**Table S2. Summary of community impacts from microcosms, mesocosms and similar studies with neonicotinoids. Treatment and endpoint concentrations (μg/L) in brackets.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Study type** | **Neonicotinoid** | **Treatment (a.i. μg/L water)** | **Taxa affected** | **Endpoints (NOEC, μg/L)** | **Indirect effects (NOEC, μg/L)** | **Reference** |
| Microcosm | imidacloprid | single pulse (1.2 to 12,000) | Diptera, Plecoptera | Feeding inhibition (12) |  | (Kreutzweiser et al., 2007) |
| Microcosm | imidacloprid | single pulse (12 to 96) | Diptera, Plecoptera | Litter decomposition (<12), survival (48) |  | (Kreutzweiser et al., 2008b) |
| Microcosm | imidacloprid | leaves (3 to 11 ppm) | Diptera, Plecoptera | Litter decomposition (11 ppm in leaves) |  | (Kreutzweiser et al., 2008a) |
| Microcosm | thiacloprid | Single pulse (0.5 to 4) | Ephemeroptera, Gammaridae | Litter consumption (1)  Weight loss (4) | Predation increased (0.5) | (Englert et al., 2012) |
| Nanocosm | thiacloprid | 5 pulses (3.3, 10 and 33) over 9 months | Diptera, Cladocera | No competition 🡪 reduction (10) and recovery | Competition 🡪 reduction (3.3) | (Liess et al., 2013) |
| Outdoor stream | imidacloprid | 3 weekly pulses (2 and 20) | Coleoptera, Ephemeroptera, Plecoptera, Trichoptera, Oligochaeta, | Abundance reduction (1.6), diversity (17.6) |  | (Pestana et al., 2009) |
| Outdoor stream | imidacloprid | Single pulse (0.1 to 10) | Ephemeroptera, Oligochaeta | Feeding inhibition (1), survival (<6) |  | (Alexander et al., 2007) |
| Outdoor stream | imidacloprid | Continuous (0.1) | Ephemeroptera | Body length (0.1) |  | (Alexander et al., 2008) |
| Outdoor stream | imidacloprid | 3 weekly pulses (12) twice | Gammarus roseli | Fecundity (<12) |  | (Böttger et al., 2013) |
| Outdoor stream | thiacloprid | single pulse (0.5 to 9,520) | Diptera, Odonata, Trichoptera, Cladocera, Gammaridae, Isopoda | Delayed mortality up to 30 days post-exposure  HC5 = 0.72 μg/L |  | (Beketov and Liess, 2008a) |
| Outdoor stream | thiacloprid | Single pulse (0.1, 3.2 and 100) | Green algae, Diptera, Ephemeroptera, Odonata, Trichoptera, Isopoda, Oligochaeta | Abundance reduction (3.2) | Algae, Chironomidae and Odonata increased | (Kattwinkel et al., 2016) |
| Outdoor stream | thiacloprid | Single pulse (0.1, 3.2 and 100) over 7 months | Coleoptera, Diptera, Ephemeroptera, Heteroptera, Odonata, Plecoptera, Trichoptera, Amphipoda, Isopoda, Oligochaeta | NOEC community (0.1)  LOEC community (3.2)  Univoltine and semivoltine species no recovery | Mulivoltine species recovery (10 weeks) | (Beketov et al., 2008) |
| Pond microcosm | imidacloprid | 2 x 21-d pulses (0.6 and 23.5) | Baetidae, Chironomidae | Community effects (0.6) |  | (Ratte and Memmert, 2003) |
| Pond microcosm | imidacloprid | 3 weekly pulses (6 and 40) | Chironomidae, Ephemeroptera | Abundance reduction, emergence & survival (2.3) | Increase in snails (*Radix* sp.) | (Colombo et al., 2013) |
| Rice field | imidacloprid | Spray @100 g/ha (52) |  | Potentially Affected Fraction (40-63%) |  | (Daam et al., 2013) |
| Rice mesocosms | imidacloprid | seedlings @ (240) | Green algae, Coleoptera, Diptera, Ephemeroptera, Heteroptera, Odonata, Archnida, Cladocera, Ostracoda, Copepoda, Mollusca, Oligochaeta | Abundance reduction (~1)  Community structure change  Predators reduction | Copepoda and Oligochaeta increased | (Sánchez-Bayo and Goka, 2006) |
| Rice mesocosms | imidacloprid | seedlings (190) | Cladocera and Diptera (except Chironomidae) increased | (Sánchez-Bayo et al., 2007) |
| Rice mesocosms | imidacloprid | seedlings @ 100 g/box (50) | Coleoptera, Diptera, Ephemeroptera, Heteroptera, Odonata, Cladocera, Ostracoda, Copepoda, Mollusca, Oligochaeta | Abundance reduction (~1)  Community structure change  Fish body size |  | (Hayasaka et al., 2012a) |
| Rice mesocosms | imidacloprid | seedlings @ 100 g/box (40) | Ephemeroptera, Heteroptera, Coleoptera and Ostracoda increased | (Hayasaka et al., 2012b) |
| Stream microcosm | imidacloprid | 3 weekly pulses (12) | Ephemeroptera, Chironomidae, Trichoptera | Abundance reduction (<12) | Gammaridae increased | (Mohr et al., 2012) |
| Stream microcosm | imidacloprid | 3 weekly pulses (12) | Ephemeroptera, Gammaridae | Downstream drift (<12) |  | (Berghahn et al., 2012) |
| Stream microcosm | imidacloprid, thiacloprid, acetamiprid | 1/10 LC50 | Diptera, Ephemeroptera, Gammaridae | Downstream drift (1/10 of LC50 for each compound) |  | (Beketov and Liess, 2008b) |

**References**

Alexander, A.C., Culp, J.M., Liber, K., and Cessna, A.J. (2007). Effects of insecticide exposure on feeding inhibition in mayflies and oligochaetes. *Environmental Toxicology and Chemistry* 26**,** 1726-1732.

Alexander, A.C., Heard, K.S., and Culp, J.M. (2008). Emergent body size of mayfly survivors. *Freshwater Biology* 53**,** 171-180.

Beketov, M., Schäfer, R.B., Marwitz, A., Paschke, A., and Liess, M. (2008). Long-term stream invertebrate community alterations induced by the insecticide thiacloprid: Effect concentrations and recovery dynamics. *Science of the Total Environment* 405**,** 96-108.

Beketov, M.A., and Liess, M. (2008a). Acute and delayed effects of the neonicotinoid insecticide thiacloprid on seven freshwater arthropods. *Environmental Toxicology and Chemistry* 27**,** 461-470.

Beketov, M.A., and Liess, M. (2008b). Potential of 11 pesticides to initiate downstream drift of stream macroinvertebrates. *Archives of Environmental Contamination and Toxicology* 55**,** 247-253.

Berghahn, R., Mohr, S., Hübner, V., Schmiediche, R., Schmiedling, I., Svetich-Will, E., and Schmidt, R. (2012). Effects of repeated insecticide pulses on macroinvertebrate drift in indoor stream mesocosms. *Aquatic Toxicology* 122-123**,** 56-66.

Böttger, R., Feibicke, M., Schaller, J., and Dudel, G. (2013). Effects of low-dosed imidacloprid pulses on the functional role of the caged amphipod *Gammarus roeseli* in stream mesocosms. *Ecotoxicology and Environmental Safety* 93**,** 93-100.

Colombo, V., Mohr, S., Berghahn, R., and Pettigrove, V.J. (2013). Structural changes in a macrozoobenthos assemblage after imidacloprid pulses in aquatic field-based microcosms. *Archives of Environmental Contamination and Toxicology* 65**,** 683-692.

Daam, M.A., Santos Pereira, A.C., Silva, E., Caetano, L., and Cerejeira, M.J. (2013). Preliminary aquatic risk assessment of imidacloprid after application in an experimental rice plot. *Ecotoxicology and Environmental Safety* 97**,** 78-85.

Englert, D., Bundschuh, M., and Schulz, R. (2012). Thiacloprid affects trophic interaction between gammarids and mayflies. *Environmental Pollution* 167**,** 41-46.

Hayasaka, D., Korenaga, T., Sánchez-Bayo, F., and Goka, K. (2012a). Differences in ecological impacts of systemic insecticides with different physicochemical properties on biocenosis of experimental paddy fields. *Ecotoxicology* 21**,** 191-201.

Hayasaka, D., Korenaga, T., Suzuki, K., Saito, F., Sánchez-Bayo, F., and Goka, K. (2012b). Cumulative ecological impacts of two successive annual treatments of imidacloprid and fipronil on aquatic communities of paddy mesocosms. *Ecotoxicology and Environmental Safety* 80**,** 355-362.

Kattwinkel, M., Reichert, P., Rüegg, J., Liess, M., and Schuwirth, N. (2016). Modeling macroinvertebrate community dynamics in stream mesocosms contaminated with a pesticide. *Environmental Science & Technology* 50**,** 3165-3173.

Kreutzweiser, D., Good, K., Chartrand, D., Scarr, T., and Thompson, D. (2007). Non-target effects on aquatic decomposer organisms of imidacloprid as a systemic insecticide to control emerald ash borer in riparian trees. *Ecotoxicology and Environmental Safety* 68**,** 315-325.

Kreutzweiser, D.P., Good, K.P., Chartrand, D.T., Scarr, T.A., and Thompson, D.G. (2008a). Are leaves that fall from imidacloprid-treated maple trees to control Asian longhorned beetles toxic to non-target decomposer organisms? *Journal of Environmental Quality* 37**,** 639-646.

Kreutzweiser, D.P., Good, K.P., Chartrand, D.T., Scarr, T.A., and Thompson, D.G. (2008b). Toxicity of the systemic insecticide, imidacloprid, to forest stream insects and microbial communities. *Bulletin of Environmental Contamination and Toxicology* 80**,** 211-214.

Liess, M., Foit, K., Becker, A., Hassold, E., Dolciotti, I., Kattwinkel, M., and Duquesne, S. (2013). Culmination of low-dose pesticide effects. *Environmental Science & Technology* 47**,** 8862-8868.

Mohr, S., Berghahn, R., Schmiediche, R., Hübner, V., Loth, S., Feibicke, M., Mailahn, W., and Wogram, J. (2012). Macroinvertebrate community response to repeated short-term pulses of the insecticide imidacloprid. *Aquatic Toxicology* 110-111**,** 25-36.

Pestana, J.L.T., Alexander, A.C., Culp, J.M., Baird, D.J., Cessna, A.J., and Soares, A.M.V.M. (2009). Structural and functional responses of benthic invertebrates to imidacloprid in outdoor stream mesocosms. *Environmental Pollution* 157**,** 2328-2334.

Ratte, H., and Memmert, A. (2003). "Biological effects and fate of imidacloprid SL 200 in outdoor microcosm ponds". (Ittingen, Switzerland: RCC Ltd).

Sánchez-Bayo, F., Ahmad, R., and Goka, K. (2007). "Evaluation of the standard quotient and EcoRR methodologies based on field monitoring from rice fields," in *Rational Environmental Management of Agrochemicals,* eds. I.R. Kennedy, K.R. Solomon, S.J. Gee, A.N. Crossan, S. Wang & F. Sánchez-Bayo. (Washington, DC: American Chemical Society), 66-86.

Sánchez-Bayo, F., and Goka, K. (2006). Ecological effects of the insecticide imidacloprid and a pollutant from antidandruff shampoo in experimental rice fields. *Environmental Toxicology and Chemistry* 25**,** 1677-1687.