

Appendix E. The Risk Quotient Method and Levels of Concern

Risk characterization integrates the results of the exposure and ecotoxicity data to evaluate the likelihood of adverse ecological effects. The means of this integration is called the quotient method. Risk quotients (RQs) are calculated by dividing exposure estimates by acute and chronic ecotoxicity values.

$$\text{RQ} = \text{EXPOSURE} / \text{TOXICITY}$$

RQs are then compared to OPP's levels of concern (LOCs). These LOCs are used by OPP to analyze potential risk to nontarget organisms and the need to consider regulatory action. The criteria indicate that a pesticide used as directed has the potential to cause adverse effects on nontarget organisms. LOCs currently address the following risk presumption categories: (1) acute risks - regulatory action may be warranted in addition to restricted use classification, (2) acute restricted use - the potential for acute risk is high, but may be mitigated through restricted use classification, (3) acute endangered species - endangered species may be adversely affected, and (4) chronic risk - the potential for chronic risk is high regulatory action may be warranted. Currently, EFED does not perform assessments for chronic risk to plants, acute or chronic risks to insects, or chronic risk from granular/bait formulations to birds or mammals.

The ecotoxicity test values (measurement endpoints) used in the acute and chronic risk quotients are derived from required studies. Examples of ecotoxicity values derived from short-term laboratory studies that assess acute effects are: (1) LC₅₀ (fish and birds), (2) LD₅₀ (birds and mammals), (3) EC₅₀ (aquatic plants and aquatic invertebrates) and (4) EC₂₅ (terrestrial plants). Examples of toxicity test effect levels derived from the results of long-term laboratory studies that assess chronic effects are: (1) LOAEL or LOAEC (birds, fish, and aquatic invertebrates) and (2) NOAEL or NOAEC (birds, fish and aquatic invertebrates). For birds, mammals, fish and aquatic invertebrates the NOAEL or NOAEC generally is used as the ecotoxicity test value in assessing chronic effects, although other values may be used when justified. Risk presumptions and the corresponding RQs and LOCs, are tabulated below.

Table 1. Risk presumptions for terrestrial animals based on risk quotients (RQ) and levels of concern (LOC).

Risk Presumption	RQ	LOC
Birds		
Acute Risk	EEC ¹ /LC ₅₀ or LD ₅₀ /ft ² or LD ₅₀ /day ³	0.5
Acute Restricted Use	EEC/LC ₅₀ or LD ₅₀ /ft ² or LD ₅₀ /day (or LD ₅₀ < 50 mg/kg)	0.2
Acute Endangered Species	EEC/LC ₅₀ or LD ₅₀ /ft ² or LD ₅₀ /day	0.1
Chronic Risk	EEC/NOAEC	1
Wild Mammals		
Acute Risk	EEC/LC ₅₀ or LD ₅₀ /ft ² or LD ₅₀ /day	0.5
Acute Restricted Use	EEC/LC ₅₀ or LD ₅₀ /ft ² or LD ₅₀ /day (or LD ₅₀ < 50 mg/kg)	0.2
Acute Endangered Species	EEC/LC ₅₀ or LD ₅₀ /ft ² or LD ₅₀ /day	0.1
Chronic Risk	EEC/NOAEC	1

¹ abbreviation for Estimated Environmental Concentration (ppm) on avian/mammalian food items

² mg/ft²

³ mg of toxicant consumed/day

LD₅₀ * wt. of bird

LD₅₀ * wt. of bird

Table 2. Risk presumptions for aquatic animals based on risk quotients (RQ) and levels of concern (LOC).

Risk Presumption	RQ	LOC
Acute Risk	EEC ¹ /LC ₅₀ or EC ₅₀	0.5
Acute Restricted Use	EEC/LC ₅₀ or EC ₅₀	0.1
Acute Endangered Species	EEC/LC ₅₀ or EC ₅₀	0.05
Chronic Risk	EEC/NOAEC	1

¹ EEC = (ppm or ppb) in water

Table 3. Risk presumptions for plants based on risk quotients (RQ) and levels of concern (LOC).

Risk Presumption	RQ	LOC
Plants Inhabiting Terrestrial and Semi-Aquatic Areas		
Acute Risk	EEC ¹ /EC ₂₅	1
Acute Endangered Species	EEC/EC ₀₅ or NOAEC	1
Plants Inhabiting Aquatic Areas		
Acute Risk	EEC ² /EC ₅₀	1
Acute Endangered Species	EEC/EC ₀₅ or NOAEC	1

¹ EEC = lbs ai/A

² EEC = (ppb/ppm) in water