

APPENDIX J
ECOLOGICAL EFFECTS DATA

Table J-1. Freshwater Fish Acute Toxicity for Technical Glyphosate and Its Salts

Species	% Active Ingredient*	96-hour LC ₅₀ NOAEC (mg a.e./L)*/ Slope	Toxicity Category ²	MRID #/Year	Study Classification
Bluegill sunfish (<i>Lepomis macrochirus</i>)	83	LC ₅₀ : 99.6 (92.1 - 107.9) ¹ NOAEC: 83 Slope: Not available	Slightly toxic	00108205/1978	Acceptable
Rainbow trout (<i>Oncorhynchus mykiss</i>)	83	LC ₅₀ : 71.4 (58.1-84.8) NOAEC: 34.9 Slope: Not available	Slightly toxic	00136339/1978	Acceptable
Rainbow trout (<i>Oncorhynchus mykiss</i>)	95.6	LC ₅₀ : 128.1 (95.6 - 172.1) NOAEC: 30.6 Slope: Not available	Practically nontoxic	44320629/1995	Acceptable
Bluegill sunfish (<i>Lepomis macrochirus</i>)	95.6	LC ₅₀ : 43 (30.6 - 53.5) NOAEC: 30.6 Slope: Not available	Slightly toxic	44320630/1995	Acceptable
Fathead minnow (<i>Pimephales promelas</i>)	96.7	LC ₅₀ : 69.4 (56.5 - 85.9) ³ NOAEC not reported Slope: Not available	Slightly toxic	00162296/1979	Acceptable
Channel catfish (<i>Ictalurus punctatus</i>)	96.7	LC ₅₀ : 93 (78.7 - 114.5) ³ NOAEC not reported Slope: Not available	Slightly toxic	00162296/1979	Acceptable
Rainbow trout (<i>Oncorhynchus mykiss</i>)	96.7	LC ₅₀ : 100.2 (85.9 - 121.6) ³ NOAEC not reported Slope: Not available	Practically nontoxic	00162296/1979	Acceptable
Bluegill sunfish (<i>Lepomis macrochirus</i>)	96.7	LC ₅₀ : 100.2 (78.7 - 114.5) ³ NOAEC not reported Slope: Not available	Practically nontoxic	00162296/1979	Acceptable

* a.i. = active ingredient; a.e. = acid equivalent
¹ Range is 95% confidence interval for endpoint
²Based on LC₅₀ (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic
³ Study conducted with the isopropylamine salt

Table J-2. Freshwater Fish Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i.*	96-hour LC₅₀/ NOAEC (mg a.e.*/L)/ Slope	Toxicity Category¹	MRID #/Year	Study Classification
Glyphosate IPA*	Rainbow trout (<i>Oncorhynchus mykiss</i>)	30	LC ₅₀ : 1 (0.8 - 1.2) ² (3.17 mg formulation/L) NOAEC: N.R.* Slope:N.R.	Highly toxic	40098001/1986	Supplemental
Glyphosate IPA (MON 77360)	Rainbow trout (<i>Oncorhynchus mykiss</i>)	30	LC ₅₀ : 1.6 (1.3 - 2.1) NOAEC: 1.3 Slope:NA*	Moderately toxic	45365003/2000	Supplemental
Glyphosate IPA	Fathead minnow (<i>Pimephales promelas</i>)	30	LC ₅₀ : 1.7 (1.4 - 2.1) NOAEC: N.R. Slope:N.R.	Moderately toxic	00162296/1979	Supplemental
Glyphosate IPA (Roundup)	Bluegill sunfish (<i>Lepomis macrochirus</i>)	31	LC ₅₀ : 1.8 (1.4 - 2.6) NOAEC: 0.7 Slope:N.R.	Moderately toxic	00124760/1982	Acceptable
Glyphosate monoammonium salt (MON78568)	Rainbow trout (<i>Oncorhynchus mykiss</i>)	66	LC ₅₀ : 1.9 (1.04 - 2.31) NOAEC: 1.04 Slope:N.R.	Moderately toxic	45767101/2002	Not classified
Glyphosate IPA (MON 77360)	Bluegill sunfish (<i>Lepomis macrochirus</i>)	30	LC ₅₀ : 2.2 (1.3 - 3.3) NOAEC: 1.3 Slope:NA	Moderately toxic	45365002/2000	Acceptable
Glyphosate IPA (MON65005)	Bluegill sunfish (<i>Lepomis macrochirus</i>)	31	LC ₅₀ : 2.4 (2.0 - 3.5) NOAEC: 1.2 Slope:N.R	Moderately toxic	44538203/1998	Acceptable
Glyphosate IPA (Roundup)	Rainbow trout (<i>Oncorhynchus mykiss</i>)	31	LC ₅₀ : 2.5 (2.0 - 3.1) NOAEC: 1.8 Slope:N.R.	Moderately toxic	00124761/1982	Supplemental
Glyphosate IPA (MON65005)	Rainbow trout (<i>Oncorhynchus mykiss</i>)	31	LC ₅₀ : 2.5 (1.9 - 3.1) NOAEC: 1.9 Slope:N.R	Moderately toxic	44538202/1998	Acceptable
Glyphosate IPA (Roundup)	Fathead minnow (<i>Pimephales promelas</i>)	41	LC ₅₀ : 2.9 (1.7 - 4.9) NOAEC: 1.7 Slope:N.R.	Moderately toxic	00070896/1980	Acceptable

Table J-2. Freshwater Fish Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i.*	96-hour LC₅₀/ NOAEC (mg a.e.*/L)/ Slope	Toxicity Category¹	MRID #/Year	Study Classification
Glyphosate IPA	Bluegill sunfish (<i>Lepomis macrochirus</i>)	30	LC ₅₀ : 3 (2.4 - 3.7) NOAEC: N.R. Slope:N.R.	Moderately toxic	40098001/1986	Supplemental
Glyphosate IPA	Rainbow trout (<i>Oncorhynchus mykiss</i>)	30	LC ₅₀ : 3.4 (5.2 - 7.3) NOAEC: N.R. Slope:N.R.	Moderately toxic	00162296/1979	Supplemental
Glyphosate IPA(MON 2139, Roundup)	Rainbow trout (<i>Oncorhynchus mykiss</i>)	41	LC ₅₀ : 3.4 (2.7 - 4.3) NOAEC: 2.7 Slope:N.R.	Moderately toxic	00070895/1980	Acceptable
Glyphosate IPA	Bluegill sunfish (<i>Lepomis macrochirus</i>)	30	LC ₅₀ : 3.7 (2.8 - 4.9) NOAEC: N.R. Slope:N.R.	Moderately toxic	00162296/1979	Supplemental
Glyphosate IPA (Roundup)	Bluegill sunfish (<i>Lepomis macrochirus</i>)	41	LC ₅₀ : 4.3 (2.7 - 7.3) NOAEC: 2.7 Slope:N.R.	Moderately toxic	00070897/1980	Acceptable
Glyphosate IPA (Roundup)	Channel catfish (<i>Ictalurus punctatus</i>)	41	LC ₅₀ : 4.9 (2.9 - 8.0) NOAEC: 2.9 Slope:N.R.	Moderately toxic	00070894/1980	Supplemental
Glyphosate IPA (Roundup)	Rainbow trout (<i>Salmo gairdneri</i>)	36	LC ₅₀ : 5.5 - 9.2 (4.2 - 13) NOAEC: 4.2 Slope:N.R.	Moderately toxic	40579203/1986	Supplemental
Glyphosate IPA (Roundup)	Chinook Salmon (<i>Oncorhynchus tschawytscha</i>)	36	LC ₅₀ : 7.0 (5.4 - 9.9) NOAEC: <1.3 Slope:N.R.	Moderately toxic	40579201/1986	Not classified
Glyphosate IPA (Roundup)	Coho Salmon (<i>Oncorhynchus kisutch</i>)	36	LC ₅₀ : 8.2 (4.2 - 13.4) NOAEC: 3.42 Slope:N.R.	Moderately toxic	40579202/1986	Not classified
Glyphosate IPA with 0.5% "X-77"	Rainbow trout (<i>Oncorhynchus mykiss</i>)	5	LC ₅₀ : 9.4 (7.0 - 12.4) NOAEC: 7 Slope:N.R.	Moderately toxic	00078664/1980	Acceptable

Table J-2. Freshwater Fish Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i.*	96-hour LC₅₀/ NOAEC (mg a.e.*/L)/ Slope	Toxicity Category¹	MRID #/Year	Study Classification
Glyphosate IPA	Channel catfish (<i>Ictalurus punctatus</i>)	30	LC ₅₀ : 9.6 (8.1 - 11.8) NOAEC: N.R. Slope:N.R.	Moderately toxic	00162296/1979	Acceptable
Glyphosate IPA (Roundup with 15 % "W")	Bluegill sunfish (<i>Lepomis macrochirus</i>)	41	LC ₅₀ : >30 (30 - 96.4) NOAEC: 30 Slope:N.R.	Slightly toxic	00078656/1980	Supplemental
Glyphosate IPA with 0.5% "X-77"	Bluegill sunfish (<i>Lepomis macrochirus</i>)	5.3	LC ₅₀ : 32.4 (24.2 - 62.4) NOAEC: 7.1 Slope:4.2	Slightly toxic	00078665/1980	Acceptable
Glyphosate IPA (Roundup with 15.3 % "AA")	Rainbow trout (<i>Oncorhynchus mykiss</i>)	41	LC ₅₀ : 36.6 (17.1 - 54.9) NOAEC: N.R. Slope:N.R.	Slightly toxic	00078658/1980	Acceptable
Glyphosate IPA (Roundup with 15 % "W")	Rainbow trout (<i>Oncorhynchus mykiss</i>)	41	LC ₅₀ : 45.2 (30.1 - 96.4) NOAEC: 30.1 Slope:N.R.	Slightly toxic	00078655/1980	Acceptable
Glyphosate (360 g/L SL)	Bluegill sunfish (<i>Lepomis macrochirus</i>)	28	LC ₅₀ : >52 (N.A.) NOAEC: 52 Slope:N.A.	Slightly toxic	45374002/2000	Supplemental
Glyphosate(80WDG)	Fathead minnow (<i>Pimephales promelas</i>)	79	LC ₅₀ : 54.3 (47.3 - 79.1) NOAEC: 28.7 Slope:N.R.	Slightly toxic	44125704/1996	Acceptable
Glyphosate(80WDG)	Rainbow trout (<i>Oncorhynchus mykiss</i>)	80	LC ₅₀ : 62.1 (48.2 - 80.0) NOAEC: 28.7 Slope:N.R.	Slightly toxic	44125705/1996	Acceptable
Glyphosate IPA (Rodeo/X-77)	Rainbow trout (<i>Salmo gairdneri</i>)	41	LC ₅₀ : 96.4 (89.0 - 118.7) NOAEC: 37.5 Slope:N.R.	Slightly toxic	40579301/1985	Not classified
Glyphosate IPA (Rodeo/X-77)	Chinook salmon (<i>Oncorhynchus tshawytscha</i>)	41	LC ₅₀ : 103.8 (89.0 - 148.3) NOAEC: 47.5 Slope:N.R.	Practically non-toxic	40579303/1985	Not classified

Table J-2. Freshwater Fish Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i.*	96-hour LC₅₀/ NOAEC (mg a.e.*/L)/ Slope	Toxicity Category¹	MRID #/Year	Study Classification
Glyphosate IPA (Rodeo/X-77)	Rainbow trout (<i>Salmo gairdneri</i>)	41	LC ₅₀ : 134 (75 - 240) NOAEC: 43 Slope:N.R.	Practically non-toxic	40579306/1987	Not classified
Glyphosate IPA (Rodeo/X-77)	Coho Salmon (<i>Oncorhynchus kisutch</i>)	41	LC ₅₀ : 148.3 (89.0 - 274.4) NOAEC: 88.5 Slope:N.R.	Practically non-toxic	40579302/1985	Not classified
Glyphosate IPA (Rodeo/X-77)	Chinook salmon (<i>Oncorhynchus tshawytscha</i>)	40	LC ₅₀ : 180.2 (133.5 - 240.3) NOAEC: 74.8 Slope:N.R.	Practically non-toxic	40579305/1987	Not classified
Glyphosate (360 g/L SL)	Rainbow trout (<i>Oncorhynchus mykiss</i>)	27	LC ₅₀ : 224.5 (160.1 - 280.0) (824 mg formulation/L) NOAEC: 160 Slope:N.R.	Practically non-toxic	45374001/1999	Supplemental
Trisodium diglyphosate/Urea (Polado formula) - MON 8000	Bluegill sunfish (<i>Lepomis macrochirus</i>)	75	LC ₅₀ :>315 (N.R.) NOAEC: 315 Slope:N.R.	Practically non-toxic	00079146/1980	Supplemental
Trisodium diglyphosate/Urea (Polado formula) - MON 8000	Rainbow trout (<i>Oncorhynchus mykiss</i>)	75	LC ₅₀ : >315 (N.R.) NOAEC: 315 Slope:N.R.	Practically non-toxic	00085637/1980	Supplemental
Glyphosate IPA (Rodeo)	Rainbow trout (<i>Salmo gairdneri</i>)	41	LC ₅₀ : 430.1 (341 - 541) NOAEC: 157 Slope:N.R.	Practically non-toxic	40579301/1985	Not classified
Glyphosate IPA (No surfactant)	Rainbow trout (<i>Oncorhynchus mykiss</i>)	62	LC ₅₀ : >461.8 (N.R.) NOAEC: N.R. Slope:N.R.	Practically non-toxic	00078661/1980	Acceptable
Glyphosate IPA (No surfactant)	Bluegill sunfish (<i>Lepomis macrochirus</i>)	62	LC ₅₀ : >461.8 (N.R.) NOAEC: N.R. Slope:N.R.	Practically non-toxic	00078662/1981	Supplemental
Glyphosate IPA (MON77945 Manufacturing concentrate)	Rainbow trout (<i>Oncorhynchus mykiss</i>)	46	LC ₅₀ : >977 (N.A.) mg formulation/L NOAEC: 591 Slope:N.A.	Practically non-toxic	44715409/1998	Not classified

Table J-2. Freshwater Fish Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i.*	96-hour LC ₅₀ /NOAEC (mg a.e.*/L)/Slope	Toxicity Category ¹	MRID #/Year	Study Classification
Glyphosate IPA with Geronol CF/AR	Rainbow trout (<i>Oncorhynchus mykiss</i>)	10	LC ₅₀ : > 450 (N.A.) mg a.e./L or > 1000 mg formulation/L NOAEC: 1000 mg formulation/L Slope:N.A.	Practically non-toxic	44738201/1996	Not classified
Glyphosate IPA with Geronol CF/AR	Rainbow trout (<i>Oncorhynchus mykiss</i>)	36	LC ₅₀ : >1000 (N.A.) mg formulation/L NOAEC: 800 Slope:N.A.	Practically non-toxic	44738201/1996	Not classified
Glyphosate IPA (Roundup Biactive)	Rainbow trout (<i>Oncorhynchus mykiss</i>)	36	LC ₅₀ : >1000 (N.A.) mg formulation/L NOAEC: 800 Slope:N.A.	Practically non-toxic	44738201/1996	Not classified
Glyphosate IPA with Geronol CF/AR	Rainbow trout (<i>Oncorhynchus mykiss</i>)	45	LC ₅₀ : >1000 (N.A.) mg formulation/L NOAEC: 1000 Slope:N.A.	Practically non-toxic	44738201/1996	Not classified

* a.i. = active ingredient; a.e. = acid equivalent; IPA = isopropylamine salt; NR = not reported; NA = not available

¹Based on LC₅₀ (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic

² Range is 95% confidence interval for endpoint

Table J-3. Freshwater Fish Acute Toxicity for Surfactants Used with Glyphosate Formulations

Chemical	Species	% a.i. ¹	96-hour LC ₅₀ /NOAEC (mg/L)/Slope	Toxicity Category ²	MRID #/Year	Study Classification
Polyoxy ethylene fatty amine (POEA or MON 0818)	Rainbow trout (<i>Oncorhynchus mykiss</i>)	100	LC ₅₀ : 1 (1.2 - 1.7) ³ NOAEC and slope not reported	Highly toxic	00162296/1979	Acceptable
Polyoxy ethylene fatty amine (POEA or MON 0818)	Fathead minnow (<i>Pimephales promelas</i>)	100	LC ₅₀ : 2 (1.5 - 2.7) NOAEC and slope not reported	Moderately toxic	00162296/1979	Acceptable

Table J-3. Freshwater Fish Acute Toxicity for Surfactants Used with Glyphosate Formulations

Chemical	Species	% a.i. ¹	96-hour LC ₅₀ /NOAEC (mg/L)/Slope	Toxicity Category ²	MRID #/Year	Study Classification
Polyoxy ethylene fatty amine (POEA or MON 0818)	Channel catfish (<i>Ictalurus punctatus</i>)	100	LC ₅₀ : 3 (2.5 - 3.7) NOAEC and slope not reported	Moderately toxic	00162296/1979	Acceptable
Polyoxy ethylene fatty amine (POEA or MON 0818)	Bluegill sunfish (<i>Lepomis macrochirus</i>)	100	LC ₅₀ : 13 (10.0 - 17.0) NOAEC and slope not reported	Slightly toxic	00162296/1979	Acceptable
Surfactant Geronol CF/AR (alkyl polyoxy ethylene phosphoric acid ester)	Zebra fish (<i>Brachydanio rerio</i>)	100	LC ₅₀ : >100 (N.A.) NOAEC and slope not reported	Practically non-toxic	44738201/ Summary of another study	Not classified

¹ a.i. = active ingredient, assumed 100% for technical material
²Based on LC₅₀ (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic
³ Range is 95% confidence interval for endpoint.

Table J-4. Freshwater Fish Acute Toxicity for Aminomethyl Phosphonic Acid (AMPA) Degradate of Glyphosate

Chemical	Species	% a.i. ¹	96-hour LC ₅₀ /NOAEC (mg/L)/Slope	Toxicity Category ²	MRID #/Year	Study Classification
AMPA	Rainbow trout (<i>Oncorhynchus mykiss</i>)	94.38	LC50: 499 (391 - 647) NOAEC: 174 Slope: 6.42	Practically nontoxic	43334713/1991	Acceptable

¹ a.i. = active ingredient, assumed 100% for technical material
²Based on LC₅₀ (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic
³ Range is 95% confidence interval for endpoint.

Table J-5. Aquatic-Phase Amphibian Acute Toxicity for Technical Glyphosate and Its Salts

Species	% Active Ingredient*	96-hour LC ₅₀ NOAEC (mg a.e./L)*/ Slope	Toxicity Category ²	MRID #/Year	Study Classification
Australian tree frog (<i>Litoria moorei</i>) Tadpole	96	LC50: 103.2 (43.2 - 172.8) ¹ NOAEL: N.R.* Slope: N.R.	Practically nontoxic	43839601/1995	Supplemental
Australian frog (<i>Crinia insignifera</i>) Adult	96	LC50: 75 (60.4-92.7) NOAEL: N.R. Slope: N.R.	Slightly toxic	43839601/1995	Supplemental
Green Frog (<i>Rana clamitans</i>) Gosner Stg 25	Tech ³	LC50: >17.9 (NR) NOAEL: NR Slope: NR	Slightly toxic	46650501/2001	Supplemental

* a.i. = active ingredient; a.e. = acid equivalent; N.R. = not reported
¹ Range is 95% confidence interval for endpoint
²Based on LC₅₀ (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic
³ Study conducted with the isopropylamine salt

Table J-6. Aquatic-Phase Amphibian Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i.*	96-hour LC ₅₀ /NOAEC (mg a.e.*/L)/ Slope	Toxicity Category ¹	MRID #/Year	Study Classification
Glyphosate- IPA (Cosmo Flux Coca mix)	African clawed frog (<i>Xenopus laevis</i>) Larvae	18	LC50: 1.1 (0.56 - 2.3) or 10 mg/L formulation NOAEL: 0.14 Slope: 4.92	Moderately toxic	46873601/2006	Supplemental
Glyphosate IPA (Cosmo Flux Poppy mix)	African clawed frog (<i>Xenopus laevis</i>) Larvae	0.0205	LC50: 1.3 (0.92 - 1.8) or 16 mg/L formulation NOAEL: 0.43 Slope: NA*	Moderately toxic	46873602/2006	Supplemental
Glyphosate IPA (Roundup Original with 15% POEA)	Green Frog (<i>Rana clamitans</i>) Gosner Stg 25	NR	LC50: 2 (1.9-2.2) or 6.5 mg/L formulation NOAEL: NR* Slope: NR	Moderately toxic	46650501/2001	Supplemental

Table J-6. Aquatic-Phase Amphibian Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i.*	96-hour LC₅₀/ NOAEC (mg a.e.*/L)/ Slope	Toxicity Category¹	MRID #/Year	Study Classification
Glyphosate IPA (Roundup Transorb with 15% POEA)	Green Frog (<i>Rana clamitans</i>) Gosner Stg 25	NR	LC50: 2.2 (2.1-2.4) or 7.2 mg/L formulation NOAEL: NR Slope: NA	Moderately toxic	46650501/2001	Supplemental
Glyphosate IPA (Roundup Original with 15% POEA)	Leopard Frog (<i>Rana pipiens</i>) Gosner Stg 25	NR	LC50: 2.9 (NR) or 9.2 mg/L formulation NOAEL: NR Slope: NR	Moderately toxic	46650501/2000	Supplemental
Glyphosate IPA (Roundup Original with 15% POEA)	American toad (<i>Bufo americanus</i>) Gosner Stg 25	NR	LC50: <4.0 (NR) or < 12.9 mg/L formulation NOAEL: NR Slope: NR	Moderately toxic	46650501/1994	Supplemental
Glyphosate IPA (Roundup with 15% POEA)	Wood Frog (<i>Rana sylvatica</i>) Gosner Stg 25	NR	LC50: 5.1 (4.9-5.4) or 16.5 mg/L formulation NOAEL: NR Slope: NR	Moderately toxic	46650501/1994	Supplemental
Glyphosate IPA (Roundup 360)	Australian tree frog (<i>Litoria moorei</i>) Tadpole	30.3	LC50: 5.6 (4.4 - 7.1) or 18.5 mg/L formulation NOAEL: N.R. Slope: N.R.	Moderately toxic	43839601/1995	Supplemental
Glyphosate IPA (Roundup Original with 15% POEA)	Leopard Frog (<i>Rana pipiens</i>) Gosner Stg 20	NR	LC50: 6.5 (6.1-6.8) or 20.9 mg/L formulation NOAEL: NR Slope: NA	Moderately toxic	46650501/1994	Supplemental
Glyphosate IPA (Roundup Original with 15% POEA)	Green frog (<i>Rana clamitans</i>) Gosner Stg 20	NR	LC50: 7.1 (6.6-7.6) or 22.8 mg/L formulation NOAEL: NR Slope: NR	Moderately toxic	46650501/1994	Supplemental
Glyphosate IPA (Roundup Original with 15% POEA)	American toad (<i>Bufo americanus</i>) Gosner Stg 20	NR	LC50: 8 (NR) or 25.8 mg/L formulation NOAEL: NR Slope: NR	Moderately toxic	46650501/1994	Supplemental

Table J-6. Aquatic-Phase Amphibian Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i.*	96-hour LC ₅₀ /NOAEC (mg a.e.*/L)/Slope	Toxicity Category ¹	MRID #/Year	Study Classification
Glyphosate IPA (Roundup Original with 15% POEA)	Wood Frog (<i>Rana sylvatica</i>) Gosner Stg 20	NR	LC50: > 8 (NR) or > 25.8 mg/L formulation NOAEL: NR Slope: NR	Moderately toxic	46650501/1994	Supplemental
Glyphosate IPA (Glyphos AU with 3-7% POEA)	Green Frog (<i>Rana clamitans</i>) Gosner Stg 25	NR	LC50: 8.9 (8.6-9.2) or 28.6 mg/L formulation NOAEL: NR Slope: NR	Moderately toxic	46650501/2001	Supplemental
Glyphosate IPA (Roundup Biactive with 10-20% unspecified surfactant)	Green frog (<i>Rana clamitans</i>) Gosner Stg 25	NR	LC50: >17.9 (NR) or > 57.7 mg/L formulation NOAEL: NR Slope: NR	Slightly toxic	46650501/2001	Supplemental
Glyphosate IPA (Glyphos BIO with 3-7% POEA)	Green Frog (<i>Rana clamitans</i>) Gosner Stg 25	NR	LC50: >17.9 (NR) or >57.7 mg/L formulation NOAEL: NR Slope: NR	Slightly toxic	46650501/2001	Supplemental
Glyphosate IPA (Roundup 360)	Australian frog (<i>Crinia insignifera</i>) Adult	30.3	LC50: 30.4 (0-infinity) or 100.2 mg/L formulation NOAEL: N.R. Slope: N.R.	Slightly toxic	43839601/1995	Supplemental
Glyphosate IPA (Roundup 360)	Australian frog (<i>Crinia insignifera</i>) Tadpole	30.3	48 hr LC50: 38.2 (30.2 - 48.8) or 125.9 mg/L formulation NOAEL: N.R. Slope: N.R.	Slightly toxic	43839601/1995	Supplemental
Glyphosate IPA (with surfactant Geronol CF/AR)	Common froglet (<i>Ranidella signifera</i>) Tadpole	45	LC50: >450 (N.A.) or >1000 mg/L formulation NOAEL: 1000 Slope: N.A.	Practically nontoxic	44738201/1996	Supplemental
Glyphosate IPA (Roundup Biactive)	Common froglet (<i>Ranidella signifera</i>) Tadpole	36	LC50: >360 (N.A) or >1000 mg/L formulation NOAEL: <800 Slope: N.A.	Practically nontoxic	44738201/1996	Supplemental

Table J-6. Aquatic-Phase Amphibian Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i.*	96-hour LC ₅₀ /NOAEC (mg a.e.*/L)/Slope	Toxicity Category ¹	MRID #/Year	Study Classification
Glyphosate IPA (with surfactant Geronol CF/AR)	Common froglet (<i>Ranidella signifera</i>) Tadpole	36	LC50: >360 (N.A.) or >1000 mg/L formulation NOAEL: 1000 Slope: N.A.	Practically nontoxic	44738201/1996	Supplemental
Glyphosate IPA (with surfactant Geronol CF/AR)	Common froglet (<i>Ranidella signifera</i>) Tadpole	10	LC50: >100 (N.A.) or >1000 mg/L formulation NOAEL: 1000 Slope: N.A.	Practically nontoxic	44738201/1996	Supplemental

* a.i. = active ingredient; a.e. = acid equivalent; IPA = isopropylamine salt, N.A. = not available, N.R. = not reported
¹Based on LC₅₀ (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic
² Range is 95% confidence interval for endpoint

Table J-7. Aquatic-Phase Amphibian Acute Toxicity for POEA Surfactant Used with Glyphosate Formulations

Chemical	Species	% a.i. ¹	96-hour LC ₅₀ /NOAEC (mg/L)/Slope	Toxicity Category ²	MRID #/Year	Study Classification
Polyoxy ethylene fatty amine (POEA or MON 0818)	Green Frog (<i>Rana clamitans</i>) Gosner Stg 25	69-73	LC50: 2.2 (2.1-2.4) NOAEC: NR* Slope: NR	Moderately toxic	46650501/2001	Supplemental

* NR = not reported
¹ a.i. = active ingredient, assumed 100% for technical material
²Based on LC₅₀ (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic
³ Range is 95% confidence interval for endpoint.

Open Literature Data for Fish and Amphibians

Table J-8. Freshwater Fish Sublethal Effects From Submitted and Open Literature Studies

Species	Chemical	NOAEC	LOAEC:Effects	MRID/ECOTOX Reference No.
Nile tilapia (<i>O. niloticus</i>)	Roundup (48% a.e.)	Not determined	5 ppm: gills: filament cell proliferation, lamellar cell hyperplasia, lamellar fusion, epithelial lifting, and aneurysm. Liver: vacuolation of hepatocytes and nuclear pyknosis. Kidneys: dilation of Bowman's space and accumulation of hyaline droplets in	E096917 – This study used to determine Action Area

Table J-8. Freshwater Fish Sublethal Effects From Submitted and Open Literature Studies				
Species	Chemical	NOAEC	LOAEC:Effects	MRID/ECOTOX Reference No.
			the tubular epithelial cells. Significant increase in aspartate aminotransferase, alanine aminotransferase, and alkaline phosphatase activities. Decreased activity.	
Nile tilapia (<i>O. niloticus</i>)	Roundup (48% a.e.)	5 ppm	15 ppm: gills: mucosal cells of laminar epithelium - loss of microridges and appearance of intercellular spaces; thickening of primary epithelium, edema, lifting and fusion of secondary lamellae – may impair respiratory function. Liver: progressive reduction and fragmentation of RER; swollen mitochondria; increases in number and sizes of lysosomes and lipid droplets; infiltration of leukocytes; increased hepatocyte size with pyknotic nuclei and presence of vacuoles. Kidney: degeneration of nuclear membrane; mitochondrial contraction and/or swelling; accumulation of large electron dense particles; increase in number and size of lysosomes and apical vacuoles; some cellular necrosis. Increased plasma aspartate and alanine aminotransferase and alkaline phosphatase activities at 15 ppm.	E096937
Topmouth gudgeon (<i>pseudorasobora parva</i>)	Glyphosate IPA salt (41%)	Not determined	1 ppm: Initial possible inhibition of liver esterase activity and then possible induction of enzyme activity. Not dose dependent.	E097111
Rainbow trout (<i>O. mykiss</i>)	Vision (356 g/L glyphosate acid with surfactant)	8 ppb	45.75 ppb: increase in wigwag behavior (one of agonistic behaviors). No effects on growth, foraging variables or antagonistic activity; no evidence of neoplasia or melanomacrophages and no increase in gill lesions at 45.75 ppb (highest concentration tested).	E097714
Rainbow trout (<i>O. mykiss</i>)	Glyphosate (assumed technical) and combinations with surfactants R-11 and Target Prospeador Acitvator	1.25 ppm (glyphosate alone)	Rainbow trout vitellogenin assay. Estrogenic effects. No effects with glyphosate alone. When combined with surfactants at 1.25 ppm, trends indicated elevated vitellogenin.	E080643
North African catfish (<i>Clarius gariepinus</i>)	Roundup (no other identification)	Not determined	3.9 ppm: Increased plasma AST, ALP, ALT levels.	E097133
Rainbow trout (<i>O.</i>)	Technical glyphosate	30.6 ppm	53.6 ppm: dark coloration	MRID 44320629

Table J-8. Freshwater Fish Sublethal Effects From Submitted and Open Literature Studies				
Species	Chemical	NOAEC	LOAEC:Effects	MRID/ECOTOX Reference No.
<i>mykiss</i>)	95.6%			
<i>T. rendalli</i>	Roundup® (480g/l) and surfactant	No NOAEL	42 mg/kg. Fish erythrocyte micronucleus assay. Pesticide applied by injection. Roundup induced micronuclei at 42, 85 and 170 mg/kg	E074478
Rainbow trout (<i>O. mykiss</i>)	Roundup® 143 g/L	0.01 ppm	0.1 ppm. Olfactory-mediated behavioral and neurophysiological response. Over a concentration range that does not result in acute toxicity, trout detect Roundup but do not avoid it. Above that concentration, they avoid it (≥ 10 ppm). Study found that behavioral responses may be more sensitive tox. endpoints than neurophysiological responses.	E089625 Tierney 2007
Rainbow trout (<i>O. mykiss</i>)	Roundup® 356 g/L glyphosate IPA MON 02139	30 ppm	40 ppm. Fish tend to avoid concentrations that are lethal (40 ppm and above). 96-hr LC ₅₀ 54.8 in the lab and 52 in the field. No mortality at 2.2 kg a.e./ha, 10x and 100x field dose.	E010471
Rainbow trout (<i>O. mykiss</i>)	Vision® 356 g a.e./L with either 10% or 15% surfactant (POEA). 7.5% surfactant tested in acute study	Avoidance: 27 ppm (15%) & 75 ppm (10%) Other behavior 6.75 ppm (15%) & 18.75 ppm (10%)	96 hr LC ₅₀ : 100 ppm (7.5%); 75 ppm (10%); 27 ppm (15%). Avoidance behavior LOAEC: 150 ppm (10%); 54 ppm (15%) Other behavior LOAEC: Erratic swimming & rapid respiration 13.5 ppm (15%); erratic swimming & labored respiration 37.5 ppm (10%)	E05182
Tilapia (<i>Oreochromis niloticus</i>) Lee Koh (<i>Cyprinus carpio</i>)	Roundup® 30.5% w/w glyphosate	0.31 ppm for tilapia 1.7 ppm for Lee Koh	Tilapia: 0.55 ppm: erratic swimming. 96-hr LC ₅₀ : 2.3 ppm. Lee Koh: LC ₅₀ : 3.1 ppm. LOAEC not provided.	E03296

Table J-9. Aquatic Amphibian Sublethal Effects From Submitted and Open Literature Studies				
Species	Chemical	NOAEC	LC₅₀ or LOAEC:Effects	MRID/ECOTOX Ref. No.
Green frog (<i>Rana pipiens</i>)	Vision® (contains POEA surfactant)	Not determined for mortality	LOAEC for mortality: 0.75 ppm a.e. at pH 7.5. Note: higher pH (7.5) versus 5.5 increases acute toxicity	E072794
African clawed frog (<i>Xenopus laevis</i>)	Rodeo® (480 g a.e./L no surfactant) Roundup® (356 g ae/L with POEA)	5 ppm a.e. (Roundup®) and 2000 ppm a.e.	Frog embryo teratogenesis assay. LC ₅₀ 's: POEA (6.8 ppm), Roundup® (9.3 ppm a.e.), Rodeo® (7297 ppm a.e.). No significant increases in embryo malformations for either	E053090

Table J-9. Aquatic Amphibian Sublethal Effects From Submitted and Open Literature Studies				
Species	Chemical	NOAEC	LC ₅₀ or LOAEC:Effects	MRID/ ECOTOX Ref. No.
	surfactant)	(Rodeo®)	formulation.	
<i>Crinia insignifera</i> , <i>Heleioporus eyrei</i> , <i>Limnodynastes dorsalis</i> , and <i>Litoria moorei</i>	Glyphosate, glyphosate IPA, Roundup®, Touchdown® and Roundup® Biactive	N/A	48-hr acute LC ₅₀ 's (formulations) for tadpoles, metamorphs and adults between 2.9 and >360 mg a.e./L with Roundup® (MON 2139) as the most toxic formulation to Roundup® Biactive as the least toxic formulation. Glyphosate IPA salt alone (LC ₅₀ : 466 mg a.e./L) less toxic than glyphosate acid (LC ₅₀ : 81.2 – 121 mg a.e./L), probably due to acid intolerance. Slight differences in species sensitivity <i>L moorei</i> tadpoles more sensitive than other tadpoles; adult and new metamorphs less sensitive than tadpoles.	E071857
Leopard frog (<i>Rana pipiens</i>), Green frog, (<i>Rana clamitans</i>) American toad, (<i>Bufo americanus</i>), African clawed frog (<i>Xenopus laevis</i>)	Vision® (contains POEA surfactant)	N/A	96-hr acute studies. Toxicity enhanced by elevated pH with Surfactant POEA (15%) hypothesized as major source of pH interaction. LC ₅₀ 's (mg a.e./L) pH 6.0 pH 7.5 Leopard frog embryo* 15.1 7.5 Leopard frog larvae* 1.8 1.1 Green frog embryo 5.3 4.1 Green frog larvae 3.5 1.4 American toad embryo 4.8 6.4 American toad larvae 2.9 1.7 African clawed frog embryo 15.6 7.9 African clawed frog larvae 2.1 0.88 *Gosner 8-25 = embryo, Gosner 25 = larvae Growth inhibition in surviving frogs observed with clawed frog, green frog and leopard frog	E072795
<i>Scinax nasicus</i> tadpoles Gosner stages 25-26 (prometamorphic)	Glyfos (48% IPA + 15% POEA)	N/A	96-hr acute LC ₅₀ : 2.64 mg glyphos/L (1.95 mg a.e./L). Malformations (craniofacial and mouth deformities, eye abnormalities and bent curved tails) increase with increased time and mortality.	E071969
Western chorus frog (<i>Pseudacris triseriata</i>) and Plains leopard frog (<i>Rana blairi</i>) tadpoles Gosner stage 25	Kleeraway Grass and Weed Killer RTU (IPA 0.75%, surfactant – ethoxylated tallowamine).		Concentration levels 750, 75, 7.5 or 0.75 ppm IPA. 24-hr exposure period. No frogs survived 7.5 – 750 ppm. Western chorus frogs slightly more sensitive. No effect on growth or final Gosner stage.	E61464
<i>Rana cascadae</i> larvae	Roundup® 50.2%	Not determined for time to metamorph- osis	LOAEL 1 ppm. Concentration levels 0.96 and 1.94 ppm for 43 days. None survived to metamorphosis at 1.94 ppm (mean time 7.5 days). Bent tails and slow swimming ability before death. Metamorphosis occurred more rapidly in treated frogs with decreased size and mass. Unclear from this study as to whether or not LOAEL is in terms of a.e..	E096423

Table J-10. Freshwater Invertebrates Acute Toxicity for Technical Glyphosate*

Species	% a.i.*	48-hour EC ₅₀ - LC ₅₀ / NOAEC (mg a.e./L)*/ Slope	Toxicity Category ¹	MRID #/Year	Study Classification
Midge (<i>Chironomus plumosus</i>)	96.7	LC ₅₀ : 53.2 (30.0 - 93.8) ² NOAEC: N.R. Slope: N.R.	Slightly toxic	00162296/1979	Acceptable
Water flea (<i>Daphnia magna</i>)	95.6	EC ₅₀ : 128.1 (95.6 - 172.1) NOAEC: 95.6 Slope: N.R.	Practically nontoxic	44320631/1995	Acceptable
Water flea (<i>Daphnia magna</i>)	83	EC ₅₀ : 647.4 (577.7 - 725.4) NOAEC: 464.8 Slope: N.R.	Practically nontoxic	00108172/1978	Acceptable

* No technical glyphosate salts were tested; a.i. = active ingredient; a.e. = acid equivalent, N.R. = not reported
¹Based on LC₅₀ (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic
² Range is 95% confidence interval for endpoint

Table J-11. Freshwater Invertebrates Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i.*	48-hour EC ₅₀ - LC ₅₀ / NOAEC (mg a.e./L)*/ Slope	Toxicity Category ¹	MRID #/Year	Study Classification
Glyphosate IPA - Roundup	Water flea (<i>Daphnia magna</i>)	41.36	EC ₅₀ : 1.6 (1.4 - 1.9) ² NOAEC: 0.6 Slope: 5.4	Moderately toxic	00070893/1980	Acceptable
Glyphosate IPA	Water flea (<i>Daphnia magna</i>)	30.3	EC ₅₀ : 2.2 (1.9 - 2.5) NOAEC: N.R. Slope: N.R.	Moderately toxic	00162296/1979	Acceptable
Glyphosate IPA (MON65005)	Water flea (<i>Daphnia magna</i>)	31.32	EC ₅₀ : 2.7 (2.3 - 3.1) NOAEC: 1.3 Slope: 6.2	Moderately toxic	44538201/1998	Acceptable
Glyphosate IPA (MON 77360)	Waterflea (<i>Daphnia magna</i>)	30.0	EC ₅₀ : 3.2 (2.9 - 3.7) NOAEC: 0.8 Slope: NA	Moderately toxic	45365004/2000	Acceptable

Table J-11. Freshwater Invertebrates Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i.*	48-hour EC ₅₀ - LC ₅₀ / NOAEC (mg a.e./L)*/ Slope	Toxicity Category ¹	MRID #/Year	Study Classification
Glyphosate IPA	Crayfish (<i>Orconectes nais</i>)	30.3	LC50: 5.2 (4.1 - 6.4) NOAEC: N.R. Slope: N.R.	Moderately toxic	40098001/1986	Supplemental
Glyphosate IPA (Roundup)	Water flea (<i>Daphnia pulex</i>)	30.3	EC50: 5.8 (5.3 - 6.4) NOAEC: N.R. Slope: N.R.	Moderately toxic	44125714/1984	Supplemental
Glyphosate IPA (Roundup)	Scud (<i>Gammarus pseudolimnaeus</i>)	31	LC50: 13 (9.6 - 19.2) NOAEC: 1.4 Slope: 2.33	Slightly toxic	00124762/1982	Supplemental
Glyphosate IPA	Midge (<i>Chironomus plumosus</i>)	30.3	LC50: 13.3 (7.0 - 23.7) NOAEC: N.R. Slope: N.R.	Slightly toxic	00162296/1979	Acceptable
Glyphosate (80WDG formulation)	Water flea (<i>Daphnia magna</i>)	80	EC50: >17.6 (N.A.) NOAEC: 17.6 Slope: N.A.	Slightly toxic	44125706/1996	Supplemental
Glyphosate IPA (Roundup with "W" surfactant)	Water flea (<i>Daphnia magna</i>)	40.7	EC50: 21.7 (18.7 - 25.0) NOAEC: N.R. Slope: N.R.	Slightly toxic	00078657/1980	Acceptable
Glyphosate monoammonium salt (MON 14420)	Daphnia (<i>Daphnia magna</i>)	68.5	EC50: 28.8 (12.3 - 48.5) NOAEC: 12.3 Slope: N.R.	Slightly toxic	45777401/1999	Acceptable
Glyphosate IPA	Scud (<i>Gammarus pseudolimnaeus</i>)	30.3	LC50: 31.8 (20.7 - 48.8) NOAEC: N.R. Slope: N.R.	Slightly toxic	00162296/1979	Acceptable
Glyphosate IPA (X-77 surfactant)	Water flea (<i>Daphnia magna</i>)	5.27	EC50: >39 (N.R.) NOAEC: 21.8 Slope: N.A.	Slightly toxic	00078666/1980	Supplemental
Glyphosate (360 g/L SL formulation)	Water flea (<i>Daphnia magna</i>)	27.25	EC50: 44.8 (38.0 - 52.0) NOAEC: 26 Slope: 7.6	Slightly toxic	45374003/1999	Acceptable

Table J-11. Freshwater Invertebrates Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i.*	48-hour EC ₅₀ - LC ₅₀ / NOAEC (mg a.e./L)*/ Slope	Toxicity Category ¹	MRID #/Year	Study Classification
Glyphosate IPA	Water flea (<i>Daphnia pulex</i>)	48	EC50: 68.3 (64.3 - 72.8.) NOAEC: <21.3 Slope: 3.9	Slightly toxic	00108109/1973	Supplemental
Glyphosate (Roundup with "AA" surfactant)	Water flea (<i>Daphnia magna</i>)	41.2	EC50: 94.5 (76.3 - 122.0) NOAEC: 17.1 Slope: 3.5	Slightly toxic	00078660/1980	Acceptable
Glyphosate IPA (Roundup Biactive)	Water flea (<i>Daphnia carinata</i>)	36	EC50: 150 (151 - 179) NOAEC: 45 Slope: N.R.	Practically nontoxic	44738201/1996	Not classified
Trisodium diglyphosate/Urea (Polado formula - MON 8000)	Water flea (<i>Daphnia magna</i>)	75	LC50: >315 (N.R.) NOAEC: 315 Slope: N.R.	Practically nontoxic	00079147/1980	Supplemental
Glyphosate IPA with surfactant Geronol CF/AR	Water flea (<i>Daphnia carinata</i>)	45	EC50: 365 (315 - 420) NOAEC: 190 Slope: N.R.	Practically nontoxic	44738201/1996	Not classified
Glyphosate IPA (no surfactant)	Water flea (<i>Daphnia magna</i>)	62.4	EC50: 401.3 (347.7 - 470.5) NOAEC: 147.8 Slope: 7.6	Practically nontoxic	00078663/1981	Acceptable
Glyphosate IPA with surfactant Geronol CF/AR	Water flea (<i>Daphnia carinata</i>)	36	EC50: 610 (540 - 700) NOAEC: 135 Slope: N.R.	Practically nontoxic	44738201/1996	Not classified
Glyphosate IPA with surfactant Geronol CF/AR	Water flea (<i>Daphnia carinata</i>)	10	EC50: 810 (700 - 940) NOAEC: 400 Slope: N.R.	Practically nontoxic	44738201/1996	Not classified
Glyphosate IPA (MON77945 Manufacturing concentrate)	Water flea (<i>Daphnia magna</i>)	46	EC50: 833 (665 - 1253) NOAEC: 204 Slope: 3.7	Practically nontoxic	44715410/1998	Not classified

* a.i. = active ingredient; a.e. = acid equivalent; IPA = isopropylamine salt

¹Based on LC₅₀ (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic

² Range is 95% confidence interval for endpoint

Table J-12. Freshwater Invertebrates Acute Toxicity for Surfactants Used with Glyphosate Formulations

Chemical	Species	% a.i.*	48-hour EC ₅₀ - LC ₅₀ / NOAEC (mg/L)/ Slope	Toxicity Category ¹	MRID #/Year	Study Classification
Surfactant Geronol CF/AR (alkyl polyoxy ethylene phosphoric acid ester)	Daphnia (<i>Daphnia magna</i>)	Tech.	EC50: 48 NOAEC: Slope: N.A.	Slightly toxic	44738201/1996	Not classified
MON 0818 (POEA)	Midge (<i>Chironomus plumosus</i>)	100	LC50: 13 (7.1- 24.0) ² NOAEC: N.R. Slope: N.R.	Slightly toxic	00162296/1979	Acceptable

* a.i. = active ingredient, assumed 100% for technical.

¹Based on LC₅₀ (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic

² Range is 95% confidence interval for endpoint

Table J-13. Freshwater Invertebrates Acute Toxicity for Aminomethyl Phosphonic Acid (AMPA) Degradate of Glyphosate

Chemical	Species	% a.i. ¹	48-hour LC ₅₀ /NOAEC (mg/L)/Slope	Toxicity Category ²	MRID #/Year	Study Classification
AMPA	Water flea (<i>Daphnia magna</i>)	94.38	EC50: 683 (553 - 1010) NOAEC: 320 Slope: N.A.	Practically nontoxic	43334715/1994	Acceptable

¹ a.i. = active ingredient, assumed 100% for technical material

²Based on LC₅₀ (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic

³ Range is 95% confidence interval for endpoint, N.A. = not available

Table J-14. Freshwater Fish Chronic Toxicity for Technical Glyphosate and Its Salts

Species	% Active Ingredient	NOAEC/LOAEC (mg acid equivalent/L)	MRID #/Year	Study Classification
Fathead minnow (<i>Pimephales promelas</i>)	87.3	25.7/>25.7 ¹	00108171/1975	Acceptable

Table J-15. Aquatic Phase Amphibian Chronic Toxicity for Technical Glyphosate IPA Salt and IPA Salt Formulations

Species	% Active Ingredient	NOAEC/LOAEC (mg acid equivalent/L)	MRID #/Year	Study Classification
Leopard Frog (<i>Rana pipiens</i>)	Tech (assumed 100%)	NOAEC/LOAEC: 1.8/>1.8	46650501/2004	Supplemental
Leopard Frog (<i>Rana pipiens</i>)	Roundup Original & Transorb 15% POEA	NOAEC/LOAEC: 0.6/1.8	46650501/2004	Supplemental

Table J-16. Aquatic-Phase Amphibian Chronic Toxicity for POEA Surfactant Used with Glyphosate Formulations

Chemical	Species	% a.i. ¹	NOAEC/ LOAEC (mg a.i./L)	MRID #/Year	Study Classification
Polyoxy ethylene fatty amine (POEA or MON 0818)	Leopard Frog (<i>Rana pipiens</i>) Larvae	Tech	NOAEC/ LOAEC: 0.6/1.8	46650501/2004	Supplemental

¹ a.i. = active ingredient, assumed 100% for technical material

Table J-17. Freshwater Invertebrates Chronic Toxicity for Technical Glyphosate IPA Salt

Species	% Active Ingredient	NOAEC/LOAEC (mg acid equivalent/L)	MRID #/Year	Study Classification
Water flea (<i>Daphnia magna</i>)	99.7	49.9/95.7 ¹	00124763/1982	Acceptable

Aquatic Plants

Table J-18. Aquatic Vascular and Nonvascular Freshwater Plant Toxicity Studies for Technical Glyphosate				
Species	% Active Ingredient*	EC₅₀ NOAEC (mg a.e./L)*/ Slope	MRID #/Year	Study Classification
Vascular Plants				
Duckweed (<i>Lemna gibba</i>)	95.6	14-day EC50: 11.9 (9.4-14.9) NOAEC: 1.3 Slope: N.R.	44320638/1996	Supplemental
Duckweed (<i>Lemna gibba</i>)	96.8	7-day EC50: 23.2 (20.3 - 27.1) NOAEC: 7.3 Slope: 2.91	45773101/2002	Acceptable
Duckweed (<i>Lemna gibba</i>)	96.6	14-day EC50: 20.8 (N.R.) NOAEC: <1.8 Slope: N.R.	40236905/1987	Acceptable
Non-vascular Plants				
Green algae (<i>Selenastrum capricornutum</i>)	96.6	4-day EC50: 12.1 (11.5 - 12.9) NOAEC: N.R. Slope: 12	40236901/1987	Acceptable
Bluegreen algae (<i>Anabaena flos-aquae</i>)	96.6	4-day EC50: 11.4 (10.5 - 12.1) NOAEC: N.R. Slope: 3.53	40236904/1987	Acceptable
Green algae (<i>Selenastrum capricornutum</i>)	95.6	5-day EC50: 13.4 (9.6 - 19.1) NOAEC: 9.6 Slope: N.R.	44320637/1995	Acceptable
Bluegreen algae (<i>Anabaena flos-aquae</i>)	95.6	5-day EC50: 14.3 (9.3 - 25.8) NOAEC: 11.5 Slope: N.R.	44320639/1996	Acceptable
Freshwater diatom (<i>Navicula pelliculosa</i>)	95.6	5-day EC50: 16.3 (11.5 - 22.9) NOAEC: 1.7 Slope: N.R.	44320641/1996	Acceptable
Freshwater diatom (<i>Navicula pelliculosa</i>)	96.6	7-day EC50: 37.3 (34.8 - 41.5) NOAEC: 18.5 Slope: 5.87	40236902/1987	Acceptable
* a.i. = active ingredient; a.e. = acid equivalent; N.R. = Not reported				
¹ Range is 95% confidence interval for endpoint				

Table J-19 Aquatic Vascular and Nonvascular Freshwater Plant Toxicity Studies for Glyphosate Formulations

Chemical	Species	% a.i.*	EC ₅₀ / NOAEC (mg a.e.*/L)/ Slope	MRID #/Year	Study Classification
Vascular Plants					
Glyphosate IPA salt* (glyphos (glyphosate product))	Duckweed (<i>Lemna gibba</i>)	31.0	7-Day EC50: 7.7 (7.1 - 8.3) ¹ NOAEC: 0.29 Slope: 4.76	45666704/2001	Acceptable
Glyphosate IPA salt (Roundup 41%)	Duckweed (<i>Lemna minor</i>)	30.3	14-day EC50: 1.5 (N.R.) NOAEC: N.R. Slope: N.R.	44125714/1984	Supplemental
Glyphosate IPA salt (TEP Roundup)	Duckweed (<i>Lemna minor</i>)	NR	48 hr. EC50: >16.91 (N.A.) NOAEC: 16.91 Slope: N.A.	44125713/1989	Supplemental
Glyphosate IPA salt	Duckweed (<i>Lemna minor</i>)	N.R.	14-day EC50: 2.0 (N.R.) NOAEC: N.R. Slope: N.R.	44125714/1984	Supplemental
Nonvascular Plants					
Glyphosate monoammonium salt (MON 14420)	Green algae (<i>Selenastrum capricornutum</i>)	68.5	72-hr EC50: 1.85 (1.3 - 2.3) NOAEC: 0.61 Slope: N.R.	45777403/1999	Supplemental
Glyphosate monoammonium salt (MON78568)	Green algae (<i>Selenastrum capricornutum</i>)	64.9	72-hr EC50: 11.2 (10 - 12.6) NOAEC: 1.58 Slope: N.R.	45767102/2002	Supplemental
Glyphosate IPA salt with surfactant Geronol CF/AR	Green algae (<i>Selenastrum capricornutum</i>)	36	72-hr EC50: 97 (85 - 111) NOAEC: 73 Slope: N.A.	44738201/1996	Supplemental
Glyphosate IPA salt with surfactant Geronol CF/AR	Green algae (<i>Selenastrum capricornutum</i>)	36	72-hr EC50: 39 (33 - 45) NOAEC: 16 Slope: N.A.	44738201/1996	Supplemental
Glyphosate (glyphos)	Freshwater diatom (<i>Navicula pelliculosa</i>)	31.0	96-hr EC50: 0.12 (0.11 - 0.13) NOAEC: 0.082 Slope: 8.78	45666701/2001	Acceptable
Glyphosate IPA salt (glyphos (glyphosate product))	Green algae (<i>Selenastrum capricornutum</i>)	31.0	96-hr EC50: 0.68 (0.57 - 0.81) NOAEC: 0.43 Slope: 4.47	45666702/2001	Acceptable
* a.i. = active ingredient; a.e. = acid equivalent; IPA = isopropylamine salt; NR = not reported; NA = not available					
¹ Range is 95% confidence interval for endpoint					

Table J-20. Aquatic Nonvascular Freshwater Plant Toxicity Studies on Glyphosate Mixtures

Chemical	Species	% a.i.*	EC ₅₀ / NOAEC (mg a.e.*/L)/ Slope	MRID #/Year	Study Classification
Nonvascular Plants					
Glyphosate acid-equivalent (IPA)/Oxyfluorfen mix	Green algae (<i>Selenastrum capricornutum</i>)	32	96-hr EC ₅₀ : 0.0026 (0.0021 - 0.0033) ¹ NOAEC: 0.00045 Slope: 3.96	45906008/2001	Acceptable
* a.i. = active ingredient; a.e. = acid equivalent; IPA = isopropylamine salt; ¹ Range is 95% confidence interval for endpoint					

Open Literature Data

Of the available open literature studies from which data may be extracted for comparing the results with the submitted studies, 3 studies, on 3 different species of green algae provide lower 96-hr EC₅₀'s based on cell counts (growth) correlated with absorbance over time for 96 hours on a Shimadzu UV-2401 PC Spectrophotometer. All of these studies were performed by the same group of scientists and published in different papers. In the first study, conducted with 95% technical material (not stated if glyphosate or the IPA of glyphosate), the 96-hr EC₅₀ was 3.530 mg/L for *Chlorella pyrenoidosa* (Ma et.al 2001, ECOTOX reference 61983). In the second study (Ma et al., 2002, ECOTOX reference 65938), the 96 hr. EC₅₀ for *Chlorella vulgaris* was 4.70 mg/L. This was again conducted with a 95% technical product. The study authors used the CAS number for glyphosate, not IPA, so it is assumed that this is the acid. The third study, conducted with *Raphidocelis subcapitata* (*Selenastrum capricornutum*) (Ma et al., 2006, ECOTOX ref. 83543), the 96 hr. acute toxicity value is 5.56 mg/L. Again, the study was conducted with 95% technical product, which is presumed to be the glyphosate acid.

Birds

Table J-21. Avian Acute Toxicity for Technical Glyphosate

Chemical	Species	% a.i.¹	LD₅₀/ LC₅₀ NOAEL/ NOAEC (mg a.e./kg bw or ppm a.e.)¹	Toxicity Category²	MRID #/Year	Study Classification
Glyphosate	Bobwhite quail (<i>Colinus virginianus</i>)	83	LD50: >3196.3 mg a.e./kg bw	Slightly toxic	00108204	Acceptable
Glyphosate	Mallard duck (<i>Anas platyrhynchos</i>)	98.5	LC50: >4570.4 (N.A.) PPM NOAEC: 4570.4	Slightly toxic	108107/37765/1973	Acceptable
Glyphosate	Bobwhite quail (<i>Colinus virginianus</i>)	98.5	LC50: >4570 (N.R.) PPM NOAEC: 4570	Slightly toxic	00076492/1973	Acceptable
Glyphosate	Bobwhite quail (<i>Colinus virginianus</i>)	95.6	LD50: >1912 (N.A.) mg/kg bw NOAEL: 1912	Slightly toxic	44320626/1997	Acceptable
Glyphosate	Mallard duck (<i>Anas platyrhynchos</i>)	95.6	LC50: >4971.2 (N.A.) PPM NOAEC: 4971.2	Slightly toxic	44320627/1998	Acceptable
Glyphosate	Bobwhite quail (<i>Colinus virginianus</i>)	95.6	LC50: >4971.2 (N.A.) PPM NOAEC: 4971.2	Slightly toxic	44320628/1997	Acceptable

¹ a.i. = active ingredient; a.e. = acid equivalent

²Based on LC₅₀ (ppm): < 50 very highly toxic; 50 - 500 highly toxic; 501 - 1000 moderately toxic; 1001-5000 slightly toxic; >5000 practically non-toxic; based on LD₅₀ (mg/kg bw): < 10 very highly toxic; 10 - 50 highly toxic; 51 - 500 moderately toxic; 501-2000 slightly toxic; >2000 practically non-toxic

³ Range is 95% confidence interval for endpoint, N.A. = not available, N.R. = not reported

Table J-22. Avian Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i. ¹	LD ₅₀ / LC ₅₀ NOAEL/ NOAEC (mg a.e./kg bw or ppm a.e.) ¹	Toxicity Category ²	MRID #/Year	Study Classification
Trisodium diglyphosate/Urea (Polado formula; MON 8000)	Bobwhite quail (<i>Colinus virginianus</i>)	75	LD50: >780 (N.R.) PPM NOAEC: 780	Slightly toxic	00085638/1980	Supplemental
Trisodium diglyphosate/Urea (Polado formula; MON 8000)	Bobwhite quail (<i>Colinus virginianus</i>)	75	LC50: >1770 (N.R.) PPM NOAEC: 1770	Slightly toxic	00085639/1981	Supplemental
Trisodium diglyphosate/Urea (Polado formula; MON 8000)	Mallard duck (<i>Anas platyrhynchos</i>)	75	LC50: >1770 (N.R.) PPM NOAEC: 315	Slightly toxic	00085640/1980	Supplemental
Glyphosate monoammonium salt (MON 14420)	Bobwhite quail (<i>Colinus virginianus</i>)	68.5	LD50: 1131 (925 - 1541) mg/kg bw NOAEL: 333 (decreases in bw and food consumption at 555 mg/kg bw)	Slightly toxic	45777402/1999	Acceptable
Glyphosate isopropylamine salt (MON65005)	Mallard duck (<i>Anas platyrhynchos</i>)	31.32	LC50> 1760 (N.A.) PPM NOAEC: 1760	Slightly toxic	44465701/1997	Acceptable
Glyphosate isopropylamine salt (MON65005)	Bobwhite quail (<i>Colinus virginianus</i>)	31.32	LC50> 1760 (N.A.) PPM NOAEC: 1760	Slightly toxic	44465702/1997	Acceptable

¹ a.i. = active ingredient; a.e. = acid equivalent
²Based on LC₅₀ (ppm): < 50 very highly toxic; 50 - 500 highly toxic; 501 - 1000 moderately toxic; 1001-5000 slightly toxic; >5000 practically non-toxic; based on LD₅₀ (mg/kg bw): < 10 very highly toxic; 10 - 50 highly toxic; 51 - 500 moderately toxic; 501-2000 slightly toxic; >2000 practically non-toxic
³ Range is 95% confidence interval for endpoint, N.A. = not available, N.R. = not reported

Table J-23. Avian Acute Toxicity for Aminomethyl Phosphonic Acid (AMPA) Degradate of Glyphosate

Chemical	Species	% a.i. ¹	LD ₅₀ / LC ₅₀ NOAEL/ NOAEC (mg a.e./kg bw or ppm a.e.)/ Slope ¹	Toxicity Category ²	MRID #/Year	Study Classification
AMPA	Bobwhite quail (<i>Colinus virginianus</i>)	87.8	LD50: >1976 (N.A.) mg/kg NOAEL: 1185 Slope: N.A.	Slightly toxic	43334709/1991	Acceptable

Table J-23. Avian Acute Toxicity for Aminomethyl Phosphonic Acid (AMPA) Degradate of Glyphosate

Chemical	Species	% a.i. ¹	LD ₅₀ / LC ₅₀ NOAEL/ NOAEC (mg a.e./kg bw or ppm a.e.)/ Slope ¹	Toxicity Category ²	MRID #/Year	Study Classification
AMPA	Bobwhite quail (<i>Colinus virginianus</i>)	87.8	LC50: >4934 (N.A.) PPM NOAEC: 4934 Slope: N.A.	Slightly toxic	43334710/1994	Acceptable
AMPA	Mallard duck (<i>Anas platyrhynchos</i>)	87.8	LC50: >4934 (N.A.) PPM NOAEC: 4934 Slope: N.A.	Slightly toxic	43334711/1994	Acceptable

¹ a.i. = active ingredient; a.e. = acid equivalent
²Based on LC₅₀ (ppm): < 50 very highly toxic; 50 - 500 highly toxic; 501 - 1000 moderately toxic; 1001-5000 slightly toxic; >5000 practically non-toxic; based on LD₅₀ (mg/kg bw): < 10 very highly toxic; 10 - 50 highly toxic; 51 - 500 moderately toxic; 501-2000 slightly toxic; >2000 practically non-toxic
⁴ Range is 95% confidence interval for endpoint, N.A. = not available

Table J-24. Avian Chronic Toxicity for Technical Glyphosate

Chemical	Species	% a.i. ¹	LD ₅₀ / LC ₅₀ NOAEL/ NOAEC (mg a.e./kg bw or ppm a.e.) ¹	Toxicity Category ²	MRID #/Year	Study Classification
Glyphosate	Mallard duck (<i>Anas platyrhynchos</i>)	90.4	LOAEC: >27 (N.A.) PPM NOAEC: 27	N.A.	00036328/113457/1975	Supplemental
Glyphosate	Mallard duck (<i>Anas platyrhynchos</i>)	83	LOAEC: >830 (N.A.) PPM NOAEC: 830	N.A.	111953/1978	Acceptable
Glyphosate	Bobwhite quail (<i>Colinus virginianus</i>)	83	LOAEC: >830 (N.A.) PPM NOAEC: 830	N.A.	108207/1978	Acceptable

¹ a.i. = active ingredient; a.e. = acid equivalent
² Range is 95% confidence interval for endpoint, N.A. = not applicable

Open Literature Data

There are additional avian toxicity data, including sublethal effects information, available in the open literature (for details see Appendix I). None of the toxicological endpoints identified in the open literature studies are more sensitive than the most sensitive acute and chronic endpoints available in the submitted avian toxicity studies (see Sections 4.2.1.1 – 4.2.1.2).

There was one subchronic study on the effects of the formulation, Roundup “(360 g/l of glyphosate, 480 g/l of IPA salt and 684 g/l of other inert ingredients)” on the epididymal region of drakes (*Anas platyrhynchos*) (Oliveira et. al. 2007). The formulation was administered by gavage to three groups of 6 adult drakes for 15 days at 0 (distilled water), 5 and 100 mg/kg bw. There was a significant reduction (90%, $p \leq 0.05$) in plasma testosterone levels after treatment at both dose levels when compared to the control group. The report stated that “alterations in the structure of the testis and epididymal region...with changes in the expression of androgen receptors restricted to the testis” were observed. The authors also stated that “the effects were mostly dose dependent, indicating that this herbicide may cause disorder in the morphophysiology of the male genital system of animals”. Further studies would be needed to determine whether or not these observed effects would affect avian (or, in this case, terrestrial-phase amphibian) reproduction.

Mammals

Table J-25. Mammalian Acute Toxicity for Technical Glyphosate

Chemical	Species	% a.i. ¹	LD ₅₀ (mg a.e./kg bw) ¹	Toxicity Category ²	MRID No.	Study Classification
Glyphosate	Rat (<i>rattus norvegicus</i>)	96	>4800 limit test. No mortalities.	Practically non-toxic	43728003	Acceptable
Glyphosate	Rat (<i>rattus norvegicus</i>)	95	>4750 – limit test. No mortalities	Practically non-toxic	45058306	Acceptable
Glyphosate	Rat (<i>rattus norvegicus</i>)	97.2	>4860 up and down – no mortalities	Practically non-toxic	46760505	Acceptable
Glyphosate	Rat (<i>rattus norvegicus</i>)	88	>4400. No mortalities	Practically non-toxic	44320604	Acceptable
Glyphosate	Rat (<i>rattus norvegicus</i>)	95	>4750 up and down – no mortalities	Practically non-toxic	46998805	Acceptable
Glyphosate	Rat (<i>rattus norvegicus</i>)	76	>3800 – no mortalities	Practically non-toxic	41400601	Acceptable
Glyphosate (IPA 62%)	Rat (<i>rattus norvegicus</i>)	96	>1920 – no mortalities	Slightly toxic (when expressed as a.e.)	44142104	Acceptable
Glyphosate	Rat (<i>rattus norvegicus</i>)	95.4	>4770 up and down – no mortalities	Practically non-toxic	46816107	Acceptable

¹ a.i. = active ingredient; a.e. = acid equivalent

²Based on LD₅₀ (mg/kg bw): < 10 very highly toxic; 10 - 50 highly toxic; 51 - 500 moderately toxic; 501-2000 slightly toxic; >2000 practically non-toxic.

Table J-26. Mammalian Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i. ¹	LD ₅₀ (mg a.e./kg bw a.e.) ¹	Toxicity Category ²	MRID No.	Study Classification
ClearOut 41 (41% glyphosate IPA)	Rat (<i>rattus norvegicus</i>)	30.3	>606	Slightly toxic	44883104	Acceptable
ClearOut 41 Plus (41% glyphosate IPA)	Rat (<i>rattus norvegicus</i>)	30.3	>606	Slightly toxic	44883113	Acceptable
Clearout 62 (62% glyphosate IPA)	Rat (<i>rattus norvegicus</i>)	62	>1240	Slightly toxic	45657801	Acceptable
Dual Salt Fully Loaded (glyphosate IPA and NH4 Salt)	Rat (<i>rattus norvegicus</i>)	36	>1800	Slightly toxic	45615104	Acceptable
Glyphosate Acid 7.10 g/kg SL Formulation	Rat (<i>rattus norvegicus</i>)	0.71	>35.5	Highly toxic when reported as a.e. due to low percentage of a.i.	43746804	Acceptable
EH-1384 (6.75% glyphosate IPA)	Rat (<i>rattus norvegicus</i>)	5	>100	Slightly toxic	45328903	Acceptable
EH-1386 (50.0% glyphosate IPA)	Rat (<i>rattus norvegicus</i>)	37	>740	Slightly toxic	45387703	Acceptable
GF-1280 (50.8% glyphosate dimethylammonium)	Rat (<i>rattus norvegicus</i>)	40.1	>2005	Practically nontoxic	46775603	Acceptable
GF-1667 (62.1% glyphosate dimethylammonium salt)	Rat (<i>rattus norvegicus</i>)	49	>2450	Practically nontoxic	46730705	Acceptable
GF-772 (40.2% IPA salt)	Rat (<i>rattus norvegicus</i>)	29.8	>1490	Slightly toxic	45871303	Acceptable
GF-887 (54.2% glyphosate IPA)	Rat (<i>rattus norvegicus</i>)	40.1	>2005	Practically nontoxic	45819303	Acceptable
Glyfos (41% IPA)	Rat (<i>rattus norvegicus</i>)	30.3	>1515	Slightly toxic	43530002	Acceptable
Glygran WDG glyphosate 80 WDG	Rat (<i>rattus norvegicus</i>)	80	>1600	Slightly toxic	44125603	Acceptable
Glyphosate	Rat (<i>rattus norvegicus</i>)	62	>3100	Practically nontoxic	45101503	Acceptable
Glyphosate Unloaded (52.9% IPA)	Rat (<i>rattus norvegicus</i>)	39.2	>1960	Slightly toxic	46783403	Acceptable
Glyphosate 360g/l SL	Rat (<i>rattus norvegicus</i>)	27.25	>1363	Slightly toxic	44953503	Acceptable

Table J-26. Mammalian Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i.¹	LD₅₀ (mg a.e./kg bw a.e.)¹	Toxicity Category²	MRID No.	Study Classification
Glyphosate 500 SL-M (36.7% Glyphosate Potassium)	Rat (<i>rattus norvegicus</i>)	36.7	>1835	Slightly toxic	45830201	Acceptable
Glyphosate Acid 7.10 g/kg SL Formulation	Rat (<i>rattus norvegicus</i>)	0.73	>36.5	Highly toxic when reported as a.e. due to low percentage of a.i.	44497001	Acceptable
Glyphosate acid formulation 500 g/kg WP	Rat (<i>rattus norvegicus</i>)	49.3	>2465	Practically nontoxic	44317201	Acceptable
Glyphosate IPA	Rat (<i>rattus norvegicus</i>)	22.9	724	Slightly toxic	44918601	Acceptable
Glyphosate IPA salt (NAF 545)	Rat (<i>rattus norvegicus</i>)	30.9	>1545	Slightly toxic	44863801	Acceptable
Glyphosate premix (62.2%)	Rat (<i>rattus norvegicus</i>)	62.2	>3110	Practically nontoxic	44949802	Acceptable
Glyphosate SL (600)	Rat (<i>rattus norvegicus</i>)	42.6	>2130	Practically nontoxic	46006803	Acceptable
HM-0548 5905-LTE Mixture of ammonium salt (19.68%) and IPA (13.36%)	Rat (<i>rattus norvegicus</i>)	25	>1250	Slightly toxic	47236803	Acceptable
HM-2028 (Glyphosate: 11.4%)	Rat (<i>rattus norvegicus</i>)	11.4	357	Moderately toxic when reported as a.e. due to low percentage of a.i.	46714802	Acceptable
LI6130 (13.41% Glyphosate Full Load: 40.6% IPA)	Rat (<i>rattus norvegicus</i>)	4	>215	Moderately toxic when reported as a.e. due to low percentage of a.i.	46862303	Acceptable
LI6167-11 (40.5% IPA ("Half load"))	Rat (<i>rattus norvegicus</i>)	30	>1500	Slightly toxic	46862103	Acceptable
MON 20033	Rat (<i>rattus norvegicus</i>)	63	3150	Practically nontoxic	41142304	Acceptable

Table J-26. Mammalian Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i. ¹	LD ₅₀ (mg a.e./kg bw a.e.) ¹	Toxicity Category ²	MRID No.	Study Classification
MON 20047	Rat (<i>rattus norvegicus</i>)	18.4	460 - 690	Moderately toxic when reported as a.e. due to low percentage of a.i.	41305404	Acceptable
MON 60696 (70.1% monoammonium salt)	Rat (<i>rattus norvegicus</i>)	54	>2700	Practically nontoxic	43049302	Acceptable
MON 65005 (41% IPA)	Rat (<i>rattus norvegicus</i>)	30.3	>1515	Slightly toxic	43020902	Acceptable
MON 77063	Rat (<i>rattus norvegicus</i>)	65.4	2599	Practically nontoxic	44615502	Acceptable
MON 77945	Rat (<i>rattus norvegicus</i>)	46.6	>2330	Practically nontoxic	44715402	Acceptable
MON 78063	Rat (<i>rattus norvegicus</i>)	37.7	>1885	Slightly toxic	44872702	Acceptable
MON 78293	Rat (<i>rattus norvegicus</i>)	39.3	>1965	Slightly toxic	44809002	Acceptable
MON 78634 (71.8% ammonium salt)	Rat (<i>rattus norvegicus</i>)	65.2	>1304	Slightly toxic	46087001	Acceptable
Mon 79186 (2.02% glyphosate IPA)	Rat (<i>rattus norvegicus</i>)	1.5	>75	Moderately toxic when reported as a.e. due to low percentage of a.i.	46473802	Acceptable
MON 79188	Rat (<i>rattus norvegicus</i>)	4.42	>221	Moderately toxic when reported as a.e. due to low percentage of a.i.	46078502	Acceptable
Nufarm NUP 3G 02 (450 g/L glyphosate as IPA salt)	Rat (<i>rattus norvegicus</i>)	45	>2250	Practically nontoxic	46009104	Acceptable
Nufarm RUP0532 (41% Glyphosate as IPA and ammonium salts)	Rat (<i>rattus norvegicus</i>)	30.3	>1515	Slightly toxic	45386802	Acceptable
NUP-07010 (Glyphosate, 41.72%)	Rat (<i>rattus norvegicus</i>)	41.72	>2086	Practically nontoxic	47298403	Acceptable

Table J-26. Mammalian Acute Toxicity for Glyphosate Formulations

Chemical	Species	% a.i. ¹	LD ₅₀ (mg a.e./kg bw a.e.) ¹	Toxicity Category ²	MRID No.	Study Classification
NUP3a99 (41% glyphosate IPA)	Rat (<i>rattus norvegicus</i>)	30.3	>1515	Slightly toxic	44872602	Acceptable
NUP3b99 (53.8% glyphosate IPA)	Rat (<i>rattus norvegicus</i>)	39.8	>1990	Slightly toxic	44873302	Acceptable
NUP5a99 (62% glyphosate MUP)	Rat (<i>rattus norvegicus</i>)	62	>3100	Practically nontoxic	45293503	Acceptable
56077-LL - Phoss-8	Rat (<i>rattus norvegicus</i>)	80	>4000	Practically nontoxic	45044402	Acceptable
Roundup L&G Ready to Use (glyphosate IPA)	Rat (<i>rattus norvegicus</i>)	0.85	>40	Highly toxic when reported as a.e. due to low percentage of a.i.	41395601	Acceptable
Spray-Charlie (44% GLY-41 (524-475 with 41% IPA)	Rat (<i>rattus norvegicus</i>)	15.2	>760	Slightly toxic	45929403	Acceptable

¹ a.i. = active ingredient; a.e. = acid equivalent
²Based on LD₅₀ (mg/kg bw): < 10 very highly toxic; 10 - 50 highly toxic; 51 - 500 moderately toxic; 501-2000 slightly toxic; >2000 practically nontoxic.

Table J-27. Mammalian Chronic Toxicity for Technical Glyphosate

Chemical	Species	% a.i. ¹	NOAEL/ NOAEC (mg a.e./kg bw or ppm a.e.) ¹	MRID #/Year	Study Classification
Glyphosate	Rat (<i>rattus norvegicus</i>)	97.67	2-generation reproduction study Parental/Systemic NOAEL: 500 mg/kg/day (10,000 ppm) LOAEL: 1500 mg/kg/day (30,000 ppm) Reproductive NOAEL: 1500 mg/kg/day (HDT) Offspring NOAEL: 500 mg/kg/day (10,000 ppm) LOAEL: 1500 mg/kg/day	41621501/1990	Acceptable
Glyphosate	Rat (<i>rattus norvegicus</i>)	100%	3-generation reproduction study Parental/Systemic, Offspring and Reproductive NOAELs: 30 mg/kg/day (highest dose tested).	00081674; 00105995 1981; 1982	Acceptable

Table J-27. Mammalian Chronic Toxicity for Technical Glyphosate

Chemical	Species	% a.i. ¹	NOAEL/ NOAEC (mg a.e./kg bw or ppm a.e.) ¹	MRID #/Year	Study Classification
Glyphosate	Rabbit (<i>Oryctolagus cuniculus</i>)	98.7	Developmental toxicity study Maternal NOAEL = 175 mg/kg/day LOAEL = 350 mg/kg/day based on mortality, diarrhea, soft stools, and nasal discharge. Developmental NOAEL = 350 mg/kg/day (HDT) LOAEL = not established.	00046363/1980	Acceptable
¹ a.i. = active ingredient; a.e. = acid equivalent ² Range is 95% confidence interval for endpoint, N.A. = not applicable					

Table J-28. Mammalian Chronic Toxicity for Surfactants

Chemical	Species	% a.i. ¹	NOAEL/ NOAEC (mg a.e./kg bw or ppm a.e.) ¹	MRID #/Year	Study Classification
POEA	Rat (<i>rattus norvegicus</i>)	100%	Reproduction/developmental screening study temporary endpoints: Parental/Systemic NOAEL: 1000 ppm (52.8 – 56.1 mg/kg bw/day (M) and 64.9 – 66.6 mg/kg bw/day (F)) Reproductive NOAEL: 300 ppm (14.9 - 16.6 mg/kg bw/day (M) and 18.9 - 19.5 mg/kg bw/day (F)) LOAEL: 1000 ppm (52.8 – 56.1 mg/kg bw/day (M) and 64.9 – 66.6 mg/kg bw/day (F)) Based on increased mean number of unaccounted-for sites. Offspring NOAEL: 300 ppm (14.9 - 16.6 mg/kg bw/day (M) and 18.9 - 19.5 mg/kg bw/day (F)) LOAEL: 1000 ppm (52.8 – 56.1 mg/kg bw/day (M) and 64.9 – 66.6 mg/kg bw/day (F)) Based on litter loss, decreased mean number of pups born live, litter size and postnatal survival from birth to PND 4. Effects not reproducible in second generation; however, this is a definitive NOAEL/LOAEL.	47097401/2006	Not classified yet – incomplete review

¹ a.i. = active ingredient; a.e. = acid equivalent

² Range is 95% confidence interval for endpoint, N.A. = not applicable

Terrestrial Invertebrates

Table J-29. Acute Toxicity Studies on Terrestrial Invertebrates for Technical Glyphosate

Chemical	Species	% a.i. ¹	LD ₅₀ / LC ₅₀ NOAEL/ NOAEC	MRID #/Year	Study Classification
Glyphosate	Honey bee (<i>Apis mellifera</i>)	98.5	48 hr LD ₅₀ (O): >100 (N.R.) ² µg/bee NOAEL: N.R. Slope: N.R.	00026489/1972	Acceptable

Table J-29. Acute Toxicity Studies on Terrestrial Invertebrates for Technical Glyphosate

Chemical	Species	% a.i. ¹	LD ₅₀ / LC ₅₀ NOAEL/ NOAEC	MRID #/Year	Study Classification
Glyphosate	Honey bee (<i>Apis mellifera</i>)	98.5	48 hr LD ₅₀ (C): >100 (N.R.) µg/bee NOAEL: N.R. Slope: N.R.	00026489/1972	Acceptable

¹ a.i. = active ingredient; a.e. = acid equivalent

² Range is 95% confidence interval for endpoint, N.R. = not reported; O = oral study; C = contact study

Table J-30. Acute Toxicity Studies on Terrestrial Invertebrates for Glyphosate Formulations

Chemical	Species	% a.i. ¹	LD ₅₀ / LC ₅₀ NOAEL/ NOAEC	MRID #/Year	Study Classification
Glyphosate monoammonium salt (MON78568)	Honey bee (<i>Apis mellifera</i>)	65.6	48 hr LD ₅₀ (C): >100 (N.A.) ² µg/bee NOAEL: 100 Slope: N.R.	45767104/2001	Not classified
Glyphosate monoammonium salt (MON78568)	Honey bee (<i>Apis mellifera</i>)	65.6	48 hr LD ₅₀ (O): >76.23 (N.A.) µg a.e./bee NOAEL: <76.23 µg a.e./bee Slope: N.R.	45767104/2001	Not classified
Glyphosate monoammonium salt (MON78568)	Predatory mite (<i>Typhlodromus pyri</i>)	64.9	7 D LD ₅₀ (C): 1200 (839-1786) g a.e./ha NOAEL: 216 Slope: N.R.	45767105/2002	Not classified
Glyphosate monoammonium salt (MON78568)	Predatory mite (<i>Typhlodromus pyri</i>)	64.9	7 D LD ₅₀ (C): >4320 (N.R.) g/ha NOAEL: 216 Slope: N.R.	45767106/2002	Not classified
Glyphosate monoammonium salt (MON78568)	Predatory mite (<i>Typhlodromus pyri</i>)	64.9	14 - 21 D LD ₅₀ (C): N.A. (N.A.) g/ha NOAEL: 216 or <119 (no dose-response) Slope: N.A.	45767106/2002	Not classified
Glyphosate monoammonium salt (MON78568)	Earthworm (<i>Eisenia fetida</i>)	64.9	14 D LD ₅₀ (C): >6560 (N.A.) mg/kg soil NOAEL: 6560 Slope: N.R.	45767109/2001	Not classified
Glyphosate monoammonium salt (MON78568)	Parasitic wasp (<i>Aphidius rhopalosiphi</i>)	64.9	48 hr - 13 days LD ₅₀ (C): >108 (N.R.) g a.e./ha NOAEL: Not established Slope: N.R.	45767107/2002	Not classified

Table J-30. Acute Toxicity Studies on Terrestrial Invertebrates for Glyphosate Formulations

Chemical	Species	% a.i. ¹	LD ₅₀ / LC ₅₀ NOAEL/ NOAEC	MRID #/Year	Study Classification
Glyphosate monoammonium salt (MON78568)	Parasitic wasp (<i>Aphidius rhopalosiphi</i>)	64.9	48 hr - 13 days LD ₅₀ (C): >4320 (N.R.) g/ha NOAEL: 4320 Slope: N.R.	45767107/2002	Not classified
Glyphosate monoammonium salt (MON78568)	Parasitic wasp (<i>Aphidius rhopalosiphi</i>)	64.9	48 hr - 13 days LD ₅₀ (C): >4320 (N.R.) g a.e./ha NOAEL: 4320 Slope: N.R.	45767108/2002	Not classified
Glyphosate monoammonium salt (MON78568)	Lacewing (<i>Chrysoperla carnia</i>)	64.9	Up to 10 days LD ₅₀ (C): >4320 (N.R.) g/ha NOAEC: 4320 Slope: N.R.	45767110/2002	Not classified
Glyphosate IPA salt (MON 2139)	Honey bee (<i>Apis mellifera</i>)	36	48 hr LD ₅₀ (O): >100 (N.R.) μg/bee NOAEL: N.R. Slope: N.R.	00026489/1972	Acceptable
Glyphosate IPA salt (MON 2139)	Honey bee (<i>Apis mellifera</i>)	36	48 hr LD ₅₀ (C): >100 (N.R.) μg/bee NOAEL: N.R. Slope: N.R.	00026489/1972	Acceptable
Glyphosate IPA salt (MON65005)	Honey bee (<i>Apis mellifera</i>)	31.32	48 hr LD ₅₀ (C): >31.3 (N.A.) μg a.e./bee NOAEL: 319 Slope: N.A.	44465703/1997	Acceptable
Glyphosate IPA salt (MON 77360)	Honey bee (<i>Apis mellifera</i>)	30.0	48 hr LD ₅₀ (C): >30 (NA) μg/bee NOAEL: 30 Slope: NA	45370301/2001	Acceptable
Glyphosate IPA salt (MON 77360)	Honey bee (<i>Apis mellifera</i>)	30.0	48 hr LD ₅₀ (O): >30 (NA) μg/bee NOAEL: 15 Slope: NA	45370302/2001	Supplemental

¹ a.i. = active ingredient; a.e. = acid equivalent/ IPA = isopropylamine; N.R. = not reported; O = oral study; C = contact study
² Range is 95% confidence interval for endpoint,

Open Literature Data

Open literature data on glyphosate, its salts and/or formulations included a large number of efficacy studies which were not useful for a quantitative assessment of risk. Those studies which could possibly be used were either tested at lower concentrations than the submitted studies with no effects or insufficient information was provided on the test material to determine the concentration levels tested for either the active ingredient and/or the glyphosate acid equivalent.

Terrestrial Plants

Studies on Technical Material

Table J-31. Vegetative Vigor Study on Terrestrial Plants with Technical Glyphosate

Chemical	Species	% a.i. ¹	EC ₂₅ / NOAEC (EC ₀₅) (lbs a.e./Acre ¹)	MRID #/Year	Study Classification
Monocots					
Glyphosate	Oat (<i>Avena sativa</i>)	96.6	21 D EC ₂₅ : 0.4 (N.R.) LB/A NOAEC/EC ₀₅ : 0.14 Slope: 2.3	43088701/1994	Acceptable
Glyphosate	Corn (<i>Zea mays</i>)	96.6	21 D EC ₂₅ : 0.43 (N.R.) LB/A NOAEC/EC ₀₅ : 0.07 Slope: 3.7	43088701/1994	Acceptable
Glyphosate	Onion (<i>Allium cepa</i>)	96.6	21 D EC ₂₅ : 0.83 (N.R.) LB/A NOAEC/EC ₀₅ : 0.56 Slope: 2.4	43088701/1994	Acceptable
Glyphosate	Ryegrass (<i>Lolium perenne</i>)	96.6	21 D EC ₂₅ : 0.98 (N.R.) LB/A NOAEC/EC ₀₅ : 0.56 Slope: 4.9	43088701/1994	Acceptable
Dicots					
Glyphosate	Tomato (<i>Lycopersicon esculentum</i>)	96.6	21 D EC ₂₅ : 0.11 (N.R.) LB/A NOAEC/EC ₀₅ : 0.035 Slope: 3.4	43088701/1994	Acceptable
Glyphosate	Cucumber (<i>Cucumis sativus</i>)	96.6	21 D EC ₂₅ : 0.46 (N.R.) LB/A NOAEC/EC ₀₅ : 0.14 Slope: 2.6	43088701/1994	Acceptable
Glyphosate	Lettuce (<i>Lactuca sativa</i>)	96.6	21 D EC ₂₅ : 0.4 (N.R.) LB/A NOAEC/EC ₀₅ : 0.28 Slope: N.R.	43088701/1994	Acceptable
Glyphosate	Cabbage (<i>Brassica oleracea</i>)	96.6	21 D EC ₂₅ : 0.3 (N.R.) LB/A NOAEC/EC ₀₅ : 0.14 Slope: N.R.	43088701/1994	Acceptable
Glyphosate	Soybean (<i>Glycine max</i>)	96.6	21 D EC ₂₅ : 0.42 (N.R.) LB/A NOAEC/EC ₀₅ : 0.28 Slope: N.R.	43088701/1994	Acceptable
Glyphosate	Radish (<i>Raphanus sativus</i>)	96.6	21 D EC ₂₅ : 0.14 (N.R.) LB/A NOAEC/EC ₀₅ : 0.035 Slope: N.R.	43088701/1994	Acceptable
¹ a.i. = active ingredient; a.e. = acid equivalent; N.R. = Not reported ² Bold value will be used to calculate risk quotients.					

Studies on Formulations

Table J-32. Terrestrial Plant Studies with Glyphosate Formulations

Chemical	Species	% a.i. ¹	EC ₂₅ / NOAEC (EC ₀₅) (lbs a.e./Acre ¹)	MRID #/Year	Study Classification
Seedling Emergence Studies					
Monocots					
Glyphosate(80WDG formulation)	Veg.Crops(10 Sp.) (Monocots & Dicots)	75	29 D EC25: >4.5 (N.R.) NOAEC/EC05: 3.6 Slope: N.R.	44125712/1996	Acceptable
Glyphosate IPA salt CP-70139	Oat (<i>Avena sativa</i>)	50	14 D EC25: >5 (N.R.) NOAEC/EC05: N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate IPA salt CP-70139	Rice (<i>Oryza sativa</i>)	50	14 D EC25: >5 (N.R.) NOAEC/EC05: N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate IPA salt CP-70139	Sorghum (<i>Sorghum bicolor</i>)	50	14 D EC25: >5 (N.R.) NOAEC/EC05: N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate IPA salt CP-70139	Barnyard grass (<i>Echinochloa crusgalli</i>)	50	14 D EC25: >5 (N.R.) NOAEC/EC05: N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate(80WDG formulation)	Veg.Crops(10 Sp.) (Monocots & Dicots)	48.3	4WKS EC25: >4 (N.A.) NOAEC/EC05: 4 Slope: N.A.	44320635/1996	Acceptable
Dicots					
Glyphosate(80WDG formulation)	Veg.Crops(10 Sp.) (Monocots & Dicots)	75	29 D EC25: >4.5 (N.R.) NOAEC/EC05: 3.6 Slope: N.R.	44125712/1996	Acceptable
Glyphosate IPAsalt CP-70139	Soybean (<i>Glycine max</i>)	50	14 D EC25: >5 (N.R.) NOAEC/EC05: N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate IPA salt CP-70139	Sugarbeet (<i>Beta vulgaris</i>)	50	14 D EC25: >5 (N.R.) NOAEC/EC05: N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate IPA salt CP-70139	Buckwheat (<i>Polygonum convolvulus</i>)	50	14 D EC25: >5 (N.R.) NOAEC/EC05: N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate IPA salt CP-70139	Cocklebur (<i>Xanthium pensylvanicum</i>)	50	14 D EC25: >5 (N.R.) NOAEC/EC05: N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate IPA salt CP-70139	Crabgrass (<i>Digitaria sanguinalis</i>)	50	14 D EC25: >5 (N.R.) NOAEC/EC05: N.R. Slope: N.R.	40159301/1987	Acceptable

Table J-32. Terrestrial Plant Studies with Glyphosate Formulations

Chemical	Species	% a.i.¹	EC₂₅/ NOAEC (EC₀₅) (lbs a.e./Acre¹)	MRID #/Year	Study Classification
Glyphosate IPA salt CP-70139	Panicum grass (<i>Panicum sp.</i>)	50	14 D EC ₂₅ : >5 (N.R.) NOAEC/EC ₀₅ : N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate IPA salt CP-70139	Downy brome (<i>Bromus tectorum</i>)	50	14 D EC ₂₅ : >5 (N.R.) NOAEC/EC ₀₅ : N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate IPA salt CP-70139	Velvetleaf (<i>Abutilon theophrasti</i>)	50	14 D EC ₂₅ : >5 (N.R.) NOAEC/EC ₀₅ : N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate IPA salt CP-70139	Smartweed (<i>Polygonum pensylvanicum</i>)	50	14 D EC ₂₅ : >5 (N.R.) NOAEC/EC ₀₅ : N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate IPA salt CP-70139	Morning glory (<i>Ipomoea sp.</i>)	50	14 D EC ₂₅ : >5 (N.R.) NOAEC/EC ₀₅ : N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate IPA salt CP-70139	Lambsquarter (<i>Chenopodium album</i>)	50	14 D EC ₂₅ : >5 (N.R.) NOAEC/EC ₀₅ : N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate IPA salt CP-70139	Hemp (<i>Sesbania exaltata</i>)	50	14 D EC ₂₅ : >5 (N.R.) NOAEC/EC ₀₅ : N.R. Slope: N.R.	40159301/1987	Acceptable
Glyphosate(80WDG formulation)	Veg.Crops(10 Sp.) (Monocots & Dicots)	48.3	4WKS EC ₂₅ : >4 (N.A.) NOAEC/EC ₀₅ : 4 Slope: N.A.	44320635/1996	Acceptable
Vegetative Vigor Studies					
Monocots					
Glyphosate(80WDG formulation)	Onion (<i>Allium cepa</i>)	75	27 D EC ₂₅ : 0.28 (N.R.) NOAEC/EC ₀₅ : 0.14 Slope: N.R.	44125715/45045101/1995	Acceptable
Glyphosate(80WDG formulation)	Sorghum (<i>Sorghum bicolor</i>)	75	27 D EC ₂₅ : 0.16 (N.R.) NOAEC/EC ₀₅ : 0.07 Slope: N.R.	44125715/45045101/1995	Acceptable
Glyphosate(80WDG formulation)	Wheat (<i>Triticum aestivum</i>)	75	27 D EC ₂₅ : 0.22 (N.R.) NOAEC/EC ₀₅ : 0.1 Slope: N.R.	44125715/45045101/1995	Acceptable
Glyphosate(80WDG formulation)	Corn (<i>Zea mays</i>)	75	27 D EC ₂₅ : 0.35 (N.R.) NOAEC/EC ₀₅ : 0.18 Slope: N.R.	44125715/45045101/1996	Acceptable
Glyphosate(80WDG formulation)	Corn (<i>Zea mays</i>)	48.3	48WKS EC ₂₅ : 0.227 (N.R.) NOAEC/EC ₀₅ : 0.148 Slope: N.R.	44320636/1996	Acceptable

Table J-32. Terrestrial Plant Studies with Glyphosate Formulations

Chemical	Species	% a.i.¹	EC₂₅/ NOAEC (EC₀₅) (lbs a.e./Acre¹)	MRID #/Year	Study Classification
Glyphosate(80WDG formulation)	Purple nutsedge (<i>Cyperus rotundus</i>)	48.3	4WKS EC25: 0.805 (N.R.) NOAEC/EC05: 0.445 Slope: N.R.	44320636/1996	Acceptable
Glyphosate(80WDG formulation)	Wheat (<i>Triticum aestivum</i>)	48.3	4WKS EC25: 0.176 (0.138-0.183 a.e.) NOAEC/EC05: 0.049 Slope: N.R.	44320636/1996	Acceptable
Glyphosate(80WDG formulation)	Oat (<i>Avena sativa</i>)	48.3	4WKS EC25: 0.201 (N.R.) NOAEC/EC05: 0.148 Slope: N.R.	44320636/1996	Acceptable
Dicots					
Glyphosate(80WDG formulation)	Garden pea (<i>Pisum sativum</i>)	75	27 D EC25: 0.89 (N.R.) NOAEC/EC05: 0.45 Slope: N.R.	44125715/45045101/1995	Acceptable
Glyphosate(80WDG formulation)	Sugarbeet (<i>Beta vulgaris</i>)	75	27 D EC25: 0.21 (B.R.) NOAEC/EC05: 0.12 Slope: N.R.	44125715/45045101/1995	Acceptable
Glyphosate(80WDG formulation)	Sunflower (<i>Helianthus annuus</i>)	75	27 D EC25: 0.16 (N.R.) NOAEC/EC05: 0.08 Slope: N.R.	44125715/45045101/1995	Acceptable
Glyphosate(80WDG formulation)	Radish (<i>Rhaphanus sativus</i>)	75	27 D EC25: 0.09 (N.R.) NOAEC/EC05: 0.02 Slope: N.R.	44125715/45045101/1995	Acceptable
Glyphosate(80WDG formulation)	Soybean (<i>Glycine max</i>)	75	27 D EC25: 0.32 (N.R.) NOAEC/EC05: 0.12 Slope: N.R.	44125715/45045101/1995	Acceptable
Glyphosate(80WDG formulation)	Cucumber (<i>Cucumis sativus</i>)	75	27 D EC25: 0.45 (N.R.) NOAEC/EC05: 0.16 Slope: N.R.	44125715/45045101/1995	Acceptable
Glyphosate(80WDG formulation)	Sugarbeet (<i>Beta vulgaris</i>)	48.3	4WKS EC25: 0.277 (N.R.) NOAEC/EC05: 0.148 Slope: N.R.	44320636/1996	Acceptable
Glyphosate(80WDG formulation)	Radish (<i>Rhaphanus sativus</i>)	48.3	4WKS EC25: 0.235 (N.R.) NOAEC/EC05: 0.148 Slope: N.R.	44320636/1996	Acceptable
Glyphosate(80WDG formulation)	Soybean (<i>Glycine max</i>)	48.3	4WKS EC25: 0.126 (N.R.) NOAEC/EC05: 0.049 Slope: N.R.	44320636/1996	Acceptable
Glyphosate(80WDG formulation)	Lettuce (<i>Lactuca sativa</i>)	48.3	4WKS EC25: 0.217 (N.R.) NOAEC/EC05: 0.148 Slope: N.R.	44320636/1996	Acceptable

Table J-32. Terrestrial Plant Studies with Glyphosate Formulations

Chemical	Species	% a.i.¹	EC₂₅/ NOAEC (EC₀₅) (lbs a.e./Acre¹)	MRID #/Year	Study Classification
Glyphosate(80WDG formulation)	Cucumber (<i>Cucumis sativus</i>)	48.3	4WKS EC25: 0.074 (N.R.) NOAEC/EC05: 0.049 Slope: N.R.	44320636/1996	Acceptable
Glyphosate(80WDG formulation)	Rape (<i>Brassica compestris</i>)	48.3	4WKS EC25: 0.098 (0.065-0.084) NOAEC/EC05: 0.049 Slope: N.A.	44320636/1996	Acceptable
Glyphosate(80WDG formulation)	Okra (<i>Hibiscus esculentus</i>)	48.3	4WKS EC25: 0.172 (N.R.) NOAEC/EC05: 0.049 Slope: N.R.	44320636/1996	Acceptable

¹ a.i. = active ingredient; a.e. = acid equivalent; N.R. = Not reported; IPA = isopropylamine