

GLYPHOSATE FACTSHEET

The active ingredient, glyphosate, is one of the most widely used pesticides worldwide. According to the State of California data, 4,609,943 lbs of glyphosate were used in 2001.

First registered for use in 1974, glyphosate is marketed by various companies under an assortment of trade names such as Roundup®, Glyphomax, Roundup Ultra®, Accord, and Shackle. Glyphosate is a post-emergent, non-selective, broad-spectrum herbicide.

Toxicity to Humans

The oral LD₅₀, or dose that can kill 50% of a test population, is 4320 mg/kg in rats. The EPA lists glyphosate in category class II, meaning the label must carry the word “Warning.” Glyphosate has been responsible for eye and skin irritation injuries among workers and applicators. Goggles and skin protection are recommended for use.

Carcinogenicity of Glyphosate:

On June 26, 1991, the Environmental Protection Agency classified glyphosate in Group E based on evidence of non-carcinogenicity in adequate studies with two animal species rat and mouse. Glyphosate’s carcinogenic potential was first considered in 1985 by the EPA’s Toxicology Branch Ad Hoc Committee. Glyphosate was then considered a Group C carcinogen, based on increased incidence of renal tumors. These findings were referred to the Scientific Advisory panel, and in 1986 they classified glyphosate as a Group D carcinogen (inadequate animal evidence of carcinogenic potential). The Science Advisory Panel concluded that the carcinogenic potential of glyphosate could not be determined from existing data and proposed that the rat studies be repeated. Upon receipt of the second rat chronic/ carcinogenicity study, all findings were referred to the Health Effects Division Carcinogenicity Peer Review Committee. In 1991, the Peer Review Committee classified glyphosate as Group E (evidence of non-carcinogenicity) based on a lack of convincing evidence.¹

Inert Ingredients

Most pesticides also contain inert ingredients that function as surfactants which aid in the penetration of the herbicide to the plant cells. In the case of glyphosate-based, Roundup□, the inert surfactant is polyethyloxyated tallowamine (POEA). On a weight basis, this surfactant is approximated to be

three times as toxic as that of glyphosate.² Symptoms associated with POEA toxicity include gastrointestinal pain and vomiting, swelling of the lungs and pneumonia, reduction of blood pressure, and red blood cell destruction. Current research suggests a synergistic toxic effect of glyphosate with its surfactant, POEA. At high dosages, inhalation of the combined product can cause severe effects including lung hemorrhages, bloody noses, and diarrhea.³ Deaths have resulted from accidental or intentional ingestion of undiluted product.

Risks to the Environment

A close reading of the literature suggests the manufacturer's assumptions that glyphosate is "completely safe for the environment" is an overstatement. For instance, on January 10, 1997, after receiving complaints from the New York Attorney General's Office, Monsanto agreed to remove its advertisements portraying the herbicide as "environmentally friendly" and "biodegradable".⁴ The Attorney General's Office disapproved of the advertisements on grounds that they inaccurately implied that Roundup® is as safe as the active ingredient, glyphosate. As the Attorney General pointed out, the product contains ingredients with toxicity greater than glyphosate alone.

Glyphosate is very stable in the environment. The chemical binds to many soil types and clay materials, making it immobile in many soils. Because glyphosate binds so tightly to soils, it can move into groundwater when the soil particles are washed into streams or rivers. Its binding to soil particles is also responsible for inhibiting soil microorganisms. High levels of glyphosate are known to inhibit soil respiration after ten weeks of chronic exposure.⁵ Glyphosate has been detected in run-off four months after application and in stream sediment 19 months after application. Although molecules of glyphosate tightly bond to organic matter and sandy soils, glyphosate can remain active in the environment.

Glyphosate is manufactured to be used in aquatic weed programs. However its safety has been questioned. If glyphosate is maintained at very low doses, significant genetic damage occurs in tadpoles if exposed to labeled levels for more than 24 hours.⁶

Fungal species are important to the cycling of nutrients. Fungi break down dead plant tissue and allow root systems to then take up the available nutrients. While glyphosate usually did not exert any effect on the total count of soil fungi, it did alter sub-soil fungal organisms after testing periods lasting six to ten weeks. Two strains of fungi showed population increases after treatment with Roundup®, while one strain, *Penicillium funiculosum*, was completely eliminated by a high treatment level.⁷

Physicochemical Properties

Log K_{ow} = .0017

K_{OC} = 24,000

LD₅₀ = 4320

LC₅₀ = 86

Water Solubility = 12,000

Half Life = 47 days

¹ Federal Register. "Glyphosate Pesticide Tolerances". 11 April, 1997: 17723-17730

² Sawada, Y., Y. Nagai, and I. Yamamoto. "Probable toxicity of surface-active agent in commercial herbicide containing glyphosate." *Lancet* 1 (1994):299

³ Adam, A., A. Marzuki, H. Abdul Rahman, M. Abdul Aziz. "The oral and intratracheal toxicities of Roundup® and its components to rats." *Veterinary and Human Toxicology* 39.3 (1997): 147-151.

⁴ *Agrow: World Crop Protection News*, 15 November 1996:11.

⁵ Abdel-Mallek AY, M. Abdel-Kader, and A. Shonkeir. "Effect of glyphosate on fungal population, respiration and the decay of some organic matters in Egyptian soil." *Microbiology Research* 149 (1993): 69-73.

⁶ Clements C., S. Ralph, and M. Petras, "Genotoxicity of select herbicides in *Rana catesbeiana* tadpoles using the alkaline single-cell gel DNA electrophoresis (comet) assay." *Environmental Molecular Mutagenicity* 29.3 (1997): 277-288.

⁷ Abdel-Mallek AY, M. Abdel-Kader, and A. Shonkeir. "Effect of glyphosate on fungal population, respiration and the decay of some organic matters in Egyptian soil." *Microbiology Research* 149 (1993): 69-73.