

## Imidacloprid - Fate Studies

Aguera, A., E. Almansa, S. Malato, M.I. Maldonado, A.R. Fernandez-Alba. 1998. Evaluation of photocatalytic degradation of imidacloprid in industrial water by GC-MS and LC-MS. *Analisis* 26(7): 245-251.

Anderson, C. 1991. Photodegradation of NTN 33893 in water. Yuki Institute, Ibaraki, Japan. 128 pp. Miles Report No. 101956. (Reviewed in Mulye 1995)

Anderson, J.P.E. 1995. Mineralization of [imidazolidin-4,5-<sup>14</sup>C] NTN 33893 to <sup>14</sup>CO<sub>2</sub> in sterile and microbiologically active samples of 2 agricultural soils. Bayer AG, Leverkusen, Germany. 6 pp. Report No. 107300. (Reviewed in Mulye 1997a)

Armbrust, K.L. and H.B. Peeler. 2002. Effects of formulation on the run-off of imidacloprid from turf. *Pest Management Science*. 58:702-706.

Arora, P.K., G. Jyot, B. Singh, R.S. Battu, B. Singh, P.S. Aulakh. 2009. Persistence of imidacloprid on grape leaves, grape berries and soil. *Bull Environ Contam Toxicol*. 82(2):239-242.

Bacey, J. 2000. Environmental fate of imidacloprid. Environmental Monitoring and Pest Management Branch. Department of Pesticide Regulation, California.  
[www.cdpr.ca.gov/docs/empm/pubs/fatememo/imid.pdf](http://www.cdpr.ca.gov/docs/empm/pubs/fatememo/imid.pdf)

Bakker, F. and J. Calis. 2003. A semi-field approach to testing effects of fresh or aged pesticide residues on bees in multiple-rate test designs. *Bull Insectology* 56(1):97-102.

Baskaran, S., R.S. Kookana, and R. Naidu. 1997. Determination of the insecticide imidacloprid in water and soil using high-performance liquid chromatography. *Journal of Chromatography A* 787(1-2):271-275.

Bonmatin, J. M., I. Moineau, R. Charvet, C. Fleche, M. E. Colin, and E. R. Bengsch. 2003. A LC/APCI-MS/MS method for analysis of imidacloprid in soil, in plants, and in pollens. *Anal. Chem.* 75:2027–2033.

Bonmatin, J.M., P.A. Marchand, R. Charvet, I. Moineua, E.R. Bengsch, and M.E. Colin. 2005. Quantification of imidacloprid uptake in maize crops. *J. Agric. Food Chem.* 53: 5336–5341.

Brimble, S., P. Bacchus, and P.Y. Caux. 2005. Pesticide utilization in Canada: a compilation of current sales and use data. Environment Canada, Ottawa.

Byrtus, G., A. Anderson, K. Saffran, G. Bruns, and L. Checknita. 2002. Determination of new pesticides in Alberta's surface waters (1999-2000). The Water Research User Group, Alberta Environment.  
[http://www3.gov.ab.ca/env/water/reports/NewPesticidesInSurfaceWaters\\_1999\\_2000.pdf](http://www3.gov.ab.ca/env/water/reports/NewPesticidesInSurfaceWaters_1999_2000.pdf)

Capri, E., M.G. Camisa, F. Flores-Céspedes, C.R. Glass, E. Gonzalez-Pradas, and M. Trevisan. 2001. Imidacloprid and pyrimethanil soil sorption. *Agronomie* 21:57-64.

CCME (Canadian Council of Ministers of the Environment). 1991. Appendix IX - A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life. *In: Canadian Water Quality Guidelines*. Canadian Council of Resource and Environment Ministers, 1987. Prepared by the Task Force on Water Quality Guidelines. [Updated and reprinted with minor revisions and editorial changes in *Canadian Environmental Quality Guidelines*, Chapter 4, Canadian Council of Ministers of the Environment, 1999, Winnipeg].

CCME (Canadian Council of Ministers of the Environment). 1993. Appendix B-5b – Protocols for deriving water quality guidelines for the protection of agricultural water uses (October, 1993). *In: Canadian Water Quality Guidelines*, Canadian Council of Resource and Environment Ministers. 1987. Prepared by the Task Force on Water Quality Guidelines. [Updated and reprinted with minor revisions and editorial changes in *Canadian Environmental Quality Guidelines*, 1999, Canadian Council of Ministers of the Environment, Winnipeg.]

CEI (Cantox Environmental Inc.). 2003. Review on pesticide use research and monitoring activities in the maritime region (Nova Scotia, New Brunswick and Prince Edward Island). Marine Environmental Sciences Division, Department of Fisheries and Oceans.

Celis, R. and W.C. Koskinen. 1999. Characterization of pesticide desorption from soil by the isotopic exchange technique. *Soil Science America Journal* 63: 1659-1666.

Choo, H.Y., H.H. Kim, H.K. Kaya. 1998. Effects of selected chemical pesticides on *Agameris unka* (Nematoda: Mermithidae), a parasite of the brown plant hopper, *Nilaparvata lugens*. *Biocontrol Sci Technol* 8(3): 413-427.

Clark, T., E. Kaußmann, E. Römer, and G. Schepers. 1998. The fate of imidacloprid in tobacco smoke of cigarettes made from imidacloprid-treated tobacco. *Pestic. Sci.* 52: 119–125.

Claudianos, C. H. Ranson, R.M. Johnson, S. Biswas, M.A. Schuler, M.R. Berenbaum, R. Feyereisen, J.G. Oakeshott. 2006. A deficit of detoxification enzymes: pesticide sensitivity and environmental response in the honeybee. *Insect Mol Biol.* 15(5):615-636.

Cowles, R.S., M.E. Montgomery, CASJ Cheah. 2006. Activity and residues of imidacloprid applied to soil and tree trunks to control hemlock woolly adelgid (Hemiptera: Adelgidae) in forests. *J Econ Entomol* 99(4): 1258-1267.

Cox, L. 1997a. Changes in sorption of imidacloprid with incubation time. Bayer Corporation, Kansas City, Missouri. Report No. 107685. 28 pp. (Reviewed in Mulye 1997a)

Cox, L., W. Koskinen, and P.Yen. 1997b. Sorption-desorption of imidacloprid and its metabolites in soils. *J. Agric. Food Chem.* 45(4): 1468–1472.

Cox, L., W.C. Koskinen, and P.Y. Yen. 1997c. Sorption-desorption of imidacloprid and its metabolites in soils. *J. Agric. Food Chem.* 45(4):1468-1472.

Cox, L., W. Koskinen, and P. Yen. 1998a. Changes in sorption of imidacloprid with incubation time. *Soil Sci. Soc. Am. J.* 62(2): 342–347.

Cox, L., W. Koskinen, R. Celis, P. Yen, M. Hermosin, and J. Cornejo. 1998b. Sorption of imidacloprid on soil clay mineral and organic components. *Soil Sci. Soc. Am. J.* 62(4): 911–915.

Cox, L., W. Koskinen, and P. Yen. 1998c. Influence of soil properties on sorption-desorption of imidacloprid. *J. Environ. Sci. Health.* B33(2): 123–134.

Cox, L., W.C. Koskinen, and P.Y. Yen. 1998d. Influence of soil properties on sorption-desorption of imidacloprid. *J. Environ. Sci. Health* B33(2): 123-134.

Dikshit A.K., D.C. Pachauri, and T. Jindal. 2003. Maximum residue limit and risk assessment of betacyfluthrin and imidacloprid on tomato (*Lycopersicon esculentum* Mill). *Bulletin of Environmental Contamination and Toxicology.* 70:1143-1150.

Elbert, A., B. Becker, J. Hartwig, and C. Erdelen. 1991. Imidacloprid-a new systemic insecticide. *Pflanzenschutz-Nachr. Bayer* 44:113–136.

ENKON Environmental Limited. 2001. Survey of Pesticide Use in British Columbia : 1999.

Environment Canada. 2005. Toxicity testing using imidacloprid: inland silverside test report. Prepared by Stantec Inc. for the National Guidelines and Standards Office, Environment Canada. Ottawa.

Environment Canada. 2006 (Draft). Presence, levels and relative risks of priority pesticides in selected Canadian aquatic ecosystems. Summary of 2003-2005 surveillance results. Prepared by Cantox Environmental for the National Water Quality Monitoring Office, Environment Canada, Ottawa.

Environment Canada. 2006. BC Ministry of Environment, Lands and Parks. Surrey, British Columbia.

Felsot A.S. and Ruppert, J.R. 2002. Imidacloprid residues in Willapa Bay (Washington State) water and sediment following application for control of burrowing shrimp. *Journal of Agriculture and Food Chemistry.* 50(15):4417-4423.

Felsot, A.S., W. Cone, J. Yu, and J.R. Ruppert. 1998. Distribution of imidacloprid in soil following subsurface drip chemigation. *Bull. Environ. Contam. Toxicol.* 60:363–370.

Felsot, A.S., W. Cone, J. Yu, and J.R. Ruppert. 1998. Distribution of imidacloprid in soil following subsurface drip chemigation. *Bull. Environ. Contam. Toxicol.* 60:363-370.

Flores-Cespedes, F., E Gonzalez-Pradas, M. Fernandez-Perez, M. Villafranca-Sanchez, M. Socias-Viciano, and M.D. Urena-Amate. 2002. Effects of dissolved organic carbon on sorption and mobility of imidacloprid in soil. *J. Environ. Qual.* 31:880-888.

Flores-Céspedes, F., E. González-Pradas, M. Fernández-Pérez, M. Villafranca-Sánchez, M. Socías-Viciana, and M.D. Ureña-Amate. 2002. Effects of dissolved organic carbon on sorption and mobility of imidacloprid in soil. *J. Environ. Qual.* 31: 880–888.

Fritz, R. and A. Brauner. 1988. Leaching behaviour of NTN 33893 aged in soil. Miles Report No. 99635. Bayer AG, Leverkusen, Germany. 45 pp. (Reviewed in Mulye 1995)

Fritz, R., and E. Hellpointner. 1991. Degradation of pesticides under anaerobic conditions in the water/sediment system: imidacloprid. Miles Report No. 101346. Bayer AG, Leverkusen, Germany. 69 pp. (Reviewed in Mulye 1995)

Giroux, I. 2003. Contamination de l'eau souterraine par les pesticides et les nitrates dans les régions en culture de pommes de terre. Campagne d'échantillonnage de 1999-2000-2001. Direction de suivi de l'état de l'environnement, Ministère de l'Environnement, Gouvernement du Québec, Québec. [www.mddep.gouv.qc.ca/pesticides/pomme\\_terre/Pesticides\\_pomme\\_terre.pdf](http://www.mddep.gouv.qc.ca/pesticides/pomme_terre/Pesticides_pomme_terre.pdf)

Goring, C.A.I., D.A. Laskowski, J.H. Hamaker, and R.W. Meikle. 1975. Principles of pesticide degradation in soil. *In*: Haque, R. and V.H. Freed, eds. *Environmental dynamics of pesticides*. pp 135 – 172. Plenum Press, New York. (Cited in Mulye 1995)

Guay, I. 1998. Recommandation de critères de qualité de l'eau pour l'imidacloprid pour la protection de la vie aquatique. Direction du suivi de l'état de l'environnement, Service des avis et des expertises, Ministère de l'Environnement du Québec, Québec.

Gupta, S., V.T. Gajbhiye, and N.P. Agnihotri. 2002. Leaching behavior of imidacloprid formulations in soil. *Bull. Environ. Contam. Toxicol.* 68: 502–508.

Heim, D., Z. Yan, and P.P. Halarnkar. 1996. Anaerobic aquatic biotransformation of [pyridinyl-<sup>14</sup>C-methyl] imidacloprid at 5°C. Bayer Corporation, Kansas City, Missouri. Report No. 107546. 138 pp.

Heimbach and Hendel. 2001. Unpublished study. Bayer CropScience AG, Monheim am Rhein, Germany. (Cited in Krohn and Hellpointner 2002)

Henneböle, J. 1998. Aerobic metabolism of imidacloprid, <sup>14</sup>C-NTN 33893, in an aquatic model ecosystem under xenon light and sunlight conditions. Bayer AG, Institute for Metabolism Research and Residue Analysis, Leverkusen-Bayerwerk, Germany. Report No. PF 4337.

Júnior, R.P.S., J.H. Smelt, J.J.T.I. Boesten, R.F.A. Hendriks, and S.E.A.T.M. van der Zee. 2004. Preferential flow of bromide, bentazon, and imidacloprid in a dutch clay soil. *J. Environ. Qual.* 33: 1473–1486.

Kennedy, J.M. and R.E. Talbert. 1977. Comparative persistence of dinitroaniline type herbicides on the soil surface. *Weed Science* 25: 373-381. (Cited in Mulye 1995)

König, T. 1997. Method for the determination of imidacloprid in water by LC-MS-MS with solid phase extraction. Bayer AG, Crop Protection-Development, Institute for Metabolism Research and Residue Analysis, Monheim, Germany. 19 pp.

Krohn, J. 1989. Water solubility of NTN 33893. Miles report No. 99859. Bayer AG, Wuppertal-Elberfeld, Germany. 10 pp. (Reviewed in Mulye 1995)

Krohn, J. 1996a. Water solubility and partition coefficient of desnitro compound. Bayer Corporation, Kansas City, Missouri. Report No. 107676. (Reviewed in Mulye 1997a)

Krohn, J. 1996b. Water solubility and partition coefficient of urea compound. Bayer Corporation, Kansas City, Missouri. Report No. 107677. 15 pp. (Reviewed in Mulye 1997a)

Krohn, J. and E. Hellpointner. 2002. Environmental fate of imidacloprid. *Pflanzenschutz-Nachrichten Bayer* 55: 1–26.

Kunkel, B.A., D.W. Held, D.A. Potter. 2001. Lethal and sublethal effects of bendiocarb, halofenozide, and imidacloprid on *Harpalus pennsylvanicus* (coleopteran: Carabidae) following different modes of exposure in turfgrass. *J Econ. Entomol.* 94:60-67.

McCall, P.J., D.A. Laskowski, R.L. Swann, and H.J. Dishburger. 1981. Measurement of sorption coefficients of organic chemicals and their use in environmental fate analysis. *In: Test protocols for environmental fate and movement of toxicants. Proceedings of a symposium.* Pages 89 – 109. Association of Official Analytical Chemists. 94th Annual Meeting, October 21 – 22, 1980. Washington, DC. (Cited in Mulye 1997a)

McGee, B., H. Berges, and K. Callow. 2004. Survey of pesticide use in Ontario, 2003: Estimates of pesticides used on field crops, fruit and vegetable crops, and other agricultural crops. Ontario Ministry of Agriculture and Food, Guelph, Ontario.

Meister, R.T. 2000. *Farm Chemical Handbook 86.* Meister Publishing Company, Willoughby, OH.

MENVIQ (Ministère de l'Environnement du Québec). 1990 (rév. 1992). *Méthodologie de calcul de critères de qualité de l'eau pour les substances toxiques.* Service d'évaluation des rejets toxiques, Direction de l'expertise scientifique, Ministère de l'Environnement du Québec, Québec. 147 p.

MMPP (Manitoba's Management Plus Program). 2003. Regional pesticide usage analysis (2001-2004). Manitoba Rural Adaptation Council, Manitoba Agriculture and Food, and Manitoba Crop Insurance Corporation. [http://www.mmpp.com/Home\\_Page.htm](http://www.mmpp.com/Home_Page.htm) Accessed: September 2004.

Miles, Inc. 1992. Premise termiticide - Environmental fate: Terrestrial field dissipation for California site. Volume No. 51950–0032. Department of Pesticide Regulation, Sacramento, CA.

Miles, Inc. 1992. Premise termiticide - Environmental fate: Terrestrial field dissipation for California site. Volume No. 51950–0032. Department of Pesticide Regulation, Sacramento, CA.

Miles, Inc. 1993a. NTN 33893 (imidacloprid) - Environmental fate summary. Volume No. 51950-0113. Department of Pesticide Regulation, Sacramento, CA.

Mobay Chemical Corp. 1992. Premise termiticide - Environmental fate: Hydrolysis; Aqueous and soil photolysis. Volume No. 51950-0027. Department of Pesticide Regulation, Sacramento, CA.

Mobay Chemical Corp. 1992. Premise termiticide - Environmental fate: Hydrolysis; Aqueous and soil photolysis. Volume No. 51950-0027. Department of Pesticide Regulation, Sacramento, CA.

Moza, P.N., K. Hustert, E. Feicht, and A. Kettrup. 1998. Photolysis of imidacloprid in aqueous solution. *Chemosphere*. 36(3): 497-502.

Mukherjee, I. and M. Gopal. 2000. Environmental behaviour and translocation of imidacloprid in eggplant, cabbage and mustard. *Pest Management Science* 56: 932-936

Murphy, C and Mutch, J.. 2005. Multimedia Pesticide Monitoring Programs in Prince Edward Island, New Brunswick and Nova Scotia. Year 1 and Year 2 (2003/04, 04/05) Progress Report, Environment Canada and Prince Edward Department of Environment, Energy and Forestry.

Murphy, C., J.P. Mutch, D. Reeves, T. Clark, S. Lavoie, H. Rees, L. Chow, L-A. Nunn, and D. Hebb. 2006. Multi-media pesticide monitoring programs in Prince Edward Island, New Brunswick and Nova Scotia, Final Project Report of 3-year monitoring program, 2003/04 – 2005/06. Environment Canada, Environmental Protection Branch, Charlottetown.

Nemeth-Konda, L., G. Füleky, G. Morovjan, and P. Csokan. 2002. Sorption behaviour of acetochlor, atrazine, carbendazim, diazinon, imidacloprid and isoproturon on Hungarian agricultural soil. *Chemosphere* 48: 545-552.

Oi, M. 1999. Time-dependent sorption of imidacloprid in two different soils. *J. Agric. Food Chem.* 47: 327-332.

Peterson, C.J. 2007. Imidacloprid mobility and longevity in soil columns at a termiticidal application rate. *Pest Management Science*, 63(11):1124-1132.

Phillips, P.J. and R. W. Bode. 2002. Concentrations of pesticides and pesticide degradates in the Croton River Watershed in Southeastern New York, July-September 2000. [Online]. Available at <http://ny.water.usgs.gov/pubs/wri/wri024063/wrir02-4063.pdf>. USGS-NY, Troy, NY.

Philpot, J.D. and P.Y. Yen. 1998a. Terrestrial field dissipation of imidacloprid on bare loam soil in Ontario, Canada, 1994. Bayer Report No. 107819. 265 pp. (Reviewed in Mulye 1999)

Philpot, J.D. and P.Y. Yen. 1998b. Terrestrial field dissipation of imidacloprid on potatoes in Prince Edward Island, Canada, 1994. Bayer Report No. 107820. 264 pp. (Reviewed in Mulye 1999)

Philpot, J.D. and P.Y. Yen. 1998c. Terrestrial field dissipation of imidacloprid on turf in Ontario, Canada, 1994. Bayer Report No. 107817. 419 pp. (Reviewed in Mulye 1999)

- Philpot, J.D. and P.Y. Yen. 1998d. Terrestrial field dissipation of imidacloprid on turf in British Columbia, Canada, 1995. Bayer Report No. 107821. 206 pp. (Reviewed in Mulye 1999)
- Pirard, C., J. Widart, B.K. Nguyen, C. Deleuze, L. Heudt, E. Haubruge, E. De Pauw, J.F. Focant. Development and validation of a multi-residue method for pesticide determination in honey using on-column liquid-liquid extraction and liquid chromatography-tandem mass spectrometry. *J. Chromatography*. 1152:116-123.
- PMU (Pesticide Management Unit). 2005. Sales 2003 Report for Pesticides. Prepared for New Brunswick Department of the Environment and Local Government.
- PubChem Substance. 2005. National Centre of Biotechnology Information Access (NCBI). <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pcsubstance>
- Rice, F., D. Judy, D. Koch, and K. Cain. 1991. Terrestrial field dissipation for NTN 33893 in Minnesota soil. ABC Laboratories, Inc., Columbia, MO. 510 pp. Miles Report No. 101988. (Reviewed in Mulye 1995)
- Rouchaud, J., A. Thirion, A. Wauters, F. Van de Steene, F. Benoit, N. Ceustermans, J. Gillet, S. Marchand, and L. Vanparys. 1996b. Effects of fertilizer on insecticide adsorption and biodegradation in crop soils. *Arch. Environ. Contam. Toxicol.* 31(1): 98–106.
- Sanchez-Bayo, F. and K. Goya. 2006. Influence of light in acute toxicity bioassays of imidacloprid and zinc pyrethrin to zooplankton crustaceans. *Aquat Toxicol* 78(3): 262-271.
- Sarkar, M., P. Biswas, S. Roy, R. Kole, and A. Chowdhury. 1999. Effect of pH and type of formulation on the persistence of imidacloprid in water. *Bull. Environ. Contam. Toxicol.* 63(5): 604–609.
- Sarkar, M.A., S. Roy, R.K. Kole, A. Chowdhury. 2001. Persistence and metabolism of imidacloprid in different soils of West Bengal. *Pest Management Science*. 57(7):598-602.
- Schad, T. 2001. Calculation of temperature referenced first order DT<sub>50</sub> of imidacloprid based on field dissipation studies conducted in Europe. Internal Report Bayer AG, Leverkusen.
- Scholz, K. 1991. Degradation of NTN 33893 in soil under vegetation. Bayer AG, Leverkusen, Germany. Report No 103202. 83 pp. (Reviewed in Mulye 1997a)
- Scholz, K. and M. Spiteller. 1992. Influence of groundcover on the degradation of <sup>14</sup>C-imidacloprid in soil. *Proc. Brighton Crop Protection Conference – Pests and Dis.* 883–888.
- Schoning, R. and R. Schumck. Bayer. 2003. Analytical determination of imidacloprid and relevant metabolite residues by LC MS/MS. *Bull Insectology*. 56(1):41-50.
- Schuette, J., J. Troiano, M. Pepple, and J. Dias. 2004. 2004 Update of the Well Inventory Database. [Online]. Available at <http://www.cdpr.ca.gov/docs/emppm/pubs/ehapreps/eh0404.pdf>. CDPR, Sacramento, CA.

Segawa, R. and J. Walters. 2002. Preliminary Monitoring Results of Imidacloprid Applications for Glassy-winged Sharpshooter Control in Residential Areas of Santa Clara County. [Online]. Available at <http://www.cdpr.ca.gov/docs/gwss/r101602.pdf>. CDPR, Sacramento, CA.

Segawa, R., J. Walters, and S. Fan. 2004. Preliminary Monitoring Results of Imidacloprid and Cyfluthrin Applications for Glassy-Winged Sharpshooter Control in a Residential Area of Solano County. [Online]. Available at <http://www.cdpr.ca.gov/docs/gwss/gwss091704.pdf>. CDPR, Sacramento, CA.

SFOPH (Swiss Federal Office of Public Health). 2005. GS Toxic Substances List. July 2005 edition.

Shimomura, M., H. Okuda, K. Matsuda, K. Komai, M. Akamatsu, and D.B. Sattelle. 2002. Loops D and F of nicotinic acetylcholine receptors and their role in neonicotinoid sensitivity. Poster presentation. <http://nara-kindai.univ.jp/02gakka/03ouyou/web-content/gyoseki/shimomura.pdf>.

Spiteller, M. 1993. Aerobic metabolism of imidacloprid, <sup>14</sup>C-NTN 33893, in an aquatic model ecosystem. Bayer AG, Institute for Metabolism Research, Leverkusen-Bayerwerk, Germany. Report No. PF 3950.

Stephan, C.E., D.I. Mount, D.J. Hansen, J.H. Gentile, G.A. Chapman and W.A. Brungs. 1985. Guidelines for deriving numerical national water quality criteria for the protection of aquatic organisms and their uses. U.S. Environmental Protection Agency, Washington, DC. PB85-227049.

Stevens, J. and P.P. Halarnkar. 1996. Aerobic aquatic (water only) biotransformation of [pyridinyl-<sup>14</sup>C-methyl] imidacloprid at 22°C. Bayer Corporation, Kansas City, Missouri. Report No. 107547. 171 pp.

Struger, J., T. Fletcher, P. Martos, B. Ripley, and G. Gris. 2002. Pesticide concentrations in the Don and Humber River Watersheds (1998-2000). Environment Canada, Ontario Ministry of the Environment, and City of Toronto. 21 pp.

Tornier, I., A. Kling, A. Schur. Honey bee testing in Southern Europe: from the laboratory to the relevant crop in the field. *Bull Insectology*. 56(1):185-187.

U.S. EPA (United States Environmental Protection Agency). 1975. Chemodynamic parameters – partition coefficient. Guidelines for registering pesticides in the United States. 40 FR 123: 26880.

U.S. EPA (United States Environmental Protection Agency). 1995. Imidacloprid (NTN); Pesticide Tolerances and a Feed Additive Regulation. 40 CFR Parts 180 and 186. August 30, 1995 60(168). <http://www.epa.gov/fedrgstr/EPA-PEST/1995/August/Day-30/pr-392.html>

U.S. EPA (United States Environmental Protection Agency). 2005. Pesticide Fate Database. Environmental Fate and Effects Division of the Office of Pesticide Programs. <http://cfpub.epa.gov/pfate/home.cfm>

Vilchez, J.L., R. El-Khattabi, J. Fernandez, A. Gonzalez-Casado, and A. Navalon. 1996. Determination of imidacloprid in water and soil samples by gas chromatography-mass spectrometry. *Journal of Chromatography A* 746(2): 289-294.

Vilchez, J.L., R. El-Khattabi, R. Blanc, and A. Navalon. 1998. Photochemical-fluorimetric method for the determination of the insecticide imidacloprid in water samples. *Analytica Chimica Acta* 371(2-3): 247-253.

Wamhoff, H. and V. Schneider. 1999. Photodegradation of imidacloprid. *J. Agric. Food Chem.* 47(4): 1730–1734.

Wilmes, R. 1988. Range-finding tests for abiotic degradation. Miles Report No. 94366. Bayer AG, Monheim, Germany. 11 pp. (Reviewed in Mulye 1995)

Wohlens, K. 1988. Dissociation constant of NTN 33893. Miles Report No. 99863. Bayer AG, Leverkusen, Germany. 4 pp. (Reviewed in Mulye 1995)

Yoshida, H. 1989. Hydrolysis of NTN 33893. Yuki Institute, Ibaraki, Japan. 34 pp. Miles Report No. 99708. (Reviewed in Mulye 1995)

Zheng, W. and W. Liu. 1999. Kinetics and mechanism of the hydrolysis of imidacloprid. *Pestic. Sci.* 55(4):482–485.

### **Imidacloprid - Other Ecotox Studies**

Abou-Donia, M.B., L.B. Goldstein, S. Bullman, T. Tu, W.A. Khan, A.M. Dechkovkaia, and A.A. Abdel-Rahman. 2008. Imidacloprid induces neurobehavioral deficits and increases expression of glial fibrillary acidic protein in the motor cortex and hippocampus in offspring rats following in utero exposure *J Toxicol Environ Health* 71(2):119-30.

Albajes, R., C. López, and X. Pons. 2003. Predatory fauna in cornfields and response to imidacloprid seed treatment. *J. Econ. Entomol.* 96(6): 1805–1813.

Araki, Y., W. Bornatsch, A. Brauner, T. Clark, G. Dräger, S. Kuroguchi, H. Sakamoto, and K. Vogeler. 1994. Metabolism of imidacloprid in plants. *Proc. IUPAC Congress, Wash.* 2B:157.

Avery, M.L., D.G. Decker, and D.L. Fischer. 1994. Cage and flight pen evaluation of avian repellency and hazard associated with imidacloprid-treated rice seed. *Crop Protection.* 13(7):535-540.

Avery, M.L., D.G. Decker, D.L. Fischer, and T.R. Stafford. 1993. Responses of captive blackbirds to a new insecticidal seed treatment. *Journal of Wildlife Management.* 57(3):652-656.

Avery, M.L., D.L. Fischer and T.M. Primus. 1997. Assessing the hazard to granivorous birds feeding on chemically treated seeds. *Pesticide Science* 49(4): 362-366.

Barbendrier, D., N. Kalberer, J. Romeis, P. Fluri, F. Bigler. 2004. Pollen consumption in honey bee larvae: a step forward in the risk assessment of transgenic plants. *Apidologie*. 35:293-300.

Boiteau, G., W.P.L. Osborn. 1997. Behavioral effects of imidacloprid, a new nicotinyl insecticide, on the potato aphid, *Macrosiphum euphorbiae* (Thomas) (Homoptera: aphididae). *Canadian Entomologist*. March/April 1997. 241-249.

Bowers, L.M. 1996a. Toxicity of NTN 33893 2F to the blue-green alga *Anabaena flos-aquae*. Bayer Corporation, Kansas City, Missouri. Report No. 107549. 31 pp.

Bowers, L.M. 1996b. Acute toxicity of <sup>14</sup>C-NTN 33838 to *Chironomus tentans* under static conditions. Bayer Corporation, Kansas City, Missouri. Report No. 107316. (Reviewed in Mulye 1997a)

Bowers, L.M. and C.V. Lam. 1998. Acute toxicity of 6-chloronicotinic acid (a metabolite of imidacloprid) to *Chironomus tentans* under static renewal conditions. Bayer Report No 108127. (Reviewed in Mulye 1999)

Bowman, J. and J. Bucksath. 1990a. Acute toxicity of NTN 33893 to bluegill (*Lepomis macrochirus*). Analytical Bio-Chemistry Laboratories, Inc., Columbia, Missouri (performing laboratory). Mobay Corporation, Kansas City, Missouri (submitting laboratory). 31 pp. Mobay Project ID: Report No. 100348.

Bowman, J. and J. Bucksath. 1990b. Acute toxicity of NTN 33893 to rainbow trout (*Oncorhynchus mykiss*). Analytical Bio-Chemistry Laboratories, Inc., Columbia, Missouri (performing laboratory). Mobay Corporation, Kansas City, Missouri (submitting laboratory). 29 pp. Mobay Project ID: Report No. 100349.

Brunner, J.F., J.E. Dunley, M.D. Doerr, and E.H. Beers. 2001. Effects of pesticides on *Colpoclypeus florus* (Hymenoptera: Eulophidae) and *Trichogramma platneri* (Hymenoptera: Trichogrammatidae), parasitoids of leafrollers in Washington. *J Econ Entomol* 94(5): 1075-1084.

Bullock, R.C., R.R. Pelosi. 1993. Toxicity of imidacloprid to selected arthropods in the citrus greenhouse and grove. *Proc Fla St Hort Soc*, 106, pp. 42-47.

Byrne, F.J. and N.C. Toscano. 2007. Lethal toxicity of systemic residues of imidacloprid against *Homalodisca vitripennis* (Homoptera: Cicadellidae) eggs and its parasitoid *Gonatocerus ashmeadi* (Hymenoptera: Mymaridae). *Biological Control* 43:130-135.

Capowiez, Y., M. Rault, C. Mazzia, L. Belzunces. 2003. Earthworm behaviour as a biomarker – a case study using imidacloprid. *Pedobiologia*. 47:542-547.

Capowiez, Y., M. Rault, G. Costagliola, and C. Mazza. 2005. Lethal and sublethal effects of imidacloprid on two earthworm species. *Biol Fertil Soils* 41(3): 135-143.

Capowiez, Y., F. Bastardie, and G. Costagliola. 2006. Sublethal effects of imidacloprid on the burrowing behavior of two earthworm species: Modifications of the 3-D burrow systems in artificial cores and consequences on gas diffusion in soil. *Soil Biol Biochem* 38:

Capowiez, Y., A. Berard. Assessment of the effects of imidacloprid on the behavior of two earthworm species (*Aporrectodea nocturna* and *Allolobophora icterica*) using 2D terraria. *Ecotoxicol Environ Saf* 64(2): 198-206.

Cohle, P. and J. Bucksath 1991. Early Life Stage Toxicity of NTN 33893 Technical to Rainbow Trout (*Oncorhynchus mykiss*) in a Flow-Through System. Analytical Bio-Chemistry Laboratories, Inc., Columbia, Missouri (performing laboratory). Mobay Corporation, Kansas City, Missouri (submitting company). Report Number 101214. 85 pp.

Demsia, G., D. Vlastos, M. Goumenou, and D.P. Matthopoulos. 2007. Assessment of the genotoxicity of imidacloprid and metalaxyl in cultured human lymphocytes and rat bone marrow. *Mutat Res* 634(1/2): 32-39.

Dobbs, M.G. and J.T. Frank. 1996. Acute toxicity of <sup>14</sup>C-NTN 33519 to *Hyaella azteca* under static conditions. Bayer Corporation, Kansas City, Missouri. Report No. 107148. 31 pp.

Dorgerloh, M. 2000. Imidacloprid - Influence on the growth of green alga, *Selenastrum capricornutum*. Bayer AG, Crop Protection - Development, Institute for Environmental Biology, Leverkusen-Bayerwerk, Germany. GLP-Study No. E 323 1806-3. Report No. DOM 20018. 26 pp.

Dorgerloh, M. and H. Sommer. 2001. Influence of imidacloprid (tech.) on development and emergence of larvae of *Chironomus riparius* in a water-sediment system. Bayer AG, Crop Protection

Drobne, D., M. Blazic, C.A.M. vanGestel, V. Leser, P. Zidar, A. Jemec, P. Trebse. 2008. Toxicity of imidacloprid to the terrestrial isopod Porcello Scaber (*Isopoda*, Crustacea). *Chemosphere*. 71:1326-1334.

England, D., and J.D. Bucksath. 1991. Acute toxicity of NTN 33893 to *Hyaella azteca*. ABC Laboratories, Inc., Columbia, Missouri (performing laboratory). Mobay Corporation, Kansas City, Missouri (submitting company). Columbia, Missouri. 29 pp. Report No. 101960.

Fahrbach, S. E. 2006. Structure of the mushroom bodies of the insect brain. *Annu. Rev. Entomol.* 51:209–232.

Feng, S., Z. Kong, X. Wang, L. Zhao, and P. Peng. 2004. Acute toxicity and genotoxicity of two novel pesticides on amphibian. *Rana N. Hallowell. Chemosphere* 56(5): 457-463.

Fitzpatrick, U., T.E. Murray, R.J. Paxton, J. Breen, D. Cotton, V. Santorum, M.J.F. Brown. 2007. Rarity and decline in bumblebees – a test of causes and correlates in the Irish fauna. *Biol Conserv*, 136:185-194.

Gagliano, G.G. 1991. Growth and survival of the midge (*Chironomus tentans*) exposed to NTN 33893 technical under static renewal conditions. Mobay Corporation, Stilwell, Kansas (performing laboratory). Mobay Corporation, Kansas City, Missouri (submitting company). 43 pp. Mobay Report No. 101985.

- Gagliano, G.G. 1992. Raw data and statistical analysis supplement for early life stage toxicity of NTN 33893 to rainbow trout (*Oncorhynchus mykiss*). ABC Laboratories, Inc., Columbia, Missouri (performing laboratory). Miles Incorporated, Agriculture Division, Kansas City, Missouri (submitting company). Miles Report No. 101214-1. 295 pp.
- Gagliano, G.G., and L.M. Bowers. 1991. Acute toxicity of NTN 33893 to the green alga (*Selenastrum capricornutum*). Mobay Corporation, Stilwell, Kansas (performing laboratory). Mobay Corporation, Kansas City, Missouri (submitting company). 30 pp. Mobay Report No. 101986.
- Grau, R. 1986. Summary of Report No. VK-300: Bird oral toxicity/ Canary bird. Bayer AG, Leverkusen-Beyerwerk, Germany. Report No. 106610. 2 pp. (Cited in Mulye 1996).
- Grau, R. 1987a. Summary of Report no. VT-113: Bird oral toxicity/ Pigeon. Bayer AG, Leverkusen-Beyerwerk, Germany. Report No. 106611. 3 pp. (Cited in Mulye 1996)
- Grau, R. 1987b. The acute toxicity of NTN 33893 Techn. to golden orfe (*Leuciscus idus melanotus*) in a static test. Final Report FO-1042, Study No. E 2820089-9. Bayer AG, Leverkusen, Germany. 11+ pp.
- Grau, R. 1988a. Acute oral LD<sub>50</sub> of NTN 33893 to Japanese quail. Bayer AG, Leverkusen, Germany. Report No. 106608. 42 pp.
- Grau, R. 1988b. The acute toxicity of NTN 33893 technical to rainbow trout (*Salmo gairdneri*) in a static test. Bayer AG, Leverkusen-Bayerwerk, Germany (performing laboratory). Mobay Corporation, Kansas City, Missouri (submitting company). 18 pp. Report No. 101303.
- Hall, A.T. 1996. Toxicity of NTN 33893 2F to the freshwater diatom *Navicula pelliculosa*. Bayer Corporation, Kansas City, Missouri. Report No. 107658. 31 pp. (Reviewed in Mulye 1997a)
- Hammer, M. and R. Menzel. Learning and memory in the honeybee. *J Neuroscience*. 15(3):1617-1630.
- Hancock, G.A. 1996. NTN 33893 technical: an acute oral LD50 with mallards. Bayer Corporation, Kansas City, Missouri. Report No. 107354. 32 pp. (Reviewed in Mulye 1997a)
- Heimbach, F. 1986. Growth inhibition of green algae (*Scenedesmus subspicatus*) caused by NTN 33893 (technical). Bayer AG, Leverkusen, Germany Report HBF/A1 27. 16 pp.
- Hendel, B. 2001. Influence of imidacloprid (tech.) of *Gammarus pulex* in a water-sediment system under static conditions. Bayer AG, Crop Protection Research, Environmental Research, Institute for Environmental Biology, Leverkusen, Germany. Report No. HDB/SP 10-00. 41 pp.
- Hewitt, M. 2006. Characterizing potato pesticide impacts in aquatic systems of Atlantic Canada. Project Report submitted under the Pesticide Science Fund, Environment Canada.
- Hill, T.A., R.E. Foster. 2000. Effects of insecticides on the Diamondback Moth (Lepidoptera: Plutellidae) and its parasitoid *Diadegma insulare* (Hymenoptera: Ichneumonidae) *J Econ Entomol* 93(3): 763-768.

- Jemec, A., T. Tisler, D. Drobne, K. Sepcic, D. Fournier, and P. Trebse. 2007. Comparative toxicity of imidacloprid, of its commercial liquid formulation and of diazinon to a non-target arthropod, the microcrustacean *Daphnia magna*. *Chemosphere* 68(8): 1408-1418.
- Kaakeh, N., W. Kaakeh, and G.W. Bennett. 1996. Topical toxicity of imidacloprid, fipronil, and seven conventional insecticides to the adult convergent lady beetle (Coleoptera: Coccinellidae). *J. Entomol. Sci.* 31: 315–322.
- Karabay, N.U. and M.G. Oguz, 2005. Cytogenetic and genotoxic effects of the insecticides, imidacloprid and methamidophos. *Genet Mol Res* 4(4): 653-662.
- Key, P., K. Chung, T. Siewicki, and M. Fulton. 2007. Toxicity of three pesticides individually and in mixture to larval grass shrimp. *Ecotoxicol Environ Saf* 68(2): 272-277.
- Koester J. 1992. Comparative metabolism of (pyridinyl-<sup>14</sup>C-methyl)-imidacloprid in plant cell suspension cultures. *Proc. Brighton Crop Protection Conference – Pests and Dis.* 2: 901–906
- Kreutzweiser, D., K. Good, D. Chartrand, T. Scarr, and D. Thompson. 2007. Non-target effects on aquatic decomposer organisms of imidacloprid on aquatic decomposer organisms of imidacloprid as a systemic insecticide to control emerald ash borer in riparian trees. *Ecotoxicol Environ Safety* 68(3):315-325.
- Kreutzweiser, D.P., D.G. Thompson, and T.A. Scarr. 2008. Imidacloprid in leaves from systemically treated trees may inhibit litter breakdown by non-target invertebrates. *Ecotoxicol Environ Safety*, 72(4): 1053-1057.
- Kunkel, B.A., D.W. Held, and D.A. Potter. 1999. Impact of halofenozide, imidacloprid, and bendiocarb on beneficial invertebrates and predatory activity in turfgrass. *J Econ Entomol* 92(4): 992-930.
- Mota-Sanchez, D. B.M. Cregg, D.G. McCullough, T.M. Poland, R.M. Hollingworth. 2009. Distribution of trunk-injected <sup>14</sup>C-imidacloprid in ash trees and effects on emerald ash borer (Coleoptera:Buprestidae) adults. *Crop Protection* 28:655-661.
- Lal, O.P., R.K. Palta, YNS, Srivastava. 2001. Impact of imidacloprid and carbofuran on earthworm castings in Okra Field. *Ann Plant Prot Sci* 9(1): 137-138.
- Laskowski, R. 2001. Why short-term bioassays are not meaningful – effects of a pesticide (imidacloprid) and a metal (cadmium) on pea aphids (*Acyrtosipon pisum* Harris) *Ecotoxicology* 10(3): 177-183.
- Lintott, D.R. 1992. NTN 33893 (240 FS formulation): acute toxicity to the mysid, *Mysidopsis bahia*, under flow-through conditions. Toxicon Environmental Sciences, Jupiter, Florida (performing laboratory). Miles Incorporated, Kansas City, Missouri (submitting company). 43 pp. Miles Report No. 103845.

Liu, M.Y., Lanford, J. and Casida, J.E., 1995. Relevance of [<sup>3</sup>H]imidacloprid binding site in house fly head nicotinic acetylcholine receptor to insecticidal activity of 2-nitromethylene- and 2-nitroimino-imidazolidines. *Pestic. Biochem. Physiol.* 46, pp. 200–206.

Luo, Y., Y. Zhang, Y. Zhong, and Z.M. Kong. 1999. Toxicological study of two novel pesticides on earthworm *Eisenia foetida*. *Chemosphere* 39(13): 2347-2356.

Matsuda K., M. Shimomura, Y. Kondo, M. Ihara, K. Hashigami, N. Yoshida, V. Raymond, N.P. Morgan, J.C. Freeman, K. Komai, and D.B. Sattelle. 2000. Role of loop D of the  $\alpha 7$  nicotinic acetylcholine receptor in its interaction with the insecticide imidacloprid and related neonicotinoids. *Br. J. Pharmacol.* 130:981-6. (Cited in Hovda and Hooser 2002)

Miles, Inc. 1993b. Imidacloprid (syn. PREMISE, NTN 33893) - Comparative metabolism in plant cell suspension cultures. Volume No. 51950–0078. Department of Pesticide Regulation, Sacramento, CA.

Miles, Inc. 1993b. Imidacloprid (syn. PREMISE, NTN 33893) - Comparative metabolism in plant cell suspension cultures. Volume No. 51950–0078. Department of Pesticide Regulation, Sacramento, CA.

Mostert, M.A., A.S. Schoeman, M. Van der Merwe. 2000. The toxicity of five insecticides to earthworms of the *Pheretima* Group, using an artificial soil test. *Pest Manag Sci* 56(1): 1093-1097.

Mostert, M.A., A.S. Schoeman, M. Van der Merve. 2002. The relative toxicities of insecticides to earthworms of the *Pheretima* Group (*Oligochaeta*). *Pest Manag Sci* 58(5): 446-450.

Mota-Sanchez, D. B.M. Cregg, D.G. McCullough, T.M. Poland, and R.M. Hollingworth. 2009. Distribution of trunk-injected <sup>14</sup>C-imidacloprid in ash trees and effects on emerald ash borer (*Coleoptera*:*Buprestidae*) adults. article in press.

Mauelshagen, J. and U. Greggers. 1993. Experimental access to associative learning in honeybees. *Apidologie*. 24:249-266.

Nauen, R., B. Koob, A. Elbert. Antifeeding effects of sublethal dosages of imidacloprid on *Bemisia tabaci*. *Entomologia Experimentalis et Applicata*. 88:287-293.

Papachristos, D.P. and P.G. Milonas. 2008. Adverse effects of soil applied insecticides on the predatory coccinellid *Hippodamia undecimnotata* (*Coleoptera*: *Coccinellidae*). *Biological Control*, 47(1):77-81.

Pike, K.S., G.L. Reed, G.T. Graf, and D. Allison. 1993. Compatibility of imidacloprid with fungicides as a seed-treatment control of Russian wheat aphid (*Homoptera*: *Aphidae*) and effect on germination, growth, and yield of wheat barley. *Journal of Economic Entomology*. 86(2): 586-593

Quintela, E., C. MacCoy. 1997. Effects of imidacloprid on development, mobility, and survival of first instars of *Diaprepes abbreviatus* (*Coleoptera*:*Curculionidae*). *J Econ Entomol* 90(4): 988-995.

Rogers, M.A., V.A. Krischik, L.A. Martin. 2007. Effect of soil application of imidacloprid on survival of adult green lacewing, *Chrysoperla carnea* (Neuroptera:Chrysopidae) used for biological control in greenhouse. *Biol. Control* 42:172-177.

Roney, D.J., and L.M. Bowers. 1996. Acute toxicity of <sup>14</sup>C-NTN 33823 to *Hyaella azteca* under static conditions. Bayer Corporation, Kansas City, Missouri. Miles Report No. 107315. 34 pp. (Reviewed in Mulye 1997a)

Rouchaud, J. F. Gustin, A. Wauters. 1996. Imidacloprid insecticide soil metabolism in sugar beet field crops. *Bull. Environ. Contam. Toxicol.* 56:29-36.

Sánchez-Bayo, F. and K. Goka. 2005. Unexpected effects of zinc pyrethrin and imidacloprid on Japanese medaka fish (*Oryzias latipes*). *Aquatic Toxicol.* 74: 285–293.

Sánchez-Bayo, F., and K. Goka. 2006. Influence of light in acute toxicity bioassays of imidacloprid and zinc pyrethrin to zooplankton crustaceans. *Aquat. Toxicol.* 78: 262-271.

Song, M.Y. and J.J. Brown. 1998. Osmotic effects as a factor modifying insecticide toxicity on *Aedes* and *Artemia*. *Ecotoxicol. Environ. Safety.* 41:195-202.

Sone, S., K. Nagata, S. Tsuboi, T. SHomo. 1994. Toxic symptoms and neural effects of a new class of insecticide, imidacloprid, on the American cockroach. *J. Pesticide Sci* 19:62-72.

Stafford, T.R. 1991. NTN 33893 2.5G: an acute oral LD<sub>50</sub> with house sparrows, *Passer domesticus*. Mobay Corporation, Kansas City, Missouri. Report No. 101324. 23 pp. (Reviewed in Mulye 1996)

Stafford, T.R. 1992. Technical NTN 33893: a one-generation reproduction study with mallard ducks. Miles Report No. 103813. Miles, Inc., Kansas City, MO. 99 pp.

Stoughton, S.J. 2006. Toxicity of imidacloprid to two aquatic invertebrates, *Chironomus tentans* and *Hyaella azteca*, under different exposure conditions. M.Sc. Thesis. University of Saskatchewan, Saskatoon.

Stoughton, S., J. Leber, J. Culp, and A. Cessna. 2008. Acute and chronic toxicity of imidacloprid to the aquatic invertebrates *Chironomus tentans* and *Hyaella azteca* under constant- and pulse-exposure conditions. *Archives of Environ Cont and Tox.* 54(4):662-673.

Takada, T. 1986. NTN 33893: Acute fish toxicity on common carp. Nitokuno, Basic Research Division, Toxicity Research Department. Report No. RW86102.

Tisler, T., A. Jemec, B. Mozetic, P. Trebse. 2009. Hazard identification of imidacloprid to aquatic environment. *Chemosphere.* In press.

Toll, P.A. 1990b. Technical NTN 33893: a subacute dietary LC<sub>50</sub> with mallard ducks. Miles, Inc., Stilwell, KS. 36 pp. Miles Report No. 100238. (Reviewed in Mulye 1995)

Toll, P.A. 1990c. Technical NTN 33893: a one-generation reproduction study with bobwhite quail. Miles, Inc., Stilwell, KS. 114 pp. Miles Report No. 101203. (Reviewed in Mulye 1995)

Toll, P.A. 1990d. Technical NTN 33893: an acute oral LD<sub>50</sub> with bobwhite quail. Miles, Inc., Stilwell, KS. 25 pp. Miles Report No. 100059. (Reviewed in Mulye 1995)

Tomizawa, M., A. Cowan, J.E. Casia. 2001. Analgesic and toxic effects of neonicotinoid insecticides in mice. *Toxicol Applied Phramacol* 177:77-83.

Tomizawa, M. and J.E. Casida. 1999. Minor structural changes in nicotinoid insecticides confer differential subtype selectivity for mammalian nicotinic acetylcholine receptors. *British J. Pharmacol* 127:115-122

Tomizawa, M. and J.E. Casida. 2002. Desnitro-imidacloprid activates the extracellular signal-regulated kinase cascade via the nicotinic receptor and intracellular calcium mobilization in N1E-115 cells. *Toxicol Applied Phramacol* 184:180-186.

Tomizawa, M., D. Maltby, T.T. Talley, K.A. Durkin, K.F. Medzihradzky, A. L. Burlingame, P. Taylor, J.E. Casida. 2008. Atypical nicotinic agonist bound conformations conferring subtype selectivity. *PNAS*. 105(5):1728-1732.

Vincent, C., A. Ferran, L. Guige, J. Brun. 2000. Effects of imidacloprid on coccinellid larval biology and locomotor behavior. *Eur J Entomol* 97(4):501-506.

Walters, J., H. Casjens, and K. Goh. 2001. Preliminary Monitoring Results of Imidacloprid and Cyfluthrin Applications for Glassy-Winged Sharpshooter Control in Commercial Areas of Butte County. [Online]. Available at [http://www.cdpr.ca.gov/docs/gwss/r1018\\_01.pdf](http://www.cdpr.ca.gov/docs/gwss/r1018_01.pdf). CDPR, Sacramento, CA.

Ward, G.S. 1990a. NTN-33893 technical: acute toxicity to sheepshead minnow, *Cyprinodon variegatus*, under static conditions. Toxicon Environmental Sciences, Jupiter, Florida (performing laboratory). Mobay Corporation, Kansas City, Missouri (submitting laboratory). 36 pp. Mobay Project ID: Report No. 100354.

Ward, G.S. 1990b. NTN 33893 technical: acute toxicity to the mysid, *Mysidopsis bahia*, under flow-through test conditions. Toxicon Environmental Sciences, Jupiter, Florida (performing laboratory). Mobay Corporation, Kansas City, Missouri (submitting laboratory). 46 pp. Mobay Report No. 100355.

Ward, G.S. 1991. NTN 33893 technical: chronic toxicity to the mysid *Mysidopsis bahia* under flow-through conditions. Toxicon Environmental Sciences, Jupiter, FL. 87 pp. Miles Report No. 101347

Young, B.M. and G.C. Blakemore. 1990. 21-day chronic static renewal toxicity of NTN 33893 to *Daphnia magna*. Analytical Bio-Chemistry Laboratories, Inc., Columbia, Missouri (performing laboratory). Mobay Corporation, Kansas City, Missouri (submitting laboratory). 84 pp. Mobay Report No. 100247. 50 *Canadian Water Quality Guidelines Imidacloprid*

Zhang, A., H. Kayser, P. Maianfisch, J.E. Casida. 2000. Insect nicotinic acetylcholine receptor : conserved neonicotinoid specificity of [3H] imidacloprid binding site. J. Neurochem. 75:1294-1303.

## **Imidacloprid – Usage Data**