Appendix K: Ecological Effects

Myclobutanil

Freshwater Fish - Acute

Common Name	%AI	Study parameters	Endpoint	MRID	Classification/ Category
Bluegill sunfish *(Lepomis macrochirus)*	84.5	96 hour study 10 fish/vessel 0, 0(solvent), 0.84, 1.5, 2.7, 4.7, 8.4 mg/L Static study	96 HR LC_{50}=2.4 (1.5-4.7) mg/L. NOAEC = 1.5 mg/L LOAEC = 2.7 mg/L based on quiescence, loss of equilibrium and death.	00144285	Acceptable Moderately toxic[1]
Rainbow trout *(Oncorhynchus mykiss)*	84.5	96 hour study 10 fish/vessel 0, 0(solvent), 1.0, 1.8, 3.2, 5.6, 10 mg/L Static study	96 HR LC_{50}=4.2 (3.2-5.6) mg/L NOAEC = 1.8 mg/L LOAEC = 3.2 mg/L (loss of equilibrium, surfacing and dark coloration). Mortality observed at 5.6 mg/L and above.	00141677	Acceptable Moderately toxic[1]

[1]Based on LC_{50} (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic

Freshwater Invertebrates - Acute

Common Name	%AI	Study parameters	Endpoint	MRID	Classification/ Category
Water flea *(Daphnia magna)*	84.5	48 hour study 20 inverts/conc. level 0, 0(solvent), 1.8, 3.2, 5.6, 10, 18 mg/L Static study	48 HR EC_{50} =11 (9.5-13) mg/L. Slope = 6.83 (4.1 – 9.6) NOAEC = 10 mg/L LOAEC = 5.6 mg/L (settled to the bottom). Mortality observed at 10 mg/L and above.	00141678	Acceptable Slightly toxic[1]

[1]Based on EC_{50} (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic

Freshwater Fish - Chronic

Common Name	%AI	Study parameters	Endpoint	MRID	Classification
Fathead minnow (*Pimephales promelas)*		Early life stage 0, 0 (solvent), 0.45, 0.98, 2.2, 4, 8.5 mg/L tested	NOAEC = 0.98 mg/L Early life LOAEC=2.2 mg/L 2.2 < MATC < 4 mg/L. Total mortality at 8.5 mg/L.	00164986 40409201 40480401	Acceptable

Aquatic Plants

Common Name	%AI	Study parameters	Endpoint	MRID	Classification
Freshwater green algae *(Selenastrum capricornutum)* Tier II reproduction	100	Mean measured concentrations tested: 0, 0 (solvent), 0.56, 1.1, 2.2, 5.1, 6.6 mg/L	120-hour EC_{50} = 0.83 mg/L (0.56-1.1). 120-hour NOAEC = 0.56 mg/L LOAEC = 1.1 mg/L (cell density)	419848-01	Acceptable

Birds - Acute

Common Name	%AI	Study parameters	Endpoint	MRID	Classification/ Category
Bobwhite Quail *(Colinus virginianus)*	84.5	Acute oral study 10 birds/dose level 21 day observation period 0 (vehicle), 316, 464, 681, 1000, 1470 mg/kg tested	LD_{50} = 498 (408-598) mg/kg bw Slope = 7.03 (3.5-10.5) NOAEL not determined LOAEL 316 mg/kg (lethargy and anorexia). Mortalities all dose levels (1, 4, 8, 10 and 10, respectively). Good dose response; NOAEL not critical in this case.	00144286	Acceptable Moderately toxic[1]
Bobwhite Quail *(Colinus virginianus)*	84.5	Subacute dietary study 10 birds/ concentration level 5 days on treatment, 3 days observation 0 (vehicle), 246, 641, 1150, 3000, 4530 ppm tested (measured concentrations)	LC_{50} >4530 ppm NOAEC: 1150 ppm LOAEC: 3000 ppm Mortality: 2 at 3000 ppm and 1 at 4530 ppm. Anorexia and lethargy at 3000 and 4530 ppm	00144287	Acceptable Slightly toxic[2]
Mallard Duck *(Anas platyrhynchos)*	84.5	Subacute dietary study 10 birds/ concentration level 5 days on treatment, 3 days observation 0 (vehicle), 270, 620, 1250, 2220, 4090 ppm tested (measured concentrations)	LC_{50} >4090 ppm NOAEC: 1250 ppm LOAEC: 2220 ppm (anorexia and lethargy). One bird died at 4090 ppm.	00144288	Acceptable Slightly toxic[2]

[1] Based on LD_{50} (mg/kg) <10 very highly toxic; 10-50 highly toxic; 51-500 moderately toxic; 501-2000 slightly toxic; >2000 practically nontoxic

[2] Based on LC_{50} (mg/kg) <50 very highly toxic; 50-500 highly toxic; 501-1000 moderately toxic; 1001-5000 slightly toxic; >5000 practically nontoxic

Mammals - Acute

Common Name	%AI	Study parameters	Endpoint	MRID	Classification/ Category
Laboratory mouse *(Mus musculus)*	91.9	Acute oral study 0, 1.3, 2.0, 3.2, 5.0 g/kg bw tested 10/dose level 14-day observation period	Acute oral LD_{50}=1360 mg/kg bw This study was conducted on female mice (original DER mistakenly stated that it was in the rat). Mortality at all dose levels tested. Multiple clinical signs, including ataxia, tremors, loss of righting and others – not dose-related; however, early deaths may have affected reporting. HED used rat values 1.6 (M) and 2.29 (F) g/kg bw	00165239 00141662	Acceptable Slightly toxic[1]

[1] Based on LD_{50} (mg/kg) <10 very highly toxic; 10-50 highly toxic; 51-500 moderately toxic; 501-2000 slightly toxic; >2000 practically nontoxic

Acute Rat Toxicity Comparison of Myclobutanil Formulations

Formulation (%)	LD_{50} (mg/kg bw)	MRID
Technical Product	1600 (M) 2290 (F)	00141662
1.5% with 2.5% permethrin	> 5050 (M & F)	44155803
2.25% with 60% mancozeb	> 5000 (M)	40149003
60% formulation with inerts	980 (M) 1235 (F)	00164467, 00164468
Fludioxonil, 1.45%; Mefenoxam, 3.61%; Azoxystrobin, 8.55%; and Myclobutanil, 9.75%	5979 (F)	47092603
Up-and-Down Method: 0.9% Myclobutanil (granules)	> 5000 (F)	46886701
1% formulation	> 5000 (M & F)	45381001
21% formulation	3749 (F) >5000 (M)	45218401
6.0% formulation	LD_{50} between 500 & 5,000 (M & F)	45056903
1% formulation	> 5,000 (M & F)	44265201

Terrestrial Invertebrates

Common Name	%AI	Study parameters	Endpoint	MRID	Classification
Honeybee	27.58		LD_{50} > 362 µg/bee	00144289	

Birds - Chronic

Common Name	%AI	Study Parameters	Endpoint	MRID	Classification
Bobwhite Quail *(Colinus virginianus)*	94.2	Reproduction study Mean measured concentrations: 0 (vehicle), 72.5, 124.2, 181.8, 255.8 ppm 16 pairs per concentration level	NOAEC = 256 ppm LOAEC >256 ppm No treatment-related effects at any level. Not tested at sufficiently high concentration levels	43087901	Supplemental
Mallard Duck *(Anas platyrhynchos)*	94.2	Reproduction study Mean measured concentrations: 0 (vehicle), 72.5, 124.2, 181.8, 255.8 ppm 16 pairs per concentration level	NOAEC = 256 ppm LOAEC >256 ppm No treatment-related effects at any level. Not tested at sufficiently high concentration levels	43087902	Supplemental

Mammals - Chronic

Common Name	%AI	Study Parameters	Endpoint	MRID	Classification
Laboratory rat *(Rattus norvegicus)*	84.5	2-Generation reproduction study 25 rats/sex/group 0, 50, 200 or 1000 ppm 4, 16 or 80 mg/kg bw/day based on overall mean concentration of active ingredient in dietary analyses.	Parental NOAEC/NOAEL: 50 ppm/4 mg/kg bw/day Parental LOAEC/LOAEL: 200 ppm/16 mg/kg bw/day based on hepatocellular hypertrophy and increases in liver weights. Offspring/Reproductive NOAEC/NOAEL: **200 ppm/16 mg/kg/day** Offspring/Reproductive LOAEC/LOAEL: 1000 ppm/80 mg/kg/day based on testicular, epididymal and prostatic atrophy in P_2 males; slight increase in stillborns, decrease in body weight gain in pups during lactation in F_1 and F_2 generations.	00149581 00143766	Acceptable

1,2,4-triazole and triazole alanine degradates:

Unreviewed studies

Common Name	%AI	Study parameters	Endpoint	MRID	Classification
Rainbow trout (*Salma gairdneri*)	1,2,4-triazole	Acute study	LD_{50} = 760 mg/kg	45284017	Unreviewed
Water flea (*Daphnia magna*)	1,2,4-triazole	Acute study	LC_{50} = 900 (730 to 2200, 95% C.I.) mg/L	00133381	Unreviewed
Green algae (*Scenedesmus subspicatus*)	1,2,4-triazole		EC_{50} = 6.3 (5.5 to 7.1, 95% C.I.) mg/L	00133382	Unreviewed
Coturnix quail	1,2,4-triazole	Acute study	LD_{50} >316 mg triazole/kg bird	45284015	Unreviewed

Mammalian - Acute

Common Name	%AI	Study parameters	Endpoint	MRID	Classification/Category
Laboratory mouse *(Mus musculus)*	1,2,4-triazole	Acute oral study	LD_{50} = 3650 mg/kg	45284001	Practically nontoxic[1]

[1] Based on LD_{50} (mg/kg) <10 very highly toxic; 10-50 highly toxic; 51-500 moderately toxic; 501-2000 slightly toxic; >2000 practically nontoxic

Mammalian - Chronic

Common Name	%AI	Study Parameters	Endpoint	MRID	Classification
Laboratory rat *(Rattus norvegicus)*	Triazole Alanine	Reproduction and fertility effects 0, 200, 2000, 10000 ppm M: (F0/F1) 0, 50/47, 213/192, 1098/929 mg/kg/day F: 0, 51/49, 223/199, 1109/988 mg/kg/day	Parental NOAEC/NOAEL: 10000 ppm/929 mg/kg/day Parental LOAEC/LOAEL: >10000 ppm/929mg/kg/day Offspring NOAEC/NOAEL: <250 ppm/19 mg/kg/day Offspring LOAEC/LOAEL: 2000ppm/192 mg/kg/day based on reduced mean litter weights in both generations Repro LOAEC/LOAEL: >10000 ppm/929mg/kg/day	00164112	Acceptable

Common Name	%AI	Study Parameters	Endpoint	MRID	Classification
Laboratory rat *(Rattus norvegicus)*	1,2,4-triazole	Reproduction and fertility effects 0, 250, 500, 3000 ppm M: 15, 31, 189 mkd F: 18, 36, 218 mkd	Parental NOAEC/NOAEL: <250 ppm/15 mg/kg/day Parental LOAEC/LOAEL: 250 ppm/15 mg/kg/day based on decrease in bodyweight, bodyweight gain and spleen weight. Offspring NOAEC/NOAEL: <250 ppm/19 mg/kg/day Offspring LOAEC/LOAEL: 250 ppm/19 mg/kg/day based on decrease in bodyweight, bodyweight gain, brain and spleen weights Repro NOAEC/NOAEL: 250 ppm/15 mg/kg/day Repro LOAEC/LOAEL: 500 ppm/31 mg/kg/day based on abnormal sperm and ↓# of CL in F_1 females At 3000 ppm/218 mg/kg/day, reproductive failure (no viable offspring), ↑CL in F_0 parental females	46467304	Acceptable

Conazoles (DMI triazole):

The studies summarized below are limited to those mentioned in section 4 and that met specific data standards described in that section.

Aquatic Vascular Plants

Conazole	EC_{50} (mg/L) [1]	Most sensitive parameter	MRID	Study Classification
Bromuconazole	0.16	Frond production	42937141	Acceptable
Difenoconazole	1.9	Frond number	46950204	Supplemental
Metconazole	0.022	Frond number	46808428	Acceptable
Propiconazole	9.02	Frond production	00133363	Supplemental
Prothioconazole	0.073	Frond number	46246101	Acceptable
Tetraconazole	0.31	Frond number	45842201	Acceptable
Triticonazole	1.4	Frond number	44802119	Acceptable

[1] Based on toxicity to duckweed (*Lemna gibba*)

Aquatic Invertebrates (Daphnia magna) - Acute and Chronic

Conazole	48-hr EC_{50}/LC_{50} (mg/L)	MRID/ Study Classification	NOAEC (mg/L)	Most sensitive parameter	MRID/ Study Classification
Cyproconazole	26	40607735/ Acceptable	0.019	Reproduction (# live offspring)	47036201/ Supplemental

Conazole	48-hr EC_{50}/LC_{50} (mg/L)	MRID/ Study Classification	NOAEC (mg/L)	Most sensitive parameter	MRID/ Study Classification
			0.29	Reproduction (# live offspring)	43187701/ Acceptable
Difenoconazole	0.77	42245110/ Acceptable	0.0056	Number of young per adult per reproductive day and adult length	42245114/ Supplemental
Fenbuconazole	2.3	41073507/ Acceptable	0.078	Reproduction and length	41875007/ Supplemental
Hexaconazole	2.9	00160502/ Acceptable	0.226	Total young and young per female reproductive day and length	42147301/ Acceptable
Prothioconazole	1.2	46246009/ Acceptable	0.51	Number of offspring per parent per reproduction day and terminal length	46246028/ Acceptable
Tebuconazole	4	40700913/ Acceptable	0.120	Adult length and survival and young per adult per reproduction day	40700915/ Acceptable
Tetraconazole	3.07	45823201/ Acceptable	0.19	Time to first brood release and reproduction (neonates/adult)	45823207/ Acceptable
	2.63	44367018/ Supplemental	0.51	Survival and reproduction	44367019/ Supplemental
Triadimefon	7.16	43257001/ Acceptable	0.052	Adult length	41922102/ Supplemental
			0.087	Reproduction	00094679/ Supplemental
Triadimenol	2.5	00126282/ Acceptable	0.199	Reproduction (# young produced)	00094680/ Acceptable

Aquatic Invertebrates (other) - Acute and Chronic

Conazole[1]	Common Name	Study type	Endpoint	MRID/ Study Classification
Fenbuconazole	Midge *(Chironomus riparius)*	Chronic	NOAEC = 1.01 (mg/L)	46553601/ Supplemental
Prothioconazole	Midge *(Chironomus riparius)*	Chronic	NOAEC = 0.985 (mg/L)	46246131/ Supplemental
Tetraconazole	Midge *(Chironomus riparius)*	Chronic	NOAEC = 2.97 (mg/L)	46614304/ Supplemental

Conazole[1]	Common Name	Study type	Endpoint	MRID/ Study Classification
Triadimefon	Crayfish *(Orconectes neglectus)*	Acute	96 hr LC_{50} = 104 mg/L	00149324/ Supplemental

Terrestrial Plants

Conazole	EC_{25} (lbs a.i./A)		$NOAEC/EC_{05}$ (lbs a.i./A)		Effect/MRID	
	Seedling Emergence	Vegetative Vigor	Seedling Emergence	Vegetative Vigor	Seedling Emergence	Vegetative Vigor
Metconazole						
Monocot	0.78	>0.6	0.3	0.6	Ryegrass: reduced plant height 46805103	46805104
Dicot	0.15	0.44	0.075	0.0036 (EC_{05})	Radish: reduced plant height 46805103	Radish: reduced dry weight 46805104
Prothioconazole						
Monocot	>0.272	>0.272	0.272	0.272	46246049	46246049
Dicot	>0.272	>0.272	0.03	<0.272	Cucumber: shoot height and dry weight 46246049	46246049
Cyproconazole						
Monocot	>0.64	>0.62	0.64	0.62	46218512	46218511
Dicot	0.091	0.50	0.066	0.09	Cabbage: fresh weight 46218512	Cabbage: dry weight 46218511
Propiconazole						
Monocot	> 1.5	0.315	1.5	0.0815	41673201	Rye grass: plant height 41673203
Dicot	0.18	0.039	0.056	0.056	Cabbage: dry weight 41673201	Cabbage: dry weight 41673203
Triticonazole						
Monocot	>4.25	>4.2	1.3	4.2	Rye grass: shoot length 44802116	44802116
Dicot	0.015	1.3	0.004	1.0	Lettuce: shoot length 44802116	Turnip: dry weight 44802116