

Environmental and health effects of locust control – An annotated bibliography

updated January 2004

A large number of publications dealing with the environmental side-effects of locust- and grasshopper control in (semi-) arid and (sub-) tropical environments have been listed below. Most of these studies were carried out in Africa and Australia; a few studies from North America and Central Asia were also included. No quality criteria have been used for inclusion in the list. This list is an update of an earlier one, prepared and distributed in July 1998. I would like to thank all those who contributed to this update.

Papers have been ordered alphabetically by first author and subsequently by year, and organised by environmental compartment or groups of organisms, as outlined below:

1. Review papers and general opinion papers
2. Multi-compartment studies (generally large studies covering several taxonomic groups)
3. Environmental chemistry (some data on residues may be included in other listed reports as well; relevant data also exist in, sometimes confidential, reports of the agrochemical industry).
4. Aquatic ecotoxicology
5. Terrestrial ecotoxicology - invertebrates
6. Terrestrial ecotoxicology - vertebrates
7. Human toxicology
8. Environmental monitoring of spray operations
9. Environmental impact of biological control

Note that a new section 9 has been created in this version of the bibliography, dealing with the environmental impact of biological control of locusts and grasshoppers (mostly biopesticides). Any papers on this subject which were listed in other sections have been moved to this new section 9. Papers which deal both with chemical pesticides and biological control are mentioned under both headings.

All reports are listed in their original languages. Many of the FAO/Locustox reports are both available in English and in French; in those cases only the English version is cited.

Please send information on mistakes, omissions or new publications to the email address below. Updates of this list will be prepared and published if major changes or additions take place.

For comments and additions please contact:

Harold van der Valk
Dorpsstraat 23
5261 CJ Vught
The Netherlands
Email: harold.vandervalk@wxs.nl

1. Review papers and general opinion papers

Author(s)	Year	Title; source	Insecticide(s)
Andreasen J	1993	Impact sur l'environnement de la lutte antiacridienne en Afrique. pp. 27-30 <i>In</i> : Thiam A et Ducommun G. Protection naturelle des végétaux en Afrique. Série études et recherches No. 154-155-156. ENDA-Editions, Dakar, Senegal.	
Everts JW	1990	Methods for monitoring the impact of chemical control of locusts and grasshoppers in Africa. pp. 45-54 <i>In</i> : Proceedings of the workshop on health and environmental impact of alternative control agents for desert locust control. Oslo, January 14-17, 1990.	
Everts JW	1997	Ecotoxicology for risk assessment in arid zones: some key issues. <i>Archives of Environmental Contamination and Toxicology</i> 32(1) : 1-10	
Everts JW & Bâ L	1997	Environmental effects of locust control: state of the art and perspectives. pp 331-336 <i>In</i> : Krall S, Peveling R & Ba Diallo D (eds) New strategies in locust control. Birkhäuser Verlag, Basel, Switzerland.	
FAO	1989	Report of the working group on environmental side-effects of desert locust control. 14-16 February 1989. FAO, Rome, Italy.	
Grant IF	1988	Environmental effects of desert locust control - a monitoring framework. pp 157-171 <i>In</i> : Report of the Meeting on Desert Locust research: "defining future research priorities". Rome, Italy, 18-20 October 1988. FAO, Rome, Italy.	
Grant IF	1989	Environmental effects of desert locust control. <i>FAO Plant Protection Bulletin</i> 37(1) : 27-35	
Lahr J & Diémé E	1992	Le Projet Locustox, un programme de recherche écotoxicologique sur l'impact de la lutte antiacridienne en Afrique sur l'environnement. pp 76-87. <i>In</i> : Balança G et de Visscher M-N (eds). Méthodes de recherche en écologie des traitements antiacridiens en Afrique. PRIFAS, Montpellier, France.	
Lockwood JA	1993	Environmental issues involved in the biological control of rangeland grasshoppers (Orthoptera: Acrididae) with exotic agents. <i>Environmental Entomology</i> 22 : 503-518	
Lockwood JA & Schell SP	1997	Decreasing economic and environmental costs through reduced area and agent insecticide treatments (RAATs) for the control of rangeland grasshoppers: empirical results and their implications for pest management. <i>Journal of Orthoptera Research</i> 6 : 19-32	
Matteson PC	1992	A review of field studies of the environmental impacts of locust/grasshopper control programmes in Africa. pp 347-355 <i>In</i> : Lomer CJ & Prior C (eds) Biological control of locusts and grasshoppers. Proceedings of a workshop held at the International Institute of Tropical Agriculture, Cotonou, Republic of Benin, 29 April - 1 May 199. CAB International, Wallingford, UK.	
NORAGRIC	1990	Proceedings of the workshop on health and environmental impact of alternative control agents for Desert Locust control. Oslo, January 14-17, 1990. NORAGRIC Occasional Papers Series C, Development and Environment no. 5. NORAGRIC, Aas, Norway	

1. Review papers and general opinion papers

Author(s)	Year	Title; source	Insecticide(s)
Peveling R	1997	Le rôle de l'écotoxicologie en lutte antiacridienne - généralités. pp 261-266 <i>In</i> : Scherer R & Lié Fong Hong (eds) Symposium sur la lutte antiacridienne à Madagascar. Projet DPV-GTZ Promotion de la Protection Intégrée des Cultures et des Denrées Stockées, Antananarivo, Madagascar.	
Peveling R	2001	Environmental conservation and locust control - possible conflicts and solutions. <i>Journal of Orthoptera Research</i> 10 : 171-187	
Peveling R & Nagel P	2001	Locust and tsetse fly control in Africa: does wildlife pay the bill for animal health and food security? pp 82-108 <i>In</i> : Johnston JJ (ed.) Pesticides and wildlife. ACS Symposium Series 771. American Chemical Society, Washington D.C., USA	
Ritchie JM & Dobson H	1995	Desert Locust control operations and their environmental impact. NRI bulletin 67. NRI, Chatham, UK.	
Story PG, Hamilton JG, Deveson T, Spratt W, Hunter DH & Spurgin P	1997	The Australian Plague Locust Commission. Proceedings of Management for Sustainable Ecosystems Conference, Brisbane 1997. Hale P, Petrie A, Moloney D & Sattler P (eds). University of Queensland Press.	
Story PG, Hamilton JG, McRae H, Astheimer L, Fildes K, Walker P, Spurgin P & Hunter D	2002	Environmental issues facing aerial locust control in Australia – A case study of the Australian Plague Locust Commission. Proceedings of the Fenner Environment Conference (July 2002). Australian Academy of Science.	
TAMS Consultants/CICP	1989	Locust and grasshopper control in Africa/Asia. A programmatic environmental impact assessment. TAMS Consultants Inc. / Consortium for International Crop Protection (CICP).	
Tingle CCD, Rother JA, Dewhurst CF, Lauer S & King WJ	2002	Fipronil: environmental fate, ecotoxicology and human health concerns. <i>Reviews of Environmental Contamination and Toxicology</i> 176 : 1-66.	General review of an insecticide, but large inputs from locust control studies
van der Valk H	1988	Environmental impact of dieldrin applications in locust control - a hazard assessment. Working paper. Dieldrin meeting, Rome, 21 October 1988. FAO, Rome, Italy.	
van der Valk H	1990	Environmental impact studies of chemical locust and grasshopper control - a review. Report to the Scientific Advisory Committee of the Coordinating Group on Locust Research. FAO, Rome, Italy.	
van der Valk H	1997	Community structure and dynamics in desert ecosystems: potential implications for insecticide risk assessment. <i>Archives of Environmental Contamination and Toxicology</i> 32(1) : 11-21	
van der Valk H & Peveling R	1997	Results and recommendations of the working group environmental impact. pp 395-397 <i>In</i> : Krall S, Peveling R & Ba Diallo D (eds) New strategies in locust control. Birkhäuser Verlag, Basel, Switzerland.	
de Visscher M-N, Duranton J-F, Launois M & Garcia G	1988	Effets directs et indirects, immédiats et différés de la lutte antiacridienne sur l'environnement. Démarches préliminaires. PRIFAS Document 308. CIRAD-PRIFAS, Montpellier, France.	

1. Review papers and general opinion papers

Author(s)	Year	Title; source	Insecticide(s)
Wikteliuss S, Ardo J & Fransson T	<i>in press</i>	Desert Locust control in ecologically sensitive areas – the need for guidelines. <i>Ambio</i> 6	
Wilps H, Peveling R & Diob B	1996	Summary report on the field research in Mauritania. Project Integrated Biological Control of Grasshoppers and Locusts, PN 96.2113.7, GTZ, Eschborn, Germany.	

2. Multi-compartment studies

Author(s)	Year	Title; source	Insecticide(s)
de Visscher M-N & Balança G	1993	Les effets sur l'environnement des traitements insecticides contre les criquets ravageurs. Rapport annuel sur la première campagne de relevés (Burkina Faso, mai 92 à février 93). PRIFAS Document 469, Montpellier, France. <i>[non-target invertebrates, birds]</i>	deltamethrin, lambda-cyhalothrin, malathion
Dynamac Corporation	1988	Final technical report. Results of the Mali pesticide testing trials against the senegalese grasshopper. Dynamac/CICP, Rockville, USA <i>[environmental chemistry, non-target invertebrates, birds]</i>	fenitrothion, malathion, chlorpyrifos, bendiocarb, carbaryl, lambda-cyhalothrin, diazinon, tralometrin
Dynamac Corporation	1988	Results of the locust pesticide testing trials in Sudan. Technical report. Dynamac/CICP, Rockville, USA. <i>[environmental chemistry, non-target invertebrates, birds]</i>	fenitrothion, malathion, chlorpyrifos, bendiocarb, carbaryl, lambda-cyhalothrin
Everts JW (ed.)	1990	Environmental effects of chemical locust and grasshopper control, a pilot study. FAO, Locustox Project, Rome, Italy <i>[environmental chemistry, non-target invertebrates, aquatic ecotox, birds, soil microbiology]</i>	fenitrothion, chlorpyrifos, diflubenzuron
Everts JW, Mbaye D & Barry O (eds.)	1997	Environmental side-effects of locust and grasshopper control. Volume 1. FAO Locustox Project & Ministry of Agriculture. Dakar, Senegal <i>[compilation of Locustox studies published from 1991-1993]</i>	various
Everts JW, Mbaye D, Barry O & Mullié W (eds.)	1998	Environmental side-effects of locust and grasshopper control. Volume 2. FAO Locustox Project & Ministry of Agriculture. Dakar, Senegal <i>[compilation of Locustox studies published from 1994-1997]</i>	various
Everts JW, Mbaye D, Barry O & Mullié W (eds.)	1998	Environmental side-effects of locust and grasshopper control. Volume 3. FAO Locustox Project & Ministry of Agriculture. Dakar, Senegal <i>[compilation of Locustox studies published from 1994-1997]</i>	various
Everts JW, Mbaye D, Barry O & Mullié W (eds.)	2002	Environmental side-effects of locust and grasshopper control. Volume 4. FAO Locustox Project & Ministry of Agriculture. Dakar, Senegal <i>[compilation of Locustox studies published from 1997-2001]</i>	various

2. Multi-compartment studies

Author(s)	Year	Title; source	Insecticide(s)
IPP Consultants	2003	Chapter 6 – Environmental monitoring system for locust control operations. pp 65-83 <i>In: Technology and institutional development for sustainable locust management project. Final report, Volume 1. Asian Development Bank – project TA 3647 KAZ</i> <i>and</i> Appendix 7 – Environmental monitoring of non-target organisms on the fallow lands of north Kazakhstan during insecticide treatments (Childebaev M, ed). <i>In: Technology and institutional development for sustainable locust management project. Appendixes, Volume 3. Asian Development Bank – project TA 3647 KAZ</i> <i>[terrestrial invertebrates, birds, aquatic fauna, human occupational exposure]</i>	alpha-cypermethrin, chlorpyrifos, diflubenzuron, fipronil
Keita YF	1990	Etude de l'efficacité comparée de quelques acridicides couramment utilisés au Mali en rapport avec la zootoxicité et la phytotoxicité. Thesis biologie, Ecole Normale Supérieure, Mali.	
Keith JO, Bruggers RL, Matteson PC, El Hani A, Ghaout S, Fiedler LA, Arroub EH, Gillis JN & Phillips RL	1995	An ecotoxicological assessment of insecticides used for locust control in southern Morocco. USDA-APHIS. Denver Wildlife Research Station research report 11-55-005. <i>[environmental chemistry, non-target invertebrates, birds, mammals]</i>	malathion, dichlorvos
Müller P	1988	Ökotoxikologische Wirkungen von chlorierten Kohlenwasserstoffen, Phosphorsäureestern, Carbamaten und Pyrethroiden im nordöstlichen Sudan. University of Saarbrücken, Germany. <i>[environmental chemistry, non-target invertebrates, birds, soil microbiology]</i>	various
Peveling R, Rasolomanana H, Raholijaona, Rakotomianina L, Ravoninjatovo A, Randimbison L, Rakotondravelo M, Raveloson A, Rakotoarivony H, Bezaka S, Ranaivoson N & Rafanomezantsoa JJ	2001	Effets des traitements aériens de Fipronil et de Deltaméthrine en couverture totale sur la chaîne alimentaire. pp. 525-572 <i>In: Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.</i> <i>[non-target invertebrates, mammals, reptiles]</i>	fipronil, deltamethrin
Peveling R, McWilliam AN, Nagel P, Rasolomanana H, Raholijaona, Rakotomianina L, Ravoninjatovo A, Dewhurst CF, Gibson G, Rafanomezana S & Tingle CCD	2003	Impact of locust control on harvester termites and endemic vertebrate predators in Madagascar. <i>Journal of Applied Ecology</i> 40 : 729-741 <i>[non-target invertebrates, mammals, reptiles]</i>	fipronil, triflumuron, deltamethrin
Pinto LJ	1988	Environmental assessment. Analysis of aerial applications of fenitrothion ULV for locust control in Sudan. Consortium for International Crop Protection (CICP). <i>[environmental chemistry, non-target invertebrates, birds, mammals]</i>	fenitrothion
Rachadi T, Balança G <i>et al.</i>	1995	Les effets du fipronil sur <i>Schistocerca gregaria</i> (Forsk., 1775), divers sautériaux et la faune non-cible. Principaux résultats expérimentaux obtenus par le CIRAD-GERDAT-PRIFAS en Mauritanie (octobre à décembre 1994). PRIFAS Document 513, Montpellier, France. <i>[non-target invertebrates, birds]</i>	chlorpyrifos, fipronil

2. Multi-compartment studies

Author(s)	Year	Title; source	Insecticide(s)
Stewart DAB, du Preez I & Price RE	1995	Environmental impact of deltamethrin on non-target organisms in the Karoo. Report no. 05:7/95. Agricultural Research Council, Plant Protection Research Institute, Locust Research Division, Pretoria, South Africa.	deltamethrin
Stewart DAB and Seesink LD	1996	Impact of locust control in a semi-arid ecosystem in South Africa. <i>Proceedings of the Brighton Crop Protection Conference: Pests and Diseases</i> . Vol 3: 1193-1198.	
Stewart DAB, Seesink LD and du Preez I	1997	Impact of deltamethrin on non-target invertebrates and reptiles in the Karoo. Report no. 05:1/97. Agricultural Research Council, Plant Protection Research Institute, Locust Research Division, Pretoria, South Africa. <i>[non-target invertebrates, reptiles]</i>	deltamethrin
Tingle CCD & McWilliam AN	1999	Evaluation of short-term impact on non-target organisms of two pesticides used in emergency locust control in Madagascar. Final Report to DFID. Unpublished Report. NRI, Chatham, UK. <i>[spray deposition, non-target terrestrial invertebrates, amphibians, reptiles, birds, small mammals]</i>	fipronil, triflumuron
Tingle CCD & McWilliam AN	2001	Evaluation de l'effet à court terme sur les organismes non cibles des traitements antiacridiens d'urgence en barrières à grande échelle. pp. 115-182 <i>In: Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III : Ecotoxicologie.</i> GTZ, Antananarivo, Madagascar. <i>[non-target terrestrial invertebrates, amphibians, reptiles, birds, small mammals]</i>	fipronil, triflumuron
Van der Westhuizen MC & Roux PWJ	1998	Environmental impact of acridicides in the Karoo. Special edition – Final report 1998. Department of Zoology and Entomology, Faculty of Science, University of the Orange Free State, Bloemfontein, South Africa. <i>[flora, non-target terrestrial invertebrates]</i>	deltamethrin, esfenvalerate, fipronil, diflubenzuron

3. Environmental chemistry

Author(s)	Year	Title; source	Insecticide(s)
Aigreau D	1999	Analysis of propoxur residues on soil and vegetation. NRI unpublished report. Chatham, UK.	propoxur
Bobé A, Cooper J-F, Coste CM & Muller M-A	1998	Behaviour of fipronil in soil under Sahelian plain field conditions. <i>Pesticide Science</i> 52: 275-281	fipronil
Gadji B	1993	Déposition et dégradation du fénitrothion et du diflubenzuron sur végétation et dans les mares temporaires en milieu sahélien. Locustox report 93/4. FAO, Projet Locustox, Dakar, Senegal.	fenitrothion, diflubenzuron
Gadji B	1993	Déposition et dégradation du fénitrothion et du diflubenzuron sur végétation et dans les sols au Sénégal & suivi de résidus dans les stockages de mil en monde rural (Campagne 1992). Locustox report 93/5. FAO, Projet Locustox, Dakar, Senegal.	fenitrothion, diflubenzuron
Gadji B	1996	Déposition et disparition de la deltaméthrine et du chlorpyrifos sur végétation de mil au Sénégal (Campagne 1993). Locustox report 96/4. FAO, Projet Locustox, Dakar, Senegal.	deltamethrin, chlorpyrifos
Gadji B	1997	Déposition disparition du fenitrothion et du malathion sur végétation de mil et du chlorpyrifos sur herbe au Sénégal (campagne 1994 et campagne 1996). Locustox report 97/8. FAO, Projet Locustox, Dakar, Senegal.	fenitrothion, malathion, chlorpyrifos
Gadji B, N'Diaye MD, Diop A & Djighaly A	1997	Déposition et disparition du fipronil sur feuille de mil et sur herbe au Sénégal (campagne 1995 et 1996). Locustox report 97/15. FAO, Projet Locustox, Dakar, Senegal.	fipronil
Gadji B	1997	The dissipation of certain insecticides in the environment of the Sahel. pp 391-392 <i>In</i> : Krall S, Peveling R & Ba Diallo D (eds) New strategies in locust control. Birkhäuser Verlag, Basel, Switzerland.	
Gilmour AR, McDougall KW & Spurgin P	1999	The uptake and depletion of fenitrothion in cattle, pasture and soil following spraying of pastures for locust control. <i>Australian Journal of Experimental Agriculture</i> 39: 915-922	fenitrothion
Hooper GHS & French H	1998	Comparison of measured fenitrothion deposits from ULV aerial locust control applications with those predicted by the FSCBG aerial spray model. <i>Crop Protection</i> 17(6): 515-520	fenitrothion
King WJ & Aigreau D	1999	Technical report on a visit to Madagascar to review and advise on procedures for obtaining and analyzing field samples for the determination of pesticide residues in the environment following locust control operations. Unpublished report. NRI, Chatham, UK.	
King WJ & Aigreau D	1999	Analysis of fipronil residues on soil and vegetation. Unpublished Report. NRI, Chatham, UK.	fipronil

4. Aquatic ecotoxicology

Author(s)	Year	Title; source	Insecticide(s)
Diagne M	1996	Tests de toxicité au laboratoire de quelques acridicides vis-à-vis des juveniles d' <i>Oreochromis niloticus</i> (Cichlidae) et développement de tests au laboratoire avec <i>Caridina africana</i> (Decapoda, Atyidae). Thèse de diplôme d'Ingénieur agronome, ENSA, Thiès, Sénégal (Student thesis).	
Diallo AO, Ndour KB, Badji A & Lahr J	1996	Tests de toxicité aiguë sur <i>Oreochromis niloticus</i> (L) (Cichlidae): Méthode d'essai et résultats de deux organophosphorés (fénitrothion & chlorpyrifos). Locustox report 96/7. FAO, Projet Locustox, Dakar, Senegal.	fenitrothion, chlorpyrifos
Diallo AO, Diagne M, Ndour KB & Lahr J	1997	Tests de toxicité au laboratoire de huit acridicides vis à vis de <i>Oreochromis niloticus</i> (Pisces, Cichlidae). Locustox report 97/9. FAO, Projet Locustox, Dakar, Senegal.	bendiocarb, chlorpyrifos, deltamethrin, diflubenzuron, fenitrothion, fipronil, lambda-cyhalothrin, malathion
Diouf B	1995	Etude comparative de la toxicité des pesticides sur des individus mâles et femelles de <i>Anisops sardea</i> (Hemiptera, Notonectidae). Rapport de stage, DFPV, Niamey, Niger (Student report).	
Lahr J & Diallo AO	1993	Effects of experimental locust control with fenitrothion and diflubenzuron on the aquatic invertebrate fauna of temporary ponds in central Senegal. Locustox report 93/3. FAO, Locustox Project, Dakar, Senegal.	fenitrothion, diflubenzuron
Lahr J, Ndour KB, Badji A & Diallo AO	1995	Effects of experimental locust control with deltamethrin and bendiocarb on the aquatic invertebrate fauna of temporary ponds in central Senegal. Locustox report 95/3. FAO, Locustox Project, Dakar, Senegal.	bendiocarb, deltamethrin
Lahr J, Badji A, NDour KB & Diallo AO	1996	Acute toxicity tests with <i>Streptocephalus sudanicus</i> (Branchiopoda, Anostraca) and <i>Anisops sardeus</i> (Hemiptera, Notonectidae) using insecticides for desert locust control. Locustox report 96/5. FAO, Locustox Project, Dakar, Senegal.	bendiocarb, chlorpyrifos, deltamethrin, diflubenzuron, fenitrothion, fipronil, lambda-cyhalothrin, malathion
Lahr J	1997	Ecotoxicology of organisms adapted to life in temporary freshwater ponds in arid and semi-arid regions. <i>Archives of Environmental Contamination and Toxicology</i> 32(1) : 50-57	
Lahr J	1997	An ecological assessment of the hazard and risk of eight insecticides used in Desert Locust control to invertebrates in temporary ponds in the Sahel. Locustox report 97/3. FAO, Locustox Project, Dakar, Senegal.	bendiocarb, chlorpyrifos, deltamethrin, diflubenzuron, fenitrothion, fipronil, lambda-cyhalothrin, malathion
Lahr J & Banister K	1997	Effects of insecticides used in Desert Locust control on the aquatic fauna of the Senegal River system. pp 150-165 <i>In</i> : Remane K (ed) African inland fisheries, aquaculture and the environment. Fishing News Books, Blackwell Scientific Ltd, Oxford, UK.	chlorpyrifos, diflubenzuron, fenitrothion
Lahr J & Diallo AO	1997	Side-effects of Desert Locust control on the aquatic fauna in the Sahel: a summary of five years of research. pp. 377-382 <i>In</i> : Krall S, Peveling R & Ba Diallo D (eds) New strategies in locust control. Birkhäuser Verlag, Basel, Switzerland.	

4. Aquatic ecotoxicology

Author(s)	Year	Title; source	Insecticide(s)
Lahr J, Diallo AO, Ndour KB & Badji A	1997	Seasonal patterns in zooplankton and macroinvertebrate abundance and hydrological dynamics in a temporary pond in central Senegal (West Africa). Locustox report 97/12. FAO, Locustox Project, Dakar, Senegal.	
Lahr J, Gadji B & Dia D	1997	Estimation of buffer zones for the protection of temporary ponds against contamination by drift from ground-based insecticide applications against Desert Locusts. Locustox report 97/6. FAO, Locustox Project, Dakar, Senegal.	bendiocarb, chlorpyrifos, deltamethrin, diflubenzuron, fenitrothion, fipronil, lambda-cyhalothrin, malathion, <i>Metarhizium anisopliae</i> var. <i>acridum</i> , teflubenzuron, triflumuron
Lahr J	1998	An ecological assessment of the hazard and risk of eight insecticides used in Desert Locust control, to invertebrates in temporary ponds in the Sahel. <i>Aquatic Ecology</i> 32 : 153-162	bendiocarb, chlorpyrifos, deltamethrin, diflubenzuron, fenitrothion, fipronil, lambda-cyhalothrin, malathion
Larh J	2000	Effects of insecticides on invertebrates in temporary ponds in the Sahel. Ecotoxicology, ecological risk assessment and minimizing side-effects of locust control. PhD Thesis. Free University, Amsterdam, The Netherlands	various
Lahr J, Diallo AO, Gadji B, Diouf PS, Bedaux JJM, Badji A, Ndour KB, Andreassen J & van Straalen NM	2000	Ecological effects of experimental insecticide applications on invertebrates in Sahelian temporary ponds. <i>Environmental Toxicology and Chemistry</i> 19(5) : 1278-1289	bendicarb, deltamethrin, diflubenzuron, fenitrothion
Lahr J, Gadji B & Dia D	2000	Predicted buffer zones to protect temporary pond invertebrates from ground-based insecticide applications against desert locusts. <i>Crop Protection</i> 19 : 489-500	bendiocarb, chlorpyrifos, deltamethrin, diflubenzuron, fenitrothion, fipronil, lambda-cyhalothrin, malathion, <i>Metarhizium anisopliae</i> var. <i>acridum</i> , teflubenzuron, triflumuron
Lahr J, Badji A, Marquenie S, Schuiling E, Ndour KB, Diallo AO & Everts JW	2001	Acute toxicity of locust insecticides to two indigenous invertebrates from Sahelian temporary ponds. <i>Ecotoxicology and Environmental Safety</i> 48 : 66-75	bendiocarb, beta-cyfluthrin, chlorpyrifos, deltamethrin, diflubenzuron, fenitrothion, fipronil, lambda-cyhalothrin, malathion, <i>Metarhizium anisopliae</i> var. <i>acridum</i> , propoxur+phoxim, teflubenzuron, triflumuron
Marquenie S & Schuiling E	1997	Acute toxicity tests with two aquatic invertebrates from the Sahel: <i>Streptocephalus sudanicus</i> (Branchiopoda, Anostraca) and <i>Anispos sardeus</i> (Hemiptera, Notonectidae). Rapport de stage, Van Hall Instituut, Groningen, The Netherlands (Student report).	

4. Aquatic ecotoxicology

Author(s)	Year	Title; source	Insecticide(s)
Marquenie S, Schuiling E, Badji A & Lahr J	1997	Acute toxicity of five insecticides used in Desert Locust control to <i>Streptocephalus sudanicus</i> (Branchiopoda , Anostraca) and <i>Anisops sardeus</i> (Hemiptera , Notonectidae). Locustox report 97/1. FAO, Locustox Project, Dakar, Senegal.	beta-cyfluthrin, <i>Metarhizium flavoviride</i> , propoxur+phoxim, teflubenzuron, triflumuron
Schuiling E, Marquenie S, Badji A & Lahr J	1997	Acute toxicity tests with <i>Streptocephalus sudanicus</i> (Branchiopoda , Anstraca) and <i>Anisops sardeus</i> (Hemiptera, Notonectidae): effects of synthetic pyrethroids and methodological aspects. Locustox report 97/2. FAO, Locustox Project, Dakar, Senegal.	beta-cyfluthrin, deltamethrin, fenitrothion, lambda-cyhalothrin
Seye Y	1994	Toxicité des pesticides antiacridiens sur les invertébrés aquatiques: cas du fénitrothion, du malathion et du <i>Metarhizium flavoviride</i> . Rapport de stage, DFPV, Niamey, Niger. (Student report).	fenitrothion, malathion, <i>Metarhizium flavoviride</i>
Weenink E, Ndour KB, Badji A, Sarr M, Mullié W & Everts J	2003	Effects of chlorpyrifos on aquatic invertebrates in artificial ponds in northern Senegal. "Pesticides in non-target agricultural environments, environmental and economic implications". Joint European Southern African International Conference. Cape Town, South Africa, Jan. 21-23, 2003 [abstract only]	chlorpyrifos

5. Terrestrial ecotoxicology - invertebrates

Author(s)	Year	Title; source	Insecticide(s)
Anonymous	1998	La toxicité par ingestion de propoxur 75 WP sur <i>Trachyderma hispida</i> (Coleoptera, Tenebrionidae). Etude No. LCTX9804. FAO & CERES/Locustox Foundation, Dakar, Senegal.	propoxur
Anonymous	1998	La toxicité par ingestion de propoxur-phoxim sur <i>Trachyderma hispida</i> (Coleoptera, Tenebrionidae). Etude No. LCTX9808. FAO & CERES/Locustox Foundation, Dakar, Senegal.	propoxur, phoxim
Anonymous	1999	Test de toxicité de Sumicombi-alpha sur <i>Pimelia senegalensis</i> au laboratoire. Etude No. LCTX9901. FAO & CERES/Locustox Foundation, Dakar, Senegal.	fenitrothion, esfenvaterate
Balança G & de Visscher M-N	1994	Les effets sur les araignées et les insectes non-cibles des traitements chimiques contre les criquets ravageurs. Rapport annuel sur la deuxième campagne de relevés (Burkina Faso, juillet à novembre 1993). PRIFAS Document 494, Montpellier, France.	lambda-cyhalothrin, pyridaphenthion
Balança G & de Visscher M-N	1995	Effets des traitements chimiques antiacridiens sur des coléoptères terrestres au nord du Burkina Faso. <i>Ecologie</i> 26(2) : 115-126	malathion, lambda-cyhalothrin, pyridaphenthion
Balança G & de Visscher M-N	1996	Les effets de très faibles doses de fipronil sur diverses espèces de sautériaux et d'insectes non cibles. Résultats expérimentaux obtenus par le CIRAD-GERDAT-PRIFAS au Niger (juillet à novembre 1995). PRIFAS Document 539, Montpellier, France	fipronil
Balança G & de Visscher M-N	1997	Effects of very low doses of fipronil on grasshoppers and non-target insects following field trials for grasshopper control. <i>Crop Protection</i> 16(6) : 553-564	fipronil
Balança G & de Visscher M-N	1997	Impacts on nontarget insects of a new insecticide compound used against the Desert Locust (<i>Schistocerca gregaria</i> (Forsk. 1774)). <i>Archives of Environmental Contamination and Toxicology</i> 32(1) : 58-62	fipronil, chlorpyrifos, pyridafenthion
Balança G & de Visscher M-N	1997	Side-effects of insecticides on non-target arthropods in Burkina Faso. pp 361-367 <i>In</i> : Krall S, Peveling R & Ba Diallo D (eds) New strategies in locust control. Birkhäuser Verlag, Basel, Switzerland.	lambda-cyhalothrin, malathion, pyridaphenthion
Bèye A, Sow PC & van der Valk H	1997	Effets du fénitrothion sur les coleoptères épigés de l'agroecosystème mil au Sénégal. Locustox report 97/7. FAO, Locustox Project, Dakar, Senegal.	fenitrothion
Brown HD, Price RE & Seesink LD	1994	Impact of deltamethrin on a dipteran parasite of locusts in South Africa. Report no. 05:3/94. Agricultural Research Council, Plant Protection Research Institute, Locust Research Division, Pretoria, South Africa.	deltamethrin
Carruthers GF, Hooper GHS & Walker PW	1993	Impact of fenitrothion on the relative abundance and diversity on non-target organisms. pp. 136-138 <i>In</i> : Pest control & sustainable agriculture. Corey SA, Dall DJ & Milne WM (eds). CSIRO, Australia	fenitrothion
Carruthers GF, Walker PW, Greenslade P & Hooper GHS	2000	Impact of aerially applied fenitrothion on the collembolan fauna of arid grasslands on inland Australia. pp. 51-60 <i>In</i> : APLC Research Reports 2000. October 2000. Australian Plague Locust Commission, Canberra.	fenitrothion

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Author(s)	Year	Title; source	Insecticide(s)
Chambers BQ, Stewart DAB & du Preez I	1997	Environmental impact of silafluofen locust bait on non-target organisms in the Karoo, South Africa. Report no. 05: 2/97. Agricultural Research Council, Plant Protection Research Institute, Locust Research Division, Pretoria, South Africa.	silafluofen
Childebaev M	2003	Environmental monitoring of entomofauna of fallow lands of Northern Kazakhstan under conditions of insecticide application. <i>Plant Protection and Quarantine in Kazakhstan</i> 13(1) : 28-34. [note: in Russian]	
Danfa A & van der Valk H	1993	Toxicity tests with fenitrothion on <i>Pimelia senegalensis</i> and <i>Trachyderma hispida</i> (Coleoptera, Tenebrionidae). Locustox report 93/6. FAO. Locustox Project, Dakar, Senegal.	fenitrothion
Danfa A, Bà AL & Konaté M	1997	Test de toxicité aigue sur les termites <i>Psammodermes hybostoma</i> . Locustox report 97/10. FAO,Projet Locustox, Dakar, Senegal.	bendiocarb, chlorpyrifos, deltamethrin, diflubenzuron, fenitrothion, malathion
Danfa A, Fall B & van der Valk H	1997	Test de toxicité aigue sur un parasitoïde , Bracon hebetor Say (Hymenoptera: Braconidae), avec différents insecticides utilisés en lutte antiacridienne. Locustox report 97/5. FAO, Locustox Project, Dakar, Senegal.	bendiocarb, chlorpyrifos, deltamethrin, fipronil, lambda-cyhalothrin, malathion
Danfa A, Ba, AL, van der Valk H, Rouland-Lefevre C, Mullié WC & Everts JW	2000	Long-term effects of chlorpyrifos and fipronil on epigeal beetles and soil arthropods in the semi-arid savanna of northern Senegal. Locustox report LCTX9802. FAO & CERES/Locustox Foundation, Dakar, Senegal.	chlorpyrifos, fipronil
Danfa A, Ba AL, van der Valk H, Rouland C, Mullié W, Sarr M, & Everts J	2003	Effects of chlorpyrifos and fipronil on soil macrofauna in a sahelian savanna ecosystem. "Pesticides in non-target agricultural environments, environmental and economic implications". Joint European Southern African International Conference. Cape Town, South Africa, Jan. 21-23, 2003. [abstract only]	chlorpyrifos, fipronil
Fiskvatn K	1991	Effects of POLYTRIN C on ground living arthropods in Mali. <i>In</i> : Reports of field trials against grasshoppers in Mali, 1991 season. Ciba Geigy, Basel, Switzerland	profenofos + cypermethrin
Fiskvatn K	1993	Reduced rates of the synthetic pyrethroid lambda-cyhalothrin, and their effects on grasshoppers (Acridoidea) and non-target arthropods in Mali. Cand. Scient. thesis. Department of Biology, University of Oslo, Norway.	lambda-cyhalothrin
Hartl J	1994	Ökotoxikologische Freiland- und Halbfreilandversuche mit Triflururon in Ajoujt/ Mauretaniën. Diplomarbeit, Universität Saarbrücken, Germany. (<i>Student thesis</i>)	triflururon
Hooper GHS, Carruthers GF & Walker PW	2000	Impact of aerially applied fenitrothion on the epigeal invertebrate fauna of arid grasslands of inland Australia. pp. 1-50 <i>In</i> : APLC Research Reports 2000. October 2000. Australian Plague Locust Commission, Canberra.	fenitrothion
Johannessen B	1991	Reduced dosages of fenitrothion applied against grasshoppers (Acrididae) and short-term effects on non-target arthropods in Mali. Cand. Scient. thesis. Department of Biology, University of Oslo, Norway.	fenitrothion
Kamara O & van der Valk H	1995	Side-effects of fenitrothion and diflubenzuron on beneficial arthropods in millet in Senegal (the 1992 study). Locustox report 95/2. FAO, Locustox Project, Dakar, Senegal.	fenitrothion, diflubenzuron

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Author(s)	Year	Title; source	Insecticide(s)
Krokene P	1991	Reduced rates of teflubenzuron and their effect on grasshoppers (Acridoidea) and non-target arthropods in Mali. Cand. Scient. Thesis, Dept. of Biology, University of Oslo, Norway.	teflubenzuron
Krokene P	1993	The effect of an insect growth regulator on grasshoppers (Acrididae) and non-target arthropods in Mali. <i>Journal of Applied Entomology</i> 116 : 248-266	
Mouhim, Bagari, Cherkaoui, Afrass & Ouichouani	1996	Effets du fipronil sur les bandes larvaires et les jeunes ailés du criquet pèlerin et son impact sur la faune non-cible. Centre national anti-acridienne (CNAA), Ait Melloul, Morocco.	fipronil
Mouhim, Idrissi Raji, Cherkaoui & Ouzane	1996	Effets du fipronil sur le criquet marocain en association avec les sautériaux et son impact sur les insectes non-cibles. Centre national anti-acridienne (CNAA), Ait Melloul, Morocco.	fipronil
Murphy CF, Jepson PC & Croft BA	1994	Database analysis of the toxicity of antilocus pest pesticides to non-target, beneficial invertebrates. <i>Crop Protection</i> 13(6) : 413-420	various
Niassy A & van der Valk H	1998	Evaluation des effets du fénitrothion et du diflubenzuron sur l'entomofaune auxiliaire dans la savane sèche de Richard-Toll (région de Saint-Louis, département de Dagana), Sénégal (Août-Novembre 1991). Locustox report 98/3. FAO, Locustox Project, Dakar, Senegal.	fenitrothion, diflubenzuron
Ostermann H	1997	Aspects écotoxicologiques des dérégulateurs de croissance (IGR): comparaison des effets de l'Alsystin (triflumuron) et d'un insecticide organophosphoré sur les arthropodes non-cibles. pp 267-290 In: Scherer R & Fong Hong L (eds) Symposium sur la lutte antiacridienne à Madagascar. DPV/GTZ, Antananarivo, Madagascar	triflumuron, ...
Ottesen P	1987	The mortality of <i>Oedaleus senegalensis</i> (Orthoptera) and other invertebrates in Mali using reduced dosages of fenitrothion. University of Oslo. Institute of Biology. Oslo, Norway. (for Royal Norwegian Ministry of Foreign Affairs)	fenitrothion
Ottesen P, Fosslund S, Johannessen B & Simonson JH	1989	Reduced dosages of fenitrothion: the effect on <i>Oedaleus senegalensis</i> (Orthoptera) and non-target arthropods in Mali, West-Africa. University of Oslo, Division of Zoology. Oslo, Norway.	fenitrothion
Ottesen P & Sømme L	1987	Environmental effects of insecticides against locusts and grasshoppers. Report to the Royal Norwegian Ministry of Development Cooperation, on studies in Mali and Eritrea.	
Ottesen P & Sømme L	1990	The impact of three pesticides, fenitrothion, lambda-cyhalothrin and teflubenzuron on grasshoppers and non-target organisms in Mali, West Africa. Report to the Royal Norwegian Ministry of Foreign Affairs.	fenitrothion, lambda-cyhalothrin, teflubenzuron
Peveling R & Weyrich J	1992	Effects of neem oil, <i>Beauveria bassiana</i> and dieldrin on the non-target tenebrionid beetles in the desert zone of the Republic of Niger. pp 321-336 In: Lomer CJ & Prior C (eds) Biological control of locusts and grasshoppers. Proceedings of a workshop held at the International Institute of Tropical Agriculture, Cotonou, Republic of Benin, 29 April - 1 May 199. CAB International, Wallingford, UK.	neem, <i>Beauveria bassiana</i> , dieldrin
Peveling R, Weyrich J & Müller P	1994	Side-effects of botanicals, insect growth regulators and entomopathogenic fungi on epigeal non-target arthropods in locust control. pp 147-176 In: Krall S & Wilps H (eds) New trends in locust control. Schriftenreihe der GTZ no. 245. TZ-Verlag, Rossdorf, Germany.	Neem oil, <i>Melia</i> extracts, fenoxycarb, teflubenzuron, <i>Beauveria bassiana</i> , dieldrin, profenofos+cypermethrin

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Author(s)	Year	Title; source	Insecticide(s)
Peveling R & Sy AD	1997	Bioassays with <i>Pharoscyrnus anchorago</i> (Coleoptera: Coccinellidae), a natural enemy of scale insects in date palms in Mauritania. pp 60-62 <i>In: Haskell PT & McEwen PK (eds) New studies in ecotoxicology. The Welsh Pest Management Forum, Lakeside Publishing Ltd., Cardiff, UK</i>	<i>Metarhizium flavoviride</i> , <i>Melia volkensis</i> , diflubenzuron, fenitrothion+esfenvalerate
Peveling R & Sy AD	1997	Virulence of the entomopathogenic fungus <i>Metarhizium flavoviride</i> Gams and Rozsypal and toxicity of diflubenzuron, fenitrothion-esfenvalerate and profenofos-cypermethrin to nontarget arthropods in Mauritania. <i>Archives of Environmental Contamination and Toxicology</i> 32(1) : 69-79	<i>Metarhizium flavoviride</i> , diflubenzuron, fenitrothion+esfenvalerate, profenofos+cypermethrin
Peveling R, Hartl J & Köhne E	1997	Side-effects of the insect growth regulator triflumuron on spiders. pp 345-359 <i>In: Krall S, Peveling R & Ba Diallo D (eds) New strategies in locust control. Birkhäuser Verlag, Basel, Switzerland.</i>	triflumuron
Peveling R, Ostermann H, Razafinirina R, Tovonkery R & Zafimaniry G	1997	The impact of locust control agents on springtails in Madagascar. pp 56-59 <i>In: Haskell PT & McEwen PK (eds) New studies in ecotoxicology. The Welsh Pest Management Forum, Lakeside Publishing Ltd., Cardiff, UK.</i>	fenitrothion, fenitrothion+esfenvalerate, triflumuron
Peveling R, Attignon S, Langewald J & Ouambama Z	1999	An assessment of the impact of biological and chemical grasshopper control agents on ground-dwelling arthropods in Niger, based on presence/absence sampling. <i>Crop Protection</i> 18 : 323-339	<i>Metarhizium anisoplia</i> , fenitrothion
Peveling R, Rafanomezantsoa J-J, Razafinirina R, Tovonkery R & Zafimaniry G	1999	Environmental impact of the locust control agents fenitrothion, fenitrothion-esfenvalerate and triflumuron on terrestrial arthropods in Madagascar. <i>Crop Protection</i> 18 : 659-676	fenitrothion, fenitrothion+esfenvalerate, triflumuron
Quinn MA, Kepner RL, Walgenbach DD <i>et al.</i>	1991	Effect of habitat characteristics and perturbation from insecticides on the community dynamics of ground beetles (Coleoptera: Carabidae) on mixed-grass rangeland. <i>Environmental Entomology</i> 20(5) :1285-1294	
Rafanomezana S	2001	Impacts du fipronil 4 sur les termites de la région d'Ambovoza. pp. 325-339 <i>In : Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.</i>	fipronil
Rafanomezana S	2001	Effet à court terme des acridicides fipronil, decis et confidor sur les termites. pp. 341-350 <i>In: Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.</i>	fipronil, deltaméthrin, imidachloprid
Rafanomezana S & Rafanomezantsoa J-J	2001	Impacts du fipronil et de l'alsystin sur les arthropodes non cibles dans la région d'Ankazoabo. pp. 209-242 <i>In: Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.</i>	fipronil, triflumuron
Rafanomezantsoa J-J	2001	Impact à court terme de trois acridicides sur les arthropodes. pp. 373-450 <i>In: Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.</i>	fipronil, deltaméthrin, imidachloprid
Raveloson A	2001	Les effets de trois insecticides (fipronil, deltaméthrine, imidachloprid) sur les arthropodes non cibles épigés. pp. 427-450 <i>In: Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.</i>	fipronil, deltaméthrin, imidachloprid

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Author(s)	Year	Title; source	Insecticide(s)
Raveloson A	2001	Evaluation de l'effet à court et moyen termes du triflumuron et du fipronil sur les insectes volants non cibles: cas des Hyménoptères. pp. 281-298 <i>In: Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.</i>	fipronil, triflumuron
Saffer N, Hanrahan SA and Brown HD	1997	Impact of deltamethrin on the parasitic fly, <i>Wohlfahrtia pachytyli</i> . pp 389-390 <i>In: Krall S, Peveling R & Ba Diallo D (eds) New strategies in locust control. Birkhäuser Verlag, Basel, Switzerland.</i>	deltamethrin
Sarr I	1997	Détermination de l'impact potentiel des pesticides sur <i>Heliocheilus albipunctella</i> (mineuse de l'épi de mil) à partir d'une méthode indirecte: l'étude de la table de survie. Locustox report 97/4. FAO, Projet Locustox, Dakar, Senegal.	---
Sokolov IM	2000	How does insecticidal control of grasshoppers affect non-target arthropods? pp. 181-192 <i>In: Lockwood JA, Latchininsky AV & Sergeev MG (eds) Grasshoppers and grassland health –Managing grasshopper outbreaks without risking environmental disaster. (NATO Science Series, Series 2 - Environmental Security - Vol. 73.). Kluwer Academic Publishers, Dordrecht/Boston/London</i>	
Thiam A. & Van der Valk H	1996	Impact potentiel des insecticides sur la mortalité naturelle de la chenille mineuse de l'épi de mil (<i>Heliocheilus albipunctella</i>) : une étude de la table de survie. Locustox report 96/2. FAO, Projet Locustox, Senegal.	---
Tingle CCD	1993	Preliminary studies of the environmental impact of Dimilin used as a barrier spray against locusts. Technical report, NRI, Chatham, UK	diflubenzuron
Tingle CCD	1996	Sprayed barriers of diflubenzuron for control of the migratory locust (<i>Locusta migratoria capito</i> (Sauss.)) [Orthoptera, Acrididae] in Madagascar: short term impact on relative abundance of terrestrial non-target invertebrates. <i>Crop Protection</i> 15(6) : 579-592	diflubenzuron
Tingle CCD, Raholijaona, Rollandson T, Gilberte Z & Romule R	1997	Diflubenzuron and locust control in south-western Madagascar: relative abundance of non-target invertebrates following barrier treatment. pp 385-387 <i>In: Krall S, Peveling R & Ba Diallo D (eds) New strategies in locust control. Birkhäuser Verlag, Basel, Switzerland.</i>	diflubenzuron
Tingle CCD	1997	Aspects écotoxicologiques des dérégulateurs de croissance (IGR): Résultats préliminaires des traitements en barrières avec du Dimilin (diflubenzuron) sur les invertébrés non-cibles. pp 291-311 <i>In Scherer R & Lié Fong Hong (eds) Symposium sur la lutte antiacridienne à Madagascar. Février 1995, Tulear, Madagascar. Projet DPV-GTZ Promotion de la Protection intégrée des Cultures et des Denrées Stockées, Antananarivo, Madagascar.</i>	diflubenzuron
Tingle CCD	1997	Barrier sprays with diflubenzuron for locust control in Madagascar: Beneficial for beneficials? pp 88-92 <i>In Haskell PT & McEwen PK (Eds) New studies in ecotoxicology. Papers resulting from posters given at the Welsh Pest Management Forum conference: Ecotoxicology: Pesticides and beneficial organisms. Welsh Pest Management Forum, Cardiff.</i>	diflubenzuron

5. Terrestrial ecotoxicology - invertebrates

Author(s)	Year	Title; source	Insecticide(s)
Tingle CCD	1997	Spiders in the web of ecotoxicological impacts of IGR barrier spraying for locust control. pp 84-87 <i>In</i> Haskell PT & McEwen PK (Eds) New studies in ecotoxicology. Papers resulting from posters given at the Welsh Pest Management Forum conference: Ecotoxicology: Pesticides and beneficial organisms. Welsh Pest Management Forum, Cardiff.	diflubenzuron
Tingle CCD & Rahamefiarisoa LH	2001	Evaluation de l'effet à court terme du Triflumuron et du Fipronil sur les insectes volants non cibles de la lutte antiacridienne: cas des Diptères. pp. 299-313 <i>In</i> : Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.	triflumuron, fipronil
Tingle CCD	<i>in prep.</i>	Sprayed barriers of diflubenzuron for control of the migratory locust (<i>Locusta migratoria capito</i> (Sauss.)) [Orthoptera: Acrididae] in Madagascar: II Further examination of short-term effects at species level on non-target terrestrial invertebrates. Agriculture, Ecosystems and Environment.	diflubenzuron
Tingle CCD	<i>in prep.</i>	Sprayed barriers of diflubenzuron for control of the migratory locust (<i>Locusta migratoria capito</i> (Sauss.)) [Orthoptera: Acrididae] in Madagascar: III Longer-term effects on relative abundance of terrestrial non-target invertebrates. Agriculture, Ecosystems and Environment.	diflubenzuron
Tingle CCD, Dobson H, Cooper J & Warburton H	<i>in prep.</i>	Locust control in the future: lessons from migratory locust control in Madagascar for the role of insect growth regulators (IGRs) as barrier sprays. Ambio.	
van der Valk H & Kamara O	1993	The effect of fenitrothion and diflubenzuron on natural enemies of millet pests in Senegal. Locustox report 93/2. FAO, Locustox Project, Dakar, Senegal.	fenitrothion, diflubenzuron
van der Valk H, van der Stoep J, Fall B & Diémé E	1994	A laboratory toxicity test with <i>Bracon hebetor</i> (SAY) (Hymenoptera, Braconidae). First evaluation of rearing and testing methods. Locustox report 94/1. FAO, Locustox Project, Dakar, Senegal.	fenitrothion
van der Valk H, Diakhaté H & Seck A	1996	Toxicity tests with locust control insecticides on <i>Pimelia senegalensis</i> and <i>Trachyderma hispida</i> (Coleoptera: Tenebrionidae). Locustox report 96/6. FAO, Projet Locustox, Dakar, Senegal.	bendiocarb, chlorpyrifos, deltamethrin, fenitrothion, fipronil, malathion
van der Valk H & Diakhaté H	1997	Further toxicity tests with locust control insecticides on <i>Pimelia senegalensis</i> and <i>Trachyderma hispida</i> (Coleoptera, Tenebrionidae). Locustox report 97/16. FAO, Locustox Project, Dakar, Senegal.	bendiocarb, chlorpyrifos, deltamethrin, fipronil, lambda-cyhalothrin, malathion
van der Valk H & Kamara O	1997	Side-effects of chlorpyrifos and deltamethrin in a Sahelian millet agro-ecosystem. Locustox report 96/16. FAO, Locustox Project, Dakar, Senegal.	chlorpyrifos, deltamethrin
van der Valk H & Niassy A	1997	Side-effects of locust control on beneficial arthropods: research approaches used by the Locustox project in Senegal. pp 337-344 <i>In</i> : Krall S, Peveling R & Ba Diallo D (eds) New strategies in locust control. Birkhäuser Verlag, Basel, Switzerland.	
van der Valk H, Niassy A & Danfa A	1997	The impact of locust control insecticides on termites and ants in the arid zone of northern Senegal: A first assessment. Locustox report 97/14. FAO, Locustox Project, Dakar, Senegal.	bendiocarb, fenitrothion, diflubenzuron
van der Valk H	1998	The impact of locust and grasshopper control on beneficial arthropods in West-Africa. pp 372-380 <i>In</i> : Haskell P & McEwen P (eds) Ecotoxicology: pesticides and beneficial arthropods. Chapman and Hall, London.	fenitrothion, chlorpyrifos, deltamethrin.

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Author(s)	Year	Title; source	Insecticide(s)
van der Valk HCHG, Niassy A, & Beye AB	1999	Does grasshopper control create grasshopper problems? - Monitoring side-effects of fenitrothion applications in the western Sahel. <i>Crop Protection</i> 18 : 139-149	fenitrothion
Walker PW, Carruthers GF & Hooper GHS	2000	Impact of aerially applied fenitrothion on the coleopteran fauna of arid grasslands of inland Australia. pp. 61-73 <i>In</i> : APLC Research Reports 2000. October 2000. Australian Plague Locust Commission, Canberra.	fenitrothion

6. Terrestrial ecotoxicology - vertebrates

Author(s)	Year	Title; source	Insecticide(s)
Astheimer LB, Fildes KJ, Story PG, Szabo J., Hooper MJ & Buttemer WA	<i>in press</i>	The locust-eaters: a transient avian community at risk from pesticides. <i>Australian Journal of Ecology</i>	
Buttemer WA, Story PG, Astheimer L & Fildes K	2002	Functional performance: evaluating sublethal effects of organophosphate exposure in vertebrates. Society of Environmental Toxicology and Chemistry Conference, November 2002. Salt Lake City, USA.	
Buttemer WA, Story PG, Fildes KJ, Baudinette RV & Astheimer LB	<i>in press</i>	Fenitrothion affects exercise endurance but not aerobic capacity in the fat-tailed dunnart (<i>Sminthopsis crassicaudata</i>). <i>Environmental Toxicology and Chemistry</i>	fenitrothion
Lambert MRK	1996	Assessing the potential of lizards as bioindicators to monitor the environmental impact of pesticides in Mauritania and Senegal. NRI unpublished report to FAO project GCP/SEN/041/NET (Locustox). Chatham, UK	
Mullié WC & Keith JO	1993	Locusticide impact on birds in northern Senegal. <i>Proc. VIII Pan-Afr. Orn. Congr.</i> 617-620.	fenitrothion, chlorpyrifos
Mullié WC & Keith JO	1993	The effects of aerially applied fenitrothion and chlorpyrifos on birds in the savannah of northern Senegal. <i>Journal of Applied Ecology</i> 30 : 536-550.	fenitrothion, chlorpyrifos
Mullié WC & Touré A	2000	A validated field method for monitoring erythrocyte acetylcholinesterase inhibition in livestock after exposure to organophosphate and carbamate insecticides. <i>Etudes et Recherches Sahéliennes / Sahelian Studies and Research</i> 4-5 : 50-61	---
Peveling R & Demba SA	2003	Toxicity and pathogenicity of <i>Metarhizium anisopliae</i> var. <i>acridum</i> (<i>Deuteromycotina, Hyphomycetes</i>) and fipronil to the fringe-toed lizard <i>Acanthodactylus dumerili</i> (Squamata: Lacertidae). <i>Environmental Toxicology and Chemistry</i> 22(7) : 1437-1447	fipronil, <i>Metarhizium anisopliae</i>
Peveling, R & Rafanomezantsoa, J	2001	Les effets du Fénitrothion-Esfenvalerate et du Triflumuron sur le lézard <i>Chalaradon madagascariensis</i> Peters (Squamata: Iguanidae). pp. 489-496 <i>In</i> : Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.	fénitrothion-esfenvalerate, triflumuron
Raivoarinjanahary, H	2001	Evaluation de l'impact de deux acridicides, Triflumuron et Fipronil 7,5 utilisés en traitement en barrières, sur l'avifaune. pp. 183-207 <i>In</i> : Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.	fipronil, triflumuron
Rakotondramasy, H	2001	Evaluation comparative des effets à court terme de trois acridicides: Fipronil (Adonis 4®), Deltaméthrine (Décis 17,5®) et Imidacloprid (Confidor 10®) sur les micromammifères dans la région d'Ankazoabo. pp. 351-363 <i>In</i> : Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.	deltamethrin, fipronil, imidacloprid
Rakotondramasy, H	2001	Evaluation comparative des effets à court terme de trois acridicides: Fipronil (Adonis 4®), Deltaméthrine (Décis 17,5®) et Imidacloprid (Confidor 10®) sur les reptiles dans la région d'Ankazoabo. pp. 365-372 <i>In</i> : Zehrer W (ed). La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.	deltamethrin, fipronil, imidacloprid

6. Terrestrial ecotoxicology - vertebrates

Author(s)	Year	Title; source	Insecticide(s)
Rakotondravelo, ML	2001	Etude d'impact de l'application du et Fipronil 7,5 ULV sur le tenrec <i>Echinops telfairi</i> (Martin, 1838) dans le sud de Madagascar. pp. 243-259 <i>In: Zehrer W (ed). La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.</i>	fipronil
Randimbison, AL	2001	Effets du Triflumuron et du Fipronil sur les reptiles à Madagascar. pp. 261-280 <i>In: Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.</i>	fipronil, triflumuron
Touré A, Bâ A & Sambou N	1999	Détermination de l'activité cholinestérasique érythrocytaire de base des principales espèces animales du Sénégal – application au diagnostic des intoxications par les pesticides organophosphorés et carbamates. Locustox report 98/4. FAO, Locustox Project, Dakar, Senegal.	
Touré A, Mullié WC & Ba A	1997	Etude de la toxicité orale du chlorpyrifos sur le mouton peulh du Sénégal. Locustox report 97/18. FAO, Locustox Project, Dakar, Senegal.	chlorpyrifos
Touré A, Mullié WC & Ba A	1998	Etude de la toxicité par ingestion du chlorpyrifos et du fénitrothion sur la chèvre du Sahel. Locustox report 98/1. FAO, Locustox Project, Dakar, Senegal.	chlorpyrifos, fenitrothion
Touré A, Mullié WC & Ba A	1998	Etude sur pâturages naturels de la toxicité orale et cutanée du chlorpyrifos chez le mouton peulh du Sénégal. Locustox report 98/2. FAO, Locustox Project, Dakar, Senegal.	chlorpyrifos
Touré A, Mullié WC & Ba A	2000	Etude préliminaire de la toxicité par administration orale du chlorpyrifos et du fénitrothion chez le chèvre du Sahel. <i>Etudes et Recherches Sahéliennes / Sahelian Studies and Research</i> 4-5: 63-71	chlorpyrifos, fenitrothion
Story P & Cox M	2001	Review of the effects of organophosphorous and carbamate insecticides on vertebrates. Are there implications for locust management in Australia? <i>Wildlife Research</i> 28: 179-193	various

7. Human/occupational toxicology

Author(s)	Year	Title; source	Insecticide(s)
Dossou N & Mullié WC	1997	Exposition individuelle aux organophosphorés chez les manipulateurs de pesticides dans quatre régions du Sénégal, 1988-1995. Etude retrospective des effets à long terme des pesticides chez les manipulateurs de la Direction de la Protection des Végétaux du Sénégal, Phase I. Locustox report 97/13. FAO, Projet Locustox, Dakar, Senegal	various
Mullié WC, Andreasen J, Abiola FA, Diatta F & van der Valk H	1997	Blood cholinesterase levels in crop protection workers after routine spraying operations with organophosphate insecticides in Senegal. Locustox report 97/11. FAO, Locustox Project, Dakar, Senegal	various (mainly fenitrothion)
Mullié WC	1997	Aide mémoire pour les médecins et les infirmiers impliqués dans le suivi des manipulateurs des pesticides inhibiteurs de cholinestérase. FAO, Projet Locustox, Dakar.	
Mullié WC	1997	Le suivi sanitaire des manipulateurs d' insecticides inhibiteurs cholinestérasiques en République Islamique de Mauritanie. FAO, Projet Locustox, Dakar.	

8. Operational monitoring of locust control operations

Author(s)	Year	Title; source	Insecticide(s)
Dobson H	1998	Technical report on consultancy to provide training and advice on improved monitoring and quality control of locust spraying operations in Madagascar. Unpublished report. Natural Resources Institute, Chatham, UK.	
Grant IF	1999	Environmental Assessment of emergency locust control in Madagascar: Terms of Reference. Chatham, UK. Natural Resources Institute unpublished report.	
Lahr J	1993	Rapport de mission à Podor du 5 au 10 décembre 1993. Résumé des activités et résultats préliminaires. FAO, Projet Locustox, Dakar, Senegal.	
McWilliam AN	1996	Development of environmental monitoring protocols and strategies to reduce environmental impact of pest control measures for <i>Quelea</i> , armyworm and red locust in Central and Southern Africa. <i>In: Development of monitoring, reporting and forecasting strategies for armyworm and Quelea in Central and Southern Africa with integral environmental impact assessment of pesticides used to control migratory pests.</i> Unpublished report. Natural Resources Institute, Chatham, UK.	fenitrothion, fenthion
Tingle CCD	1999	Recommendations to FAO based on evaluation of the environmental impact of emergency locust control in Madagascar. Unpublished Report, NRI, Chatham, UK.	
Tingle CCD, McWilliam AN, Zehrer W, Rafanomezana S & Rafanomezantsoa J-J	2001	Mise en place d'un programme pour faire un suivi écotoxicologique d'une opération de lutte antiacridienne par traitement en barrières à grande échelle. pp. 61-100 <i>In: Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie.</i> GTZ, Antananarivo, Madagascar.	general (fipronil, triflumuron)
Tingle CCD & McWilliam AN	2001	Evaluation et quantification de l'espacement des barrières d'insecticide pendant une opération de lutte antiacridienne d'urgence. pp. 101-113 <i>In: Zehrer W (ed) La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie.</i> GTZ, Antananarivo, Madagascar.	fipronil, triflumuron
van der Valk H, Gadji B, Bà AL, Diallo AO, Danfa A, NDiaye MD & Everts JW	1996	Suivi environnemental des traitements antiacridiens en Mauritanie, 1994/1995. Locustox report 96/3. FAO, Projet Locustox, Dakar, Senegal.	

9. Environmental impact of biological control

Author(s)	Year	Title; source	Agent(s)
Attignon SE & Peveling R	1996	(1996) Effet de <i>Metarhizium flavoviride</i> (Deuteromycotina: Hyphomycetes) sur <i>Neoseiulus idaeus</i> Denmark & Muma (Acari: Phytoseiidae). LUBILOSA Internal Project Report.	<i>Metarhizium flavoviride</i> *
Attignon SE	1997	Effet du champignon entomopathogène <i>Metarhizium flavoviride</i> Gams & Roszypal sur les insectes non-cibles - cas de <i>Epidinocarsis lopezi</i> et <i>Clavigralla tomentosicollis</i> . LUBILOSA Internal Project Report.	<i>Metarhizium flavoviride</i>
Bomar CR, Lockwood JA, Pomerinke MA & French JD	1993	A multi-year evaluation of the effects of <i>Nosema locustae</i> (Microsporidia: Nosematidae) on rangeland grasshopper (Orthoptera: Acrididae) population density, fecundity, and natural biological controls. <i>Environmental Entomology</i> 22 : 489-497	<i>Nosema locustae</i>
Danfa A & van der Valk HCHG	1999	Laboratory testing of <i>Metarhizium</i> spp. and <i>Beauveria bassiana</i> on Sahelian non-target arthropods. <i>Biocontrol Science and Technology</i> 9 : 187-198	<i>Metarhizium</i> spp., <i>Beauveria bassiana</i>
Goettel MS & Johnson DL	1992	Environmental impact and safety of fungal biocontrol agents. pp 356-361 In: Lomer CJ & Prior C (eds) Biological control of locusts and grasshoppers. Proceedings of a workshop held at the International Institute of Tropical Agriculture, Cotonou, Republic of Benin, 29 April - 1 May 199. CAB International, Wallingford, UK.	
Ivie MA, Pollock DA, Gustafson DL, Rasolomandimby J, Ivie LL, Swearingen WD	2002	Field-based evaluation of biopesticide impacts on native biodiversity: Malagasy Coleoptera and anti-locust entomopathogenic fungi. <i>Journal of Economic Entomology</i> 95 (4): 651-660	<i>Metarhizium flavoviride</i> , <i>Beauveria bassiana</i> , fenitrothion + esfenvalerate,
Lahr J, Gadji B & Dia D	1997	Estimation of buffer zones for the protection of temporary ponds against contamination by drift from ground-based insecticide applications against Desert Locusts. Locustox report 97/6. FAO, Locustox Project, Dakar, Senegal.	<i>Metarhizium anisopliae</i> var. <i>acridum</i> [and various chemical pesticides]
Lahr J, Gadji B & Dia D	2000	Predicted buffer zones to protect temporary pond invertebrates from ground-based insecticide applications against desert locusts. <i>Crop Protection</i> 19 : 489-500	<i>Metarhizium anisopliae</i> var. <i>acridum</i> [and various chemical pesticides]
Lahr J, Badji A, Marquenie S, Schuiling E, Ndour KB, Diallo AO & Everts JW	2001	Acute toxicity of locust insecticides to two indigenous invertebrates from Sahelian temporary ponds. <i>Ecotoxicology and Environmental Safety</i> 48 : 66-75	<i>Metarhizium anisopliae</i> var. <i>acridum</i> [and various chemical pesticides]
Langewald J, Stolz I, Everts J. & peveling R	2003	Towards the registration of microbial insecticides in Africa: Non target arthropod testing on Green Muscle(tm), a grasshopper and locust control product based on the fungus <i>Metarhizium anisopliae</i> var. <i>acridum</i> . pp 207-225 In: Neuenschwander P, Borgemeister C, Langewald J (eds) <i>Biological Control in Integrated Pest Management Systems in Africa</i> . CABI Publishing, Wallingford, UK.	<i>Metarhizium anisopliae</i> var. <i>acridum</i>
Marquenie S, Schuiling E, Badji A & Lahr J	1997	Acute toxicity of five insecticides used in Desert Locust control to <i>Streptocephalus sudanicus</i> (Branchiopoda , Anostraca) and <i>Anisops sardeus</i> (Hemiptera , Notonectidae). Locustox report 97/1. FAO, Locustox Project, Dakar, Senegal.	<i>Metarhizium flavoviride</i> [and various chemical pesticides]

9. Environmental impact of biological control

Author(s)	Year	Title; source	Agent(s)
Milner RJ, Lim RP & Hunter DM	2002	Risks to the aquatic ecosystem from the application of <i>Metarhizium anisopliae</i> for locust control in Australia	<i>Metarhizium anisopliae</i>
Peveling R & Weyrich J	1992	Effects of neem oil, <i>Beauveria bassiana</i> and dieldrin on the non-target tenebrionid beetles in the desert zone of the Republic of Niger. pp 321-336 In: Lomer CJ & Prior C (eds) Biological control of locusts and grasshoppers. Proceedings of a workshop held at the International Institute of Tropical Agriculture, Cotonou, Republic of Benin, 29 April - 1 May 199. CAB International, Wallingford, UK.	neem, <i>Beauveria bassiana</i> [and a chemical pesticide]
Peveling R, Weyrich J & Müller P	1994	Side-effects of botanicals, insect growth regulators and entomopathogenic fungi on epigeal non-target arthropods in locust control. pp 147-176 In: Krall S & Wilps H (eds) New trends in locust control. Schriftenreihe der GTZ no. 245. TZ-Verlag, Rossdorf, Germany.	Neem oil, <i>Melia</i> extracts, <i>Beauveria bassiana</i> [and various chemical pesticides]
Peveling R & Sy AD	1997	Bioassays with <i>Pharoscyrnus anchorago</i> (Coleoptera: Coccinellidae), a natural enemy of scale insects in date palms in Mauritania. pp 60-62 In: Haskell PT & McEwen PK (eds) New studies in ecotoxicology. The Welsh Pest Management Forum, Lakeside Publishing Ltd., Cardiff, UK	<i>Metarhizium flavoviride</i> , <i>Melia volkensis</i> [and various chemical pesticides]
Peveling R & Sy AD	1997	Virulence of the entomopathogenic fungus <i>Metarhizium flavoviride</i> Gams and Rozsypal and toxicity of diflubenzuron, fenitrothion-esfenvalerate and profenofos-cypermethrin to nontarget arthropods in Mauritania. Archives of Environmental Contamination and Toxicology 32(1): 69-79	<i>Metarhizium flavoviride</i> , [and various chemical pesticides]
Peveling R & Sy AD	draft	Effect of <i>Metarhizium flavoviride</i> (IMI 330 189) on <i>Chilocorus bipustulatus</i> L. var. <i>iranensis</i> (Coleoptera: Coccinellidae), a predator of scale insects in Mauritania. LUBILOSA Biotests in Akjoujt, Mauritania, January to March 1997.	<i>Metarhizium flavoviride</i>
Peveling R & Ould Ely S	1997?	Effet de <i>Melia volkensis</i> sur <i>Chilochorus bipustulatus</i> var. <i>iranensis</i> et <i>Pharoscyrnus anchorago</i> F. (Coleoptera: Coccinellidae). Résultats préliminaires. Rapport GTZ	<i>Melia volkensis</i>
Peveling R, Attignon S, Langewald J & Ouambama Z	1999	An assessment of the impact of biological and chemical grasshopper control agents on ground-dwelling arthropods in Niger, based on presence/absence sampling. <i>Crop Protection</i> 18: 323-339	<i>Metarhizium anisopliae</i> , [and a chemical pesticide]
Peveling R & Demba SA	2003	Toxicity and pathogenicity of <i>Metarhizium anisopliae</i> var. <i>acridum</i> (<i>Deuteromycotina</i> , <i>Hyphomycetes</i>) and fipronil to the fringe-toed lizard <i>Acanthodactylus dumerili</i> (Squamata: Lacertidae). <i>Environmental Toxicology and Chemistry</i> 22(7): 1437-1447	<i>Metarhizium anisopliae</i> [and a chemical pesticide]
Prior, C	1997	Susceptibility of target acridoids and non-target organisms to <i>Metarhizium anisopliae</i> and <i>M. flavoviride</i> . pp 369-375 In: Krall S, Peveling R & Ba Diallo D (eds) New strategies in locust control. Birkhäuser Verlag, Basel, Switzerland.	<i>Metarhizium</i> spp.
Razafindratiana, E	2001	Impact des souches de champignons entomopathogènes isolés du criquet migrateur malgache sur les mammifères, les insectes utiles et la biodiversité. pp. 451-464 In: Zehrer W (ed). La Lutte Antiacridienne à Madagascar. Tome III: Ecotoxicologie. GTZ, Antananarivo, Madagascar.	<i>Metarhizium anisopliae</i> , <i>M. flavoviride</i> , <i>Beauveria bassiana</i>
Seye Y	1994	Toxicité des pesticides antiacridiens sur les invertébrés aquatiques: cas du fénitrothion, du malathion et du <i>Metarhizium flavoviride</i> . Rapport de stage, DFPV, Niamey, Niger. (Student report).	<i>Metarhizium flavoviride</i> [and various chemical pesticides]

9. Environmental impact of biological control

Author(s)	Year	Title; source	Agent(s)
Stolz I	1996	Die Wirkung des zur Heuschreckenbekämpfung eingesetzten Pilzes <i>Metarhizium flavoviride</i> Gams & Roszypal (Deuteromycotina: Moniliales) auf den Parasitoiden <i>Apoanagyrus (Epidinocarsis) lopezi</i> De Santis (Hymenoptera: Encyrtidae). <i>MSc thesis (Magister scientiarum agrarium)</i> , Universität Göttingen, Germany.	<i>Metarhizium flavoviride</i>
Stolz I	1996	The effect of <i>Metarhizium flavoviride</i> on the non-target species <i>Epidinocarsis lopezi</i> (Hymenoptera: Encyrtidae). English summary of the above cited thesis	<i>Metarhizium flavoviride</i>
Stolz I	1997	The effect of the fungus <i>Metarhizium flavoviride</i> Gams & Roszypal (Deuteromycotina: Moniliales) on the non-target species <i>Apoanagyrus (Epidinocarsis) lopezi</i> (Hymenoptera: Encyrtidae). LUBILOSA Internal Project Report.	<i>Metarhizium flavoviride</i>
Stolz I, Nagel P, Lomer C & Peveling R	2002	Susceptibility of the Hymenopteran parasitoids <i>Apoanagyrus (=Epidinocarsis) lopezi</i> (Encyrtidae) and <i>Phanerotoma</i> sp. (Braconidae) to the entomopathogenic fungus <i>Metarhizium anisopliae</i> var. <i>acridum</i> (Deuteromycotina: Hyphomycetes). <i>Biocontrol Science and Technology</i> 12 : 349-360	<i>Metarhizium anisopliae</i>
Tabel J	1994	Auswirkungen des Entomopathogens <i>Metarhizium flavoviride</i> 189 auf Non-targets bei der biologisch-integrierten Heuschreckenbekämpfung in Akjoujt, Mauretanien. Diplomarbeit, Universität Saarbrücken, Germany. (<i>student thesis</i>)	<i>Metarhizium flavoviride</i>

* Note: the nomenclature of certain *Metarhizium* species/strains has changed over the last few years; the names are listed here as they are referred to in the respective publications.