1. Effects on Fungi

<i>Absidia cuneospora</i> .....	259
<i>Alternaria citri</i> .....	76
<i>Alternaria solani</i> .....	238
<i>Alternaria</i> sp. ....	259, 262
<i>Arachnotheca albicans</i> .....	259
<i>Armillaria mellea</i> .....	224, 238
<i>Ascochyta pisi</i> .....	238
<i>Ascochyta</i> sp. ....	259
<i>Aspergillus alliaceus</i> .....	259
<i>Aspergillus amstelodami</i> .....	19, 259
<i>Aspergillus candidus</i> .....	223
<i>Aspergillus flavipes</i> .....	259
<i>Aspergillus fumigatus</i> .....	108
<i>Aspergillus leoporis</i> .....	19, 259
<i>Aspergillus niger</i> .....	238
<i>Aspergillus oryzae</i> .....	259
<i>Aspergillus punisceus</i> .....	19, 259
<i>Aspergillus sclerotiorum</i> .....	19, 259
<i>Aspergillus sydowi</i> .....	19, 259
<i>Aspergillus ustus</i> .....	259
<i>Aspergillus versicolor</i> .....	19, 259
<i>Aureobasidium</i> sp. ....	108
<i>Beauveria bassiana</i> .....	259
<i>Botrytis cinerea</i> .....	76, 238
<i>Candida albicans</i> .....	238
<i>Candida pulcherrima</i> .....	238
<i>Cephalosporium acremonium</i> .....	19, 259
<i>Cephalosporium coremioides</i> .....	259
<i>Chaetomium homopilatum</i> .....	259
<i>Chaetomium spirale</i> .....	108
<i>Chaetophoma</i> sp. ....	259
<i>Chrysosporium pannorum</i> .....	19, 259
<i>Chrysosporium</i> sp. ....	259
<i>Cladosporium cladosporioides</i> .....	108
<i>Cladosporium herbarum</i> .....	259
<i>Cladosporium hordei</i> .....	259
<i>Corticium solani</i> .....	238
<i>Cylindrocarpon</i> sp. ....	19, 259

## 2,4,5-T - Fungi (Cont'd)

<i>Diaporthe citri</i> .....	76
<i>Diplodia natalensis</i> .....	76
<i>Fusarium conglutinans</i> .....	238
<i>Fusarium moniliiforme</i> .....	259
<i>Fusarium nivale</i> .....	238
<i>Fusarium oxysporum</i> .....	259
<i>Fusarium oxysporum</i> f. <i>lycopersici</i> .....	238
<i>Fusidium</i> sp. ....	259
<i>Geotrichum</i> sp. ....	259
<i>Gibberella zeae</i> .....	238
<i>Gliomastix</i> sp. ....	259
<i>Helminthosporium sativum</i> .....	238
<i>Heterosporium</i> sp. ....	259
<i>Hyalodendron</i> sp. ....	259
<i>Malbranchea</i> sp. ....	259
<i>Microascus trigonosporus</i> .....	19, 259
<i>Microsporium canis</i> .....	238
<i>Mortierella</i> sp. ....	259
<i>Mucor hiemalis</i> .....	238
<i>Neurospora sitophila</i> .....	238
<i>Neurospora tetrasperma</i> .....	223
<i>Oospora citriaurantii</i> .....	76
<i>Paecilomyces lilacinus</i> .....	108
<i>Paecilomyces varioti</i> .....	259
<i>Penicillium brevi-compactum</i> .....	108
<i>Penicillium canescens</i> .....	19, 259
<i>Penicillium chrysogenum</i> .....	19, 238, 259
<i>Penicillium cyaneo-fulvum</i> .....	259
<i>Penicillium cyclopium</i> .....	19, 108, 259
<i>Penicillium digitatum</i> .....	76
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<i>Penicillium martensii</i> .....	259
<i>Penicillium notatum</i> .....	238
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<i>Phoma</i> sp. ....	259
<i>Phycomyces blakesleeanus</i> .....	223
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<i>Pythium debaryanum</i> .....	238
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<i>Rhizopus oryzae</i> .....	271
<i>Rhizopus stolonifer</i> .....	238, 271
<i>Rhodotorula mucilaginosa</i> .....	19, 259
<i>Saccharomyces acidifaciens</i> .....	238
<i>Saccharomyces cerevisiae</i> .....	238
<i>Saccharomyces fragilis</i> .....	238
<i>Schizophyllum commune</i> .....	223
<i>Sclerotinia sclerotiorum</i> .....	76
<i>Sporobolomyces</i> sp. ....	259
<i>Trichoderma lignorum</i> .....	76
<i>Trichoderma viride</i> .....	238

## 2,4,5-T - Fungi (Cont'd)

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<i>Verticillium albo-atrum</i> .....	169
<i>Zygodessmus</i> sp. ....	259
<i>Zygosporium</i> sp. ....	259

FUNGI (scientific names not given) ..... 196, 225, 254

2. Effects on Bacteria

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<i>Agrobacterium tumefaciens</i> .....	148, 238
<i>Azotobacter agile</i> .....	177
<i>Azotobacter chroococcum</i> .....	92, 177
<i>Azotobacter vinelandii</i> .....	176, 177
<i>Bacillus megaterium</i> .....	127, 128
<i>Bacillus</i> sp. ....	148
<i>Bacillus subtilis</i> .....	238
<i>Corynebacterium</i> sp. ....	238
<i>Nitrobacter</i> sp. ....	274
<i>Nitrosomonas</i> sp. ....	274
<i>Nocardia</i> sp. ....	238, 259
<i>Promicromonospora</i> sp. ....	259
<i>Pseudomonas fluorescens</i> .....	238
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<i>Rhizobium alfalfa</i> .....	91
<i>Rhizobium japonicum</i> .....	147
<i>Rhizobium leguminosarum</i> .....	92, 221
<i>Rhizobium lupini</i> .....	147
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<i>Rhizobium trifolii</i> .....	83, 84, 221
<i>Salmonella marcescens</i> .....	37
<i>Salmonella typhimurium</i> .....	5, 36, 37
<i>Sarcina lutea</i> .....	238
<i>Serratia marcescens</i> .....	36, 37
<i>Staphylococcus aureus</i> .....	159
<i>Streptomyces albus</i> .....	259
<i>Streptomyces aureus</i> .....	19
<i>Streptomyces azureus</i> .....	259
<i>Streptomyces diastatochromogenes</i> .....	259
<i>Streptomyces griseus</i> .....	238
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3. Effects on Algae

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## Part A

## Herbicide Effects on Microorganisms

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Part B

Effects of Microorganisms on Herbicides

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<i>Scenedesmus acutus</i> .....	30, 31
<i>Scenedesmus quadricauda</i> .....	185, 186
<i>Scenedesmus</i> sp. ....	34
<i>Trachelomonas</i> sp. ....	129

4. <u>Effects of unidentified Groups</u> .....	2, 5, 10, 11, 19, 22, 43, 52, 58, 59, 66, 71, 72, 73, 75, 81, 82, 101, 104, 105, 134, 135, 137, 138, 139, 141, 147, 149, 150, 155, 161, 163, 164, 165, 168, 178, 196, 202
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## B. 2,4-DB [4-(2,4-dichlorophenoxy)butyric acid]

1. Effects of Fungi

<i>Aspergillus niger</i> .....	56
<i>Phytophthora megasperma</i> .....	166

2. Effects of Bacteria

<i>Achromobacterium</i> sp. ....	176
<i>Flavobacterium</i> sp. ....	117, 118, 119, 120, 176
<i>Micrococcus</i> sp. ....	176
<i>Nocardia coeliaca</i> .....	176
<i>Nocardia opaca</i> .....	193
<i>Nocardia</i> sp. ....	193
<i>Pseudomonas</i> sp. ....	176

## 2,4-DB - Bacteria (Cont'd)

3. Effects of unidentified Groups ..... 2, 5, 6, 66, 196
- C. 2,4-DP [2-(2,4-dichlorophenoxy)propionic acid
1. Effects of unidentified Groups ..... 98, 196
- D. 3-(2,4-DP) [3-(2,4-dichlorophenoxy)propionic acid
1. Effects of Bacteria
- Flavobacterium* sp. .... 117
2. Effects of unidentified Groups ..... 2
- E. MCPA [(4-chloro-*o*-tolyl)oxy]acetic acid, (2-methyl-4-chlorophenoxy-acetic acid)
1. Effects of Fungi
- Aspergillus niger* ..... 28, 99  
*Fusarium culmorum* ..... 184  
*Gloeosporium kaki* ..... 132  
*Gloeosporium olivarium* ..... 132  
*Mucor* sp. .... 184  
*Penicillium* sp. .... 184  
*Schizaphyllum commune* ..... 132  
*Verticillium* sp. .... 184  
*Zygorhynchus molleri* ..... 184
2. Effects of Bacteria
- Achromobacter* sp. .... 172, 173, 174  
*Arthrobacter globiformis* ..... 160  
*Arthrobacter oxydans* ..... 160  
*Arthrobacter* sp. .... 24, 25, 108  
*Azotobacter* sp. .... 184  
*Bacterium globiforme* ..... 14  
*Bacterium* sp. .... 83  
*Brevibacterium linens* ..... 160  
*Corynebacterium* sp. .... 84, 184  
*Flavobacterium aquatile* ..... 83, 84  
*Flavobacterium peregrinum* ..... 24, 172, 173, 174, 190  
*Nocardia globerula* ..... 160  
*Nocardia rubropertincta* ..... 160  
*Pseudomonas* sp. .... 49, 62, 64, 65, 184
- BACTERIA (scientific names not given) ..... 189
3. Effects of Algae
- Chlamydomonas globosa* ..... 100

## MCPA - Algae (Cont'd)

- Chlorella pyrenoidosa* ..... 100  
*Stichococcus bacillaris* ..... 100
4. Effects of unidentified Groups ..... 2, 32, 43, 59, 63, 71, 72, 98, 114, 120, 167, 168, 178
- F. MCPB {4-[(4-chloro-*o*-tolyl)oxy]butyric acid, (4-(2-methyl-4-chloro-phenoxy)butyric acid)}
1. Effects of Fungi
- Aspergillus niger* ..... 56
2. Effects of Bacteria
- Flavobacterium* sp. .... 33  
*Nocardia opaca* ..... 193  
*Nocardia* sp. .... 193
3. Effects of Algae
- Chlamydomonas globosa* ..... 100  
*Chlorella pyrenoidosa* ..... 100  
*Stichococcus bacillaris* ..... 100
4. Effects of unidentified Groups ..... 2, 98, 99
- G. MCPP (Mecoprop) {2-(4-chloro-2-methylphenoxy)propionic acid, 2-[(4-chloro-*o*-tolyl)oxy]propionic acid}
1. Effects of unidentified Groups ..... 2, 98
- H. 2,4,5-T [(2,4,5-trichlorophenoxy)acetic acid]
1. Effects of Fungi
- Aspergillus leoporis* ..... 18  
*Gloeosporium kaki* ..... 132  
*Gloeosporium olivarum* ..... 132  
*Schizophyllum commune* ..... 132
2. Effects of Bacteria
- Agrobacterium* sp. .... 95  
*Bacillus* sp. .... 95, 171  
*Brevibacterium* sp. .... 77  
*Pseudomonas* sp. .... 80, 95, 171
- BACTERIA (scientific names not given) ..... 44, 197



## 2,4,5-T (Cont'd)

3. Effects of Algae
  - Asterionella formosa* ..... 30
  - Nitzschia actinastroides* ..... 30
  - Scenedesmus acutus* ..... 30, 31
4. Effects of unidentified Groups ..... 14, 22, 32, 35, 41, 43, 52, 59, 71, 72, 100, 102, 120, 135, 137, 139, 141, 147, 196
- I. 2,4,5-TB [4-(2,4,5-trichlorophenoxy)butyric acid]
  1. Effects of Fungi
    - Aspergillus niger* ..... 56
  2. Effects of unidentified Groups ..... 22, 196
- J. Sesone [2-(2,4-dichlorophenoxy)ethyl sodium sulfate]
  1. Effects of Bacteria
    - Bacillus cereus* var. *mycoides* ..... 187, 188
- K. Silvex (2,4,5-TP) [2-(2,4,5-trichlorophenoxy)propionic acid]
  1. Effects of Bacteria
    - Achromobacter* sp. .... 159
    - Pseudomonas* sp. .... 80, 159
    - BACTERIA (scientific names not given) ..... 44
  2. Effects of unidentified Groups ..... 2, 71, 72, 98, 196
- L. CPA (4-chlorophenoxyacetic acid,  $\rho$ -chlorophenoxyacetic acid)
  1. Effects of Fungi
    - Aspergillus niger* ..... 23, 38, 53, 56
  2. Effects of Bacteria
    - Arthrobacter* sp. .... 68
    - Pseudomonas* sp. .... 50
  3. Effects of unidentified Groups ..... 47, 48, 50
- M. 4-CPB [4-(4-chlorophenoxy)butyric acid]
  1. Effects of Fungi
    - Aspergillus niger* ..... 56

- II. Reviews ..... 1, 3, 4, 6, 7, 8, 9, 13, 16, 17, 29, 37, 39, 40, 41, 60,  
61, 67, 69, 70, 74, 76, 78, 79, 87, 88, 89, 90, 91, 92, 93, 96, 97,  
103, 106, 107, 111, 112, 113, 115, 121, 122, 123, 124, 126, 127, 128,  
130, 133, 140, 142, 144, 145, 146, 153, 158, 162, 177, 201, 202
- III. Miscellaneous ..... 36, 94, 125, 131, 136, 198

## Part B

## Effects of Microorganisms on Herbicides

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biodegradation/colonies/culture media/ecosystem/enzymes/genetic/growth/herbicide  
effects/nitrification/oxidation/physiology/plankton/population/root nodulation/  
soil/toxicity/2,4-D/3,4-D/2,4-DB/3,4-DB/2,4-DEP/2,4-DES/2,4-DP/dichlorprop/MCPA/  
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