

**Monsanto Company**

Juvenile salmon undergo a series of physiological and behavioral changes that prepare them to move from the freshwater where they were hatched to a saltwater environment. This process is called smoltification, and juveniles that complete the process are called smolts. While no allegations have been made regarding the effects of glyphosate herbicides on smoltification, a published study addresses this issue.

Mitchell *et al.* (1987) conducted a laboratory-based seawater challenge study with juvenile coho salmon and the original Roundup[®] herbicide, which contained glyphosate and a tallowamine-based surfactant. While some of Monsanto's glyphosate products approved for aquatic use (such as AquaMaster[™] herbicide) contain no surfactant, such products specify on the label that a surfactant must be added prior to herbicide application.¹

In the Mitchell *et al.* study, coho salmon smolts were exposed for 10 days to Roundup herbicide² in fresh water at concentrations of 0.094, 0.938, or 9.03 parts per million (ppm) Roundup (equivalent to 0.029 – 2.78 ppm glyphosate). This range of concentrations was selected to bracket the maximum environmental concentration of glyphosate measured in streamwater (0.27 ppm on the day of application) after an aerial application of Roundup herbicide to a forested area (Newton *et al.*, 1984). After the glyphosate exposure period, the smolts were divided into two groups: one group was exposed to seawater for 24 hours; the other group was exposed to herbicide-free fresh water for 10 days, followed by 24-hour exposure to seawater. The authors of the study reported that exposure to Roundup herbicide did not impair the ability of salmon smolts to adapt to seawater at any concentration tested, and there was no difference in adaptability among exposed and non-exposed smolts

References

- Mitchell DG, Chapman PM, Long TJ. (1987) Seawater Challenge Testing of Coho Salmon Smolts following Exposure to Roundup Herbicide. *Environmental Toxicology & Chemistry* 6: 875-878.
- Newton M, Howard KM, Kelpsas BR, Danhaus R, Lottman CM, Dubelman S. (1984) Fate of glyphosate in an Oregon forest ecosystem. *Journal of Agricultural and Food Chemistry* 32(5): 1144-1151.

¹ Only specific glyphosate formulations are labeled for aquatic use in certain world areas. Use of a product inconsistent with its label is a violation of law and is strictly prohibited. AquaMaster[™] herbicide is labeled for aquatic uses in the United States.

² "Roundup" refers to the original single active ingredient Roundup herbicide formulation (also known as MON 2139).