# 典型酰胺类除草剂的水生生物水质基准

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表S1 酰胺类农药的急性和慢性毒性数据

Table S1 Acute and chronic toxicity data of amide pesticides

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 物种Species | 拉丁名Latin name | 效应Effect | 效应终点Effect endpoint | 暴露时间（d）Exposure time（d） | 毒性值（mg·L−1）Toxicity value（mg·L−1） | 最终毒性值Final toxicity value | 成分Ingredient | 可靠度Reliability | 参考文献References |
| 甲草胺急性毒性 Alachlor acute toxicity |
| 美洲蟾蜍\* | *Bufo americanus* | 死亡Mortality | LC50 | 4 | 3.3 | 3.58748 | 43%乳油EC | 2 | [1] |
| 美洲蟾蜍\* | *Bufo americanus* | 死亡Mortality | LC50 | 4 | 3.9 | 2 | [1] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 死亡Mortality | LC50 | 2 | 7.9 | 10.651 | 99%原药TC | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 死亡Mortality | LC50 | 2 | 14.36 | 41.5%乳油EC | 1 | [3] |
| 小球藻 | *Chlorella vulgaris* | 生长Growth | EC50 | 1 | 18.6 | 18.6 | 40%乳油EC | 2 | [4] |
| 隆线溞 | *Cladoceran Daphnia carinata* | 死亡Mortality | LC50 | 2 | 11.1 | 11.1 | 99.2%原药TC | 2 | [5] |
| 斑马鱼\* | *Danio rerio* | 生长Growth | EC50 | 4 | 9.45 | 5.2488 | 93%原药TC | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 生长Growth | LC50 | 4 | 1.9 | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 14.5 | 1 | [6] |
| 斑点叉尾鮰 | *Ictalurus punctatus* | 死亡Mortality | LC50 | 4 | 16.7 | 16.7 | 43%乳油EC | 2 | [1] |
| 豹蛙\* | *Rana pipiens* | 死亡Mortality | LC50 | 4 | 3.5 | 6.34429 | 43%乳油EC | 2 | [1] |
| 豹蛙\* | *Rana pipiens* | 死亡Mortality | LC50 | 4 | 11.5 | 2 | [1] |
| 虹鳟鱼 | *Oncorhynchus mykiss* | 死亡Mortality | LC50 | 4 | 9.1 | 9.1 | 99%原药TC | 2 | [2] |
| 黑头呆鱼\* | *Pimephales promelas* | 死亡Mortality | LC50 | 4 | 5 | 5 | 92.6%原药TC | 2 | [7] |
| 大菱鲆 | *Scophthalmus maximus* | 死亡Mortality | LC50 | 4 | 1.838 | 1.838 | 99.2%原药TC | 2 | [8] |
| 非洲爪蟾\* | *Xenopus laevis* | 死亡Mortality | LC50 | 4 | 6.1 | 6.1 | 99%原药TC | 2 | [9] |
| 甲草胺慢性毒性Alachlor chronic toxicity |  |
| 鲫鱼 | *Carassius auratus* | 形态Morphology | LOEL | 60 | 0.001 | 0.001 | 99%原药TC | 2 | [10] |
| 鲫鱼 | *Carassius auratus* | 激素 Hormone(s) | LOEL | 60 | 0.001 | 2 | [11] |
| 鲫鱼 | *Carassius auratus* | 酶 Enzyme(s) | LOEL | 60 | 0.001 | 2 | [10] |
| 金鱼藻 | *Ceratophyllum demersum* | 生长Growth | EC50 | 4 | 0.085 | 0.085 | 94.1%活性成分a.i. | 2 | [12] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 繁殖Reproduction | IC50 | 4 | 5.9 | 6.401848 | 99%原药TC | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 生长Growth | IC50 | 4 | 7.3 | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 生长Growth | IC50 | 7 | 2.5 | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 繁殖Reproduction | IC50 | 7 | 4.3 | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 死亡Mortality | LOEC | 7 | 25 | 41.5%乳油EC | 1 | [3] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 繁殖Reproduction | LOEC | 7 | 25 | 1 | [3] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 繁殖Reproduction | MATC | 4 | 5.3 | 99%原药TC | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 死亡Mortality | MATC | 4 | 6.9 | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 死亡Mortality | MATC | 7 | 2.8 | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 繁殖Reproduction | MATC | 7 | 5.3 | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 繁殖Reproduction | MATC | 7 | 17.68 | 41.5%乳油EC | 1 | [3] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 繁殖Reproduction | NOEC | 7 | 12.5 | 1 | [3] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 死亡Mortality | NOEC | 7 | 12.5 | 1 | [3] |
| 衣藻 | *Chlamydomonas* | 生长Growth | EC50 | 4 | 0.46 | 0.46 | 94.1%活性成分a.i. | 2 | [12] |
| 小球藻 | *Chlorella vulgaris* | 生长Growth | EC50 | 4 | 0.026 | 0.37935 | 99%原药TC | 2 | [2] |
| 小球藻 | *Chlorella vulgaris* | 生长Growth | EC50 | 4 | 5.54 | 40%乳油EC | 2 | [4] |
| 鲤鱼 | *Cyprinus carpio* | 细胞 Cell(s） | LOEL | 28 | 1 | 0.1 | 42% 活性成分a.i. | 2 | [13] |
| 鲤鱼 | *Cyprinus carpio* | 细胞 Cell(s） | LOEL | 28 | 0.1 | 2 | [13] |
| 鲤鱼 | *Cyprinus carpio* | 生理变化Biochemistry | LOEL | 28 | 0.1 | 2 | [13] |
| 鲤鱼 | *Cyprinus carpio* | 遗传Genetics | NOEC | 30 | 0.1 | 乳油EC | 2 | [14] |
| 鲤鱼 | *Cyprinus carpio* | 遗传Genetics | NOEC | 60 | 0.1 | 2 | [14] |
| 大型蚤 | *Daphnia magna* | 死亡Mortality | NOEL | 6 | 0.1 | 0.1 | 原药TC | 2 | [15] |
| 大型蚤 | *Daphnia magna* | 繁殖Reproduction | NOEL | 6 | 0.1 | 2 | [15] |
| 大型蚤 | *Daphnia magna* | 生长Growth | NOEL | 6 | 0.1 | 2 | [15] |
| 浮萍 | *Lemna* | 生长Growth | EC50 | 4 | 0.482 | 0.482 | 94.1%活性成分a.i. | 2 | [12] |
| 豹蛙\* | *Lithobates pipiens* | 生长Growth | NOEC | 46 | 0.00015 | 0.00015 | 97%原药TC | 2 | [16] |
| 豹蛙\* | *Lithobates pipiens* | 死亡Mortality | NOEC | 46 | 0.00015 | 2 | [16] |
| 茨藻 | *Najas* | 生长Growth | EC50 | 4 | 0.584 | 0.584 | 94.1%活性成分a.i. | 2 | [12] |
| 黑头呆鱼\* | *Pimephales promelas* | 生长Growth | LOEC | 64 | 1.08 | 1.08 | 92.6%原药TC | 2 | [17] |
| 黑头呆鱼\* | *Pimephales promelas* | 死亡Mortality | MATC | 64 | 1.08 | 2 | [17] |
| 黑头呆鱼\* | *Pimephales promelas* | 发育Development | NOEC | 6 | 1.1 | 2 | [7] |
| 黑头呆鱼\* | *Pimephales promelas* | 死亡Mortality | NOEC | 6 | 1.1 | 2 | [7] |
| 黑头呆鱼\* | *Pimephales promelas* | 死亡Mortality | NOEC | 60 | 1.1 | 2 | [7] |
| 黑头呆鱼\* | *Pimephales promelas* | 生长Growth | NOEC | 64 | 0.517 | 2 | [17] |
| 四尾栅藻 | *Scendesmus quadricauda* | 生长Growth | EC50 | 4 | 1.328 | 1.328 | 94.1%活性成分a.i. | 2 | [12] |
| 月牙藻 | *Selenastrum* | 生长Growth | EC50 | 4 | 0.01 | 0.01 | 94.1%活性成分a.i. | 2 | [12] |
| 剑水蚤 | *Tigriopus japonicus* | 繁殖Reproduction | NOEL | 14 | 0.1 | 0.1 | 99%原药TC | 2 | [17] |
| 剑水蚤 | *Tigriopus japonicus* | 发育Development | NOEL | 14 | 0.1 | 2 | [18] |
| 剑水蚤 | *Tigriopus japonicus* | 繁殖Reproduction | NOEL | 14 | 0.1 | 2 | [18] |
| 剑水蚤 | *Tigriopus japonicus* | 发育Development | NOEL | 14 | 0.1 | 2 | [18] |
| 乙草胺急性毒性Acetochlor acute toxicity |
| 小球藻 | *Chlorella pyrenoidosa* | 酶 Enzyme(s) | EC50 | 1 | 0.1 | 0.1 | 95%原药TC | 2 | [19] |
| 隆线溞 | *Cladoceran Daphnia carinata* | 死亡Mortality | LC50 | 2 | 11.8 | 11.8 | 99.7%原药TC | 2 | [5] |
| 斑马鱼\* | *Danio rerio* | 生长Growth | EC50 | 4 | 1.28 | 2.412 | 98%原药TC | 1 | [20] |
| 斑马鱼\* | *Danio rerio* | 生长Growth | EC50 | 4 | 2.8 | 95%原药TC | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 0.703 | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 1.34 | 93%原药TC | 2 | [21] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 1.44 | 2 | [21] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 1.52 | 93.2%原药TC | 2 | [22] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 1.86 | 50%乳油EC | 2 | [23] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 2.9 | 98%原药TC | 1 | [20] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 2.9 | 93.2%原药TC | 1 | [24] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 3 | 93%原药TC | 2 | [21] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 3.04 | 93.2%原药TC | 2 | [25] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 4.45 | 95%原药TC | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 5.09 | 98%原药TC | 1 | [20] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 5.82 | 93%原药TC | 2 | [21] |
| 克氏原螯虾 | *Procambarus clarkii* | 死亡Mortality | LC50 | 2 | 0.1235 | 0.1235 | 50%乳油EC | 2 | [26] |
| 非洲爪蟾\* | *Xenopus laevis* | 死亡Mortality | LC50 | 4 | 3.03 | 3.03 | 92.3%原药TC | 2 | [27] |
| 热带爪蟾\* | *Xenopus tropicalis* | 死亡Mortality | LC50 | 4 | 2.42 | 2.42 | 2 | [27] |
| 乙草胺慢性毒性Acetochlor chronic toxicity |
| 斑马鱼\* | *Danio rerio* | 激素 Hormone(s) | NOEC | 7 | 0.001 | 0.01 | 95%原药TC | 2 | [28] |
| 斑马鱼\* | *Danio rerio* | 激素 Hormone(s) | NOEC | 7 | 0.01 | 2 | [28] |
| 斑马鱼\* | *Danio rerio* | 激素 Hormone(s) | NOEC | 7 | 0.1 | 2 | [28] |
| 大型蚤 | *Daphnia magna* | 繁殖Reproduction | LOEL | 6 | 0.1 | 0.1 | 原药TC | 2 | [15] |
| 大型蚤 | *Daphnia magna* | 生长Growth | LOEL | 6 | 0.1 | 2 | [15] |
| 大型蚤 | *Daphnia magna* | 死亡Mortality | NOEL | 6 | 0.1 | 2 | [15] |
| 小球藻 | *Chlorella vulgaris* | 生长Growth | EC50 | 4 | 6.7632 | 15.3317 | 原药TC | 2 | [29] |
| 小球藻 | *Chlorella vulgaris* | 生长Growth | EC50 | 4 | 34.7561 | 80%原药TC | 2 | [30] |
| 蛋白核小球藻 | *Chlorella pyrenoidosa* | 生长Growth | NOEC | 7 | 1 | 3.1623 | 95%原药TC | 2 | [19] |
| 蛋白核小球藻 | *Chlorella pyrenoidosa* | 生长Growth | NOEC | 7 | 10 | 2 | [19] |
| 稀有鮈鲫 | *Gobiocypris rarus* | 遗传Genetics | NOEC | 21 | 0.0002 | 0.00062 | 99.5%原药TC | 2 | [31] |
| 稀有鮈鲫 | *Gobiocypris rarus* | 遗传Genetics | NOEC | 21 | 0.002 | 2 | [19] |
| 蓝藻水华微囊藻 | *Microcystis flos-aquae* | 生长Growth | NOEC | 9 | 10 | 10 | 90%原药TC | 2 | [32] |
| 克氏原螯虾 | *Procambarus clarkii* | 死亡Mortality | LC50 | 4 | 0.0707 | 0.0707 | 50%乳油EC | 2 | [26] |
| 羊角月牙藻 | *Pseudokirchneriella subcapitat* | 生长Growth | EC50 | 4 | 1.5887 | 1.5887 | 80%原药TC | 2 | [33] |
| 四尾栅藻 | *Scendesmus quadricauda* | 生长Growth | EC50 | 4 | 4.3 | 4.3 | 80%原药TC | 2 | [34] |
| 斜生栅藻 | *scenedesmus obliquu* | 生长Growth | EC50 | 4 | 33.8948 | 33.8948 | 原药TC | 2 | [29] |
| 丙草胺急性毒性Pretilachlor acute toxicity |
| 斑马鱼\* | *Danio rerio* | 生长Growth | EC50 | 4 | 1.36 | 2.204 | 96.8%原药TC | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 生长Growth | LC50 | 4 | 1.74 | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 2.01 | 2 | [21] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 2.02 | 2 | [21] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 2.26 | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 2.57 | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 2.79 | 2 | [21] |
| 大型溞 | *Daphnia magna* | 死亡Mortality | LC50 | 2 | 5.01 | 5.01 | 80%原药TC | 2 | [35] |
| 泥鳅 | *Misgurnus anguillicaudatus* | 死亡Mortality | LC50 | 4 | 0.40197 | 1.372 |  | 2 | [36] |
| 泥鳅 | *Misgurnus anguillicaudatus* | 死亡Mortality | LC50 | 4 | 4.6795 | 2 | [36] |
| 大鳞副泥鳅 | *Paramisgurnus dabryanus* | 死亡Mortality | LC50 | 4 | 0.3265 | 1.293 | 2 | [36] |
| 大鳞副泥鳅 | *Paramisgurnus dabryanus* | 死亡Mortality | LC50 | 4 | 5.1225 | 2 | [36] |
| 克氏原螯虾 | *Procambarus clarkii* | 死亡Mortality | LC50 | 2 | 0.0157 | 0.0157 | 50%乳油EC | 2 | [26] |
| 非洲爪蟾\* | *Xenopus laevis* | 死亡Mortality | LC50 | 4 | 5.35 | 5.350 | 96.2%原药TC | 2 | [27] |
| 热带爪蟾\* | *Xenopus tropicalis* | 死亡Mortality | LC50 | 4 | 4.77 | 4.770 | 2 | [27] |
| 丙草胺慢性毒性Pretilachlor chronic toxicity |
| 小球藻 | *Chlorella vulgaris* | 生长Growth | EC50 | 3 | 0.734 | 20.03 | 96.6%原药TC | 2 | [37] |
| 小球藻 | *Chlorella vulgaris* | 生长Growth | EC50 | 3 | 3.304 | 2 | [37] |
| 小球藻 | *Chlorella vulgaris* | 生长Growth | EC50 | 4 | 20.03 | 90%原药TC | 2 | [30] |
| 胡鲶 | *Clarias batrachus (Linnaeus)* | 激素 Hormone(s) | LC50 | 30 | 0.29 | 0.4 | 50%乳油EC | 2 | [38] |
| 胡鲶 | *Clarias batrachus (Linnaeus)* | 激素 Hormone(s) | LC50 | 30 | 0.38 | 2 | [38] |
| 胡鲶 | *Clarias batrachus (Linnaeus)* | 激素 Hormone(s) | LC50 | 30 | 0.58 | 2 | [38] |
| 大型溞 | *Daphnia magna* | 生长Growth | EC50 | 21 | 0.55 | 0.08 | 80%原药TC | 2 | [35] |
| 大型溞 | *Daphnia magna* | 繁殖Reproduction | EC50 | 21 | 0.55 | 2 | [35] |
| 大型溞 | *Daphnia magna* | 繁殖Reproduction | MATC | 21 | 0.08 | 2 | [35] |
| 克氏原螯虾 | *Procambarus clarkii* | 死亡Mortality | LC50 | 4 | 0.0119 | 0.0119 | 50%乳油EC | 2 | [30] |
| 月牙藻 | *Selenastrum capricornutum* | 生长Growth | EC50 | 3 | 0.0013 | 0.1109 | 96.6原药TC | 2 | [37] |
| 月牙藻 | *Selenastrum capricornutum* | 生长Growth | EC50 | 3 | 0.0025 | 2 | [37] |
| 月牙藻 | *Selenastrum capricornutum* | 生长Growth | EC50 | 4 | 0.1109 | 90%原药TC | 2 | [30] |
| 丁草胺急性毒性Butachlor acute toxicity |
| 花背蟾蜍 | *Bufo raddei Strauch* | 死亡Mortality | LC50 | 4 | 1.654 | 2.22 | 60%乳油EC | 1 | [39] |
| 花背蟾蜍 | *Bufo raddei Strauch* | 死亡Mortality | LC50 | 4 | 1.928 | 1 | [39] |
| 花背蟾蜍 | *Bufo raddei Strauch* | 死亡Mortality | LC50 | 4 | 3.431 | 1 | [39] |
| 中华大蟾蜍 | *Bufo bufo Gargarizans* | 生长Growth | LC50 | 4 | 0.462 | 0.479 | 60%乳油EC | 2 | [40] |
| 中华大蟾蜍 | *Bufo bufo Gargarizans* | 生长Growth | LC50 | 4 | 0.496 | 2 | [40] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 死亡Mortality | LC50 | 2 | 3 | 3 | 99%原药TC | 2 | [2] |
| 隆线溞 | *cladoceran Daphnia carinata* | 死亡Mortality | LC50 | 2 | 3.4 | 3.42 | 99.7%原药TC | 2 | [41] |
| 隆线溞 | *cladoceran Daphnia carinata* | 死亡Mortality | LC50 | 2 | 3.45 | 99.2%原药TC | 2 | [5] |
| 鲫鱼 | *crucian* | 死亡Mortality | LC50 | 4 | 0.82 | 0.82 | 60%乳油EC | 2 | [42] |
| 斑马鱼\* | *Danio rerio* | 生长Growth | EC50 | 4 | 0.512 | 0.939799663 | 92.5%原药TC | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 0.32 | 96%原药TC | 2 | [43] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 0.45 | 95%原药TC | 1 | [44] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 0.45 | 95%原药TC | 2 | [45] |
| 斑马鱼\* | *Danio rerio* | 生长Growth | LC50 | 4 | 0.494 | 92.5%原药TC | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 0.919 | 2 | [21] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 0.951 | 50%乳油EC | 1 | [46] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 0.99 | 95%原药TC | 1 | [44] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 1.19 | 92.5%原药TC | 2 | [21] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 1.28 | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 1.73 | 2 | [44] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 1.93 | 95%原药TC | 1 | [44] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 3.37 | 92.5%原药TC | 2 | [21] |
| 泽陆蛙 | *Fejervarya limnocharis* | 死亡Mortality | LC50 | 4 | 0.87 | 0.87 | 60%活性成分a.i. | 2 | [47] |
| 白鲢鱼 | *Hypophthalmicthys molitris* | 死亡Mortality | LC50 | 4 | 0.134 | 0.134 | 60%乳油EC | 2 | [48] |
| 罗氏沼虾 | *Macrobrachium rosenbergii* | 死亡Mortality | LC50 | 2 | 7.71 | 7.71 | 99.2%原药TC | 2 | [49] |
| 贪食沼虾 | *Macrobrachium lar* | 死亡Mortality | LC50 | 2 | 8.18 | 8.18 | 活性成分a.i. | 2 | [50] |
| 泥鳅 | *Misgurnus anguillicaudatus* | 死亡Mortality | LC50 | 4 | 0.39223 | 1.10694 |  | 2 | [36] |
| 泥鳅 | *Misgurnus anguillicaudatus* | 死亡Mortality | LC50 | 4 | 3.124 | 2 | [36] |
| 罗非鱼 | *Oreochromis mossambicus* | 死亡Mortality | LC50 | 4 | 1.25 | 1.25 | 50%乳油EC | 2 | [51] |
| 大鳞副泥鳅 | *Paramisgurnus dabryanus* | 死亡Mortality | LC50 | 4 | 0.16487 | 0.67432 |  | 2 | [36] |
| 大鳞副泥鳅 | *Paramisgurnus dabryanus* | 死亡Mortality | LC50 | 4 | 2.758 | 2 | [36] |
| 克氏原螯虾 | *Procambarus clarkii* | 死亡Mortality | LC50 | 2 | 0.0126 | 0.0126 | 50%乳油EC | 2 | [26] |
| 羊角月牙藻 | *Pseudokirchneriella subcapitat* | 死亡Mortality | LC50 | 1 | 0.14 | 0.14 | 95%原药TC | 2 | [52] |
| 麦穗鱼 | *Pseudorasbora parva* | 死亡Mortality | LC50 | 4 | 0.33 | 0.33 | 60%乳油EC | 2 | [53] |
| 非洲爪蟾\* | *Xenopus laevis* | 死亡Mortality | LC50 | 4 | 2.18 | 2.18 | 92.5%原药TC | 2 | [27] |
| 热带爪蟾\* | *Xenopus tropicalis* | 死亡Mortality | LC50 | 4 | 2.13 | 2.13 |  | 2 | [27] |
| 丁草胺慢性毒性Butachlor chronic toxicity |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 生长Growth | IC50 | 4 | 1.29 | 0.8085 | 99%原药TC | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 繁殖Reproduction | IC50 | 4 | 1.19 | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 繁殖Reproduction | IC50 | 7 | 1.02 | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 生长Growth | IC50 | 7 | 1.14 | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 繁殖Reproduction | MATC | 4 | 0.53 | 2 | [2] |
| 模糊网纹蚤 |  *Ceriodaphnia dubia* | 生长Growth | MATC | 4 | 0.86 | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 繁殖Reproduction | MATC | 7 | 0.76 | 2 | [2] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 生长Growth | MATC | 7 | 0.86 | 2 | [2] |
| 蛋白核小球藻 | *Chlorella pyrenoidosa* | 生长Growth | EC50 | 4 | 3.63 | 3.63 | 90%原药TC | 2 | [54] |
| 小球藻 | *Chlorella vulgaris* | 生长Growth | EC50 | 4 | 8.6162 | 8.6162 | 93%原药TC | 2 | [30] |
| 斑马鱼\* | *Danio rerio* | 遗传Genetics | LOEC | 10 | 0.0064 | 0.29428 | 96%原药TC | 2 | [43] |
| 斑马鱼\* | *Danio rerio* | 激素 Hormone(s) | LOEC | 10 | 0.032 | 2 | [43] |
| 斑马鱼\* | *Danio rerio* | 遗传Genetics | LOEC | 10 | 0.032 | 2 | [43] |
| 斑马鱼\* | *Danio rerio* | 形态Morphology | LOEC | 30 | 0.05 | 1 | [55] |
| 斑马鱼\* | *Danio rerio* | 繁殖Reproduction | LOEC | 30 | 0.05 | 1 | [55] |
| 斑马鱼\* | *Danio rerio* | 激素 Hormone(s) | LOEC | 30 | 0.05 | 1 | [55] |
| 斑马鱼\* | *Danio rerio* | 激素 Hormone(s) | LOEC | 30 | 0.1 | 1 | [55] |
| 斑马鱼\* | *Danio rerio* | 生理变化Biochemistry | LOEC | 30 | 0.1 | 1 | [55] |
| 斑马鱼\* | *Danio rerio* | 激素 Hormone(s) | NOEC | 10 | 0.0064 | 2 | [43] |
| 斑马鱼\* | *Danio rerio* | 遗传Genetics | NOEC | 10 | 0.0064 | 2 | [43] |
| 斑马鱼\* | *Danio rerio* | 遗传Genetics | NOEC | 10 | 0.032 | 2 | [43] |
| 斑马鱼\* | *Danio rerio* | 生理变化Biochemistry | NOEC | 30 | 0.05 | 1 | [55] |
| 斑马鱼\* | *Danio rerio* | 激素 Hormone(s) | NOEC | 30 | 0.05 | 1 | [55] |
| 斑马鱼\* | *Danio rerio* | 激素 Hormone(s) | NOEC | 30 | 0.1 | 1 | [55] |
| 斑马鱼\* | *Danio rerio* | 生理变化Biochemistry | NOEC | 30 | 0.1 | 1 | [55] |
| 罗非鱼 | *Oreochromis mossambicus* | 死亡Mortality | LC50 | 7 | 1.092 | 1.092 | 活性成分a.i. | 2 | [50] |
| 尼罗罗非鱼 | *Oreochromis niloticus* | 生理变化Biochemistry | NOEC | 14 | 0.21 | 0.21 |  | 2 | [56] |
| 尼罗罗非鱼 | *Oreochromis niloticus* | 生理变化Biochemistry | NOEC | 21 | 0.21 | 2 | [56] |
| 尼罗罗非鱼 | *Oreochromis niloticus* | 生理变化Biochemistry | NOEC | 28 | 0.21 | 2 | [56] |
| 尼罗罗非鱼 | *Oreochromis niloticus* | 生理变化Biochemistry | NOEC | 42 | 0.21 | 2 | [56] |
| 克氏原螯虾 | *Procambarus clarkii* | 死亡Mortality | LC50 | 4 | 0.0073 | 0.0073 | 50%乳油EC | 2 | [26] |
| 月牙藻 | *Pseudokirchneriella subcapitata* | 生长Growth | EC50 | 4 | 0.2104 | 0.2104 | 90%原药TC | 2 | [33] |
| 四尾栅藻 | *Scendesmus quadricauda* | 生长Growth | EC50 | 4 | 0.2 | 0.2 | 90%原药TC | 2 | [34] |
| 斜生栅藻 | *Scenedesmus obliquus* | 死亡Mortality | EC50 | 4 | 2.31 | 4.03152 | 99.7%原药TC | 2 | [41] |
| 斜生栅藻 | *scenedesmus obliquus* | 生长Growth | EC50 | 4 | 7.036 | 90%原药TC | 2 | [54] |
| 异丙甲草胺急性毒性Metolachlor acute toxicity |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 死亡Mortality | LC50 | 2 | 15.93 | 15.93 | 36.1%活性成分a.i. | 1 | [3] |
| 莱茵衣藻 | *Chlamydomonas reinhardtii* | 发育Development | EC50 | 2 | 6.9 | 6.9 | 活性成分a.i. | 2 | [57] |
| 斑马鱼\* | *Danio rerio* | 生长Growth | EC50 | 4 | 7.8 | 13.8866 | 92.5%原药TC | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 发育Development | EC50 | 4 | 29.4 | 98.4%原药TC | 2 | [58] |
| 斑马鱼\* | *Danio rerio* | 生长Growth | LC50 | 4 | 3.05 | 92.5%原药TC | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 19 | 1 | [6] |
| 斑马鱼\* | *Danio rerio* | 死亡Mortality | LC50 | 4 | 46.21 | 98.4%原药TC | 2 | [58] |
| 长刺溞 | *Daphnia longispina* | 发育Development | EC50 | 2 | 18.71 | 20.98205 | 活性成分a.i. | 2 | [59] |
| 长刺溞 | *Daphnia longispina* | 发育Development | EC50 | 2 | 23.53 | 2 | [59] |
| 蚤状钩虾 | *Gammarus pulex* | 死亡Mortality | EC50 | 4 | 8.47 | 9.47087 | 98.4%原药TC | 2 | [60] |
| 蚤状钩虾 | *Gammarus pulex* | 死亡Mortality | EC50 | 4 | 10.59 | 2 | [60] |
| 斜生栅藻 | *Scenedesmus obliquus* | 生长Growth | EC50 | 1 | 0.24 | 0.24 | 96%原药TC | 2 | [61] |
| 斜生栅藻 | *Scenedesmus obliquus* | 生长Growth | EC50 | 1 | 0.24 | 2 | [62] |
| 底栖蛤蜊 | *Scrobicularia plana* | 死亡Mortality | LC50 | 4 | 40.702 | 41.10748 | 活性成分a.i. | 2 | [63] |
| 底栖蛤蜊 | *Scrobicularia plana* | 死亡Mortality | LC50 | 4 | 41.517 | 2 | [63] |
| 非洲爪蟾\* | *Xenopus laevis* | 形态Morphology | EC50 | 4 | 15.16 | 13.6 | 98%原药TC | 2 | [64] |
| 非洲爪蟾\* | *Xenopus laevis* | 死亡Mortality | LC50 | 4 | 13.6 | 99%原药TC | 2 | [9] |
| 异丙甲草胺慢性毒性Metolachlor chronic toxicity |
| 金鱼藻 | *Ceratophyllum demersum* | 生长Growth | EC50 | 4 | 0.07 | 0.07 | 94.1%原药TC | 2 | [12] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 繁殖Reproduction | LOEC | 7 | 12.5 | 8.84 | 36.1%活性成分a.i. | 1 | [3] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 死亡Mortality | LOEC | 7 | 25 | 1 | [3] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 繁殖Reproduction | MATC | 7 | 8.84 | 1 | [3] |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 死亡Mortality | NOEC | 7 | 12.5 | 1 | [3] |
| 衣藻 | *Chlamydomonas* | 生长Growth | EC50 | 4 | 1.138 | 1.138 | 94.1%原药TC | 2 | [12] |
| 小球藻 | *Chlorella vulgaris* | 生长Growth | EC50 | 4 | 0.203 | 1.6067 | 94.1%原药TC | 2 | [12] |
| 小球藻 | *Chlorella vulgaris* | 生长Growth | EC50 | 4 | 12.7172 | 原药TC |  | [29] |
| 大型蚤 | *Daphnia magna* | 生长Growth | NOEL | 6 | 0.1 | 0.1 | 原药TC | 2 | [15] |
| 大型蚤 | *Daphnia magna* | 繁殖Reproduction | NOEL | 6 | 0.1 | 2 | [15] |
| 大型蚤 | *Daphnia magna* | 死亡Mortality | NOEL | 6 | 0.1 | 2 | [15] |
| 伊乐藻 | *Elodea* | 生长Growth | EC50 | 4 | 2.355 | 2.355 | 94.1%原药TC | 2 | [12] |
| 浮萍 | *Lemna* | 生长Growth | EC50 | 4 | 0.36 | 0.36 | 94.1%原药TC | 2 | [12] |
| 豹蛙\* | *Lithobates pipiens* | 生长Growth | NOEC | 42 | 0.00022 | 0.00022 | 97%原药TC | 2 | [16] |
| 豹蛙\* | *Lithobates pipiens* | 发育Development | NOEL | 42 | 0.00022 | 2 | [16] |
| 豹蛙\* | *Lithobates pipiens* | 死亡Mortality | NOEL | 42 | 0.00022 | 2 | [16] |
| 豹蛙\* | *Lithobates pipiens* | 生长Growth | NOEL | 42 | 0.00022 | 2 | [16] |
| 茨藻 | *Najas* | 生长Growth | EC50 | 4 | 0.242 | 0.242 | 94.1%原药TC | 2 | [12] |
| 螯虾 | *Orconectes rusticus* | 行为Behavior | LOEL | 4 | 0.025 | 0.05192 | 96.1%原药TC | 1 | [65] |
| 螯虾 | *Orconectes rusticus* | 行为Behavior | LOEL | 4 | 0.08 | 1 | [65] |
| 螯虾 | *Orconectes rusticus* | 行为Behavior | NOEL | 4 | 0.07 | 1 | [65] |
| 青鳉 | *Oryzias latipes* | 遗传Genetics | NOEC | 14 | 0.1 | 0.1 | 98%原药TC | 2 | [66] |
| 四尾栅藻 | *Scendesmus quadricauda* | 生长Growth | EC50 | 4 | 0.6 | 0.6 | 50%湿性粉剂WP | 2 | [34] |
| 斜生栅藻 | *Scenedesmus obliquus* | 生长Growth | EC50 | 4 | 0.13 | 1.5873 | 96%原药TC | 2 | [62] |
| 斜生栅藻 | *scenedesmus obliquu* | 生长Growth | EC50 | 4 | 19.3811 | 原药TC | 2 | [29] |
| 月牙藻 | *Selenastrum* | 生长Growth | EC50 | 4 | 0.084 | 0.084 | 94.1%原药TC | 2 | [12] |
| 敌稗急性毒性Propanil acute toxicity |
| 模糊网纹蚤 | *Ceriodaphnia dubia* | 死亡Mortality | LC50 | 2 | 1.65 | 1.65 | 43.5%活性成分a.i. | 2 | [67] |
| 斑马鱼\* | *Danio rerio* | 形态Morphology | EC50 | 4 | 1.8 | 1.8 | 99.8%原药TC | 2 | [68] |
| 大型蚤 | *Daphnia magna* | 中毒Intoxication | EC50 | 2 | 2.1 | 2.99399 | 活性成分a.i. | 2 | [69] |
| 大型蚤 | *Daphnia magna* | 中毒Intoxication | EC50 | 2 | 3.55 | 商业制剂Commercial formulation | 2 | [70] |
| 大型蚤 | *Daphnia magna* | 中毒Intoxication | EC50 | 2 | 3.6 | 商业制剂Commercial formulation | 2 | [70] |
| 斑点叉尾鮰 | *Ictalurus punctatus* | 死亡Mortality | LC50 | 4 | 0.43 | 1.865 | 88%原药TC | 2 | [71] |
| 斑点叉尾鮰 | *Ictalurus punctatus* | 死亡Mortality | LC50 | 4 | 1.9 | 2 | [70] |
| 斑点叉尾鮰 | *Ictalurus punctatus* | 死亡Mortality | LC50 | 4 | 7.94 | 2 | [70] |
| 青鳉 | *Oryzias latipes* | 发育Development | EC50 | 4 | 9.5 | 9.5 | 99.8%原药TC | 2 | [68] |
| 黑头呆鱼\* | *Pimephales promelas* | 死亡Mortality | LC50 | 4 | 8.6 | 8.6 | 85.9%活性 | 2 | [72] |
| 敌稗慢性毒性Propanil chronic toxicity |
| 大型蚤 | *Daphnia magna* | 生理变化Biochemistry | LOEC | 4 | 0.1 | 0.08367 | 97%原药TC | 2 | [73] |
| 大型蚤 | *Daphnia magna* | 生理代谢Physiology | LOEC | 4 | 0.07 | 2 | [73] |
| 大型蚤 | *Daphnia magna* | 生理变化Biochemistry | LOEC | 4 | 0.07 | 2 | [73] |
| 大型蚤 | *Daphnia magna* | 生理变化Biochemistry | LOEC | 4 | 0.21 | 2 | [73] |
| 大型蚤 | *Daphnia magna* | 生理变化Biochemistry | LOEC | 4 | 0.55 | 2 | [73] |
| 大型蚤 | *Daphnia magna* | 生理变化Biochemistry | LOEC | 5 | 0.07 | 2 | [73] |
| 大型蚤 | *Daphnia magna* | 生理代谢Physiology | LOEC | 5 | 0.07 | 2 | [73] |
| 大型蚤 | *Daphnia magna* | 生理变化Biochemistry | LOEC | 5 | 0.1 | 2 | [73] |
| 大型蚤 | *Daphnia magna* | 生理变化Biochemistry | LOEC | 5 | 0.21 | 2 | [73] |
| 大型蚤 | *Daphnia magna* | 生理变化Biochemistry | LOEC | 5 | 0.55 | 2 | [73] |
| 大型蚤 | *Daphnia magna* | 生理变化Biochemistry | NOEC | 4 | 0.07 | 2 | [73] |
| 大型蚤 | *Daphnia magna* | 生理变化Biochemistry | NOEC | 4 | 0.1 | 2 | [73] |
| 大型蚤 | *Daphnia magna* | 生理变化Biochemistry | NOEC | 5 | 0.07 | 2 | [73] |
| 黑头呆鱼\* | *Pimephales promelas* | 生长Growth | MATC | 54 | 0.000484 | 0.00053 | 85.9%原药TC | 2 | [17] |
| 黑头呆鱼\* | *Pimephales promelas* | 死亡Mortality | MATC | 54 | 0.000582 | 2 | [17] |
| 黑头呆鱼\* | *Pimephales promelas* | 生长Growth | LOEC | 54 | 0.000582 | 2 | [17] |
| 黑头呆鱼\* | *Pimephales promelas* | 生长Growth | LOEC | 54 | 0.0006 | 85.9%活性成分a.i. | 2 | [72] |
| 黑头呆鱼\* | *Pimephales promelas* | 死亡Mortality | LOEC | 54 | 0.0038 | 2 | [72] |
| 黑头呆鱼\* | *Pimephales promelas* | 生长Growth | NOEC | 54 | 0.0004 | 2 | [72] |
| 黑头呆鱼\* | *Pimephales promelas* | 生长Growth | NOEC | 54 | 0.000402 | 85.9%原药TC | 2 | [17] |
| 黑头呆鱼\* | *Pimephales promelas* | 生长Growth | NOEC | 54 | 0.000582 | 2 | [17] |
| 黑头呆鱼\* | *Pimephales promelas* | 生长Growth | NOEC | 54 | 0.0012 | 85.9%活性成分a.i. | 2 | [72] |
| 黑头呆鱼\* | *Pimephales promelas* | 死亡Mortality | NOEC | 54 | 0.0024 | 2 | [72] |
| 月牙藻 | *Pseudokirchneriella subcapitata* | 生长Growth | EC50 | 4 | 0.012 | 0.01929 | 商业制剂Commercial formulation | 2 | [70] |
| 月牙藻 | *Pseudokirchneriella subcapitata* | 生长Growth | EC50 | 4 | 0.031 | 活性成分a.i. | 2 | [70] |

注：\*为非本土物种；TC为原药；EC为乳油制剂；a.i.为活性成分；EC50为半数效应浓度；LC50为半数致死浓度；IC50为半抑制浓度；MATC为最大可接受毒物浓度；LOEC/L为最低有效应浓度；NOEC/L为最大无效应浓度。

Note: \* means non-native species；TC is the original drug; EC is the emulsifiable concentrate preparation; a.i. is the active ingredient; EC50 is median effective concentration; LC50 is median lethal concentration; IC50 is half maximal inhibitory concentration; MATC is maximum allowable toxicant concentration; LOEC/L is lowest observable effect concentration; NOEC/L is no observable effect concentration.

表S2 拟合模型公式[74]

Table S2 Fit model formula

|  |  |
| --- | --- |
| 模型Model | 拟合公式Fitting formula |
| Normal |  |
| Log-Normal |  |
| Logistic |  |

式中：y-累计概率，%；

x-毒性值， μg·L−1；

μ-毒性值的平均值， μg·L−1；

σ-毒性值的标准差， μg·L−1；

Formula: y-Cumulative probability, %;

x-Toxicity value, μg·L−1;

μ-Average value of toxicity value, μg·L−1;

σ-Standard deviation of toxicity value, μg·L−1;

表S3 ToxRTool数据可靠性评价标准[75]

Table S3 Data reliability evaluation criteria of ToxRTool

|  |  |
| --- | --- |
| 标准Criteria | 体内试验In vivo test |
| 第1组:实验物质的鉴定Group 1: Test substance identification | 1.受试物是否已被鉴别a Was the test substance identified a |
| 2.是否明确受试物的纯度Is the purity of the substance given |
| 3.受试物的来源是否明确 Is information on the source/origin of the substance given |
| 4.对判断数据必不可少的每个测试项目的理化因素是否都已经明确bIs all information on the nature and/or physico-chemical properties of the test item given, which you deem indispensable for judging the data b |
| 第2组:实验体系的特征Group 2: Test organism characterisation | 5.实验所选物种是否明确 Is the species given |
| 6.性别是否确定 Is the sex of the test organism given |
| 7判定实验动物的血缘、种系cIs information given on the strain of test animals plus, if considered necessary to judge the study, other specifications c |
| 8.生物的年龄和体重是否给出 Is age or body weight of the test organisms at the start of the study given |
| 9.只针对重复剂量毒理学研究:饲养条件dFor repeated dose toxicity studies only: Is information given on the housing or feeding conditions d |
| 第3组:实验设计的描述Group 3: Study design description | 10.暴露途径是什么 Is the administration route given |
| 11.剂量或浓度是否给出 Are doses administered or concentrations in application media given |
| 12.暴露频率和持续时间 Are frequency and duration of exposure as well as time-points of observations explained |
| 13.是否有阴性或阳性对照Were negative and positive controls |
| 14.实验动植物数量已知吗Is the number of animals per group given |
| 15.实验过程中暴露溶液的配置、浓度均一性、溶液体积等相关信息是否给出Whether the configuration, concentration uniformity, solution volume and other relevant informationof the exposure solution are given during the experiment |
| 16.只针对吸入和重复剂量研究 For inhalation studies and repeated dose toxicity studies only  |
| 第4组:实验结果的记录Group 4: Study results documentation | 17.实验终点以及判断终点的方法是否明确Are the study endpoint(s) and their method(s) of determination clearly described |
| 18.所有试验终点研究结果的描述是否完整和透明Is the description of the study results for all endpoints investigated transparent and complete |
| 19.数据的统计分析方法是否清晰的表达Are the statistical methods applied for data analysis given and applied in a transparent manner |
| 第5组:实验设计和结果的可信性Group 5: Plausibility of study design and results | 20.选择的实验设计对于获得化学品的实验数据是否Is the study design chosen appropriate for obtaining the substance-specific data aimed at. |
| 21.定量实验结果是否可靠Are the quantitative study results reliable |

注：a受试物鉴别包括化学名称、CAS号、化学结构等，如果是混合物应明确各组成成分。b例如吸入实验的颗粒物大小或刺激性实验的pH值等。c实验动物要考虑动物的级别，如SPF级动物。d温度、湿度、食物、每笼动物数。

Note: a The identification of the test substance includes chemical name, CAS number, chemical structure, etc. If it is a mixture, the components should be clearly defined.b For example, the particle size of inhalation experiments or the pH value of irritation experiments, etc.cThe level of the animal should be considered for experimental animals, such as SPF animals.d Temperature, humidity, food, number of animals per cage.

表S4 ToxRTool分类方法[76]

Table S4 Classification methods in ToxRTool

|  |  |
| --- | --- |
| 分类Classification | 体内试验In vivo test |
| 第1类Category 1 | 18～21分18～21 Score |
| 第2类Category 2 | 13～17分13～17 Score |
| 第3类Category 3 | ＜13分或不满足任意一个斜体字标准<13 Score or none of the italics criteria met |

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