

Science for Environment Policy

Tests reveal toxic effects of a broad-spectrum herbicide on aquatic plants

Herbicides in aquatic environments can have negative consequences on local plant life. This study investigated the effects of glyphosate, one of the most widely used herbicides in the world, on a marine plant species. The herbicide caused significant changes to the plant, reducing the number and chlorophyll content of leaves, and high concentrations were lethal. The authors say use of this chemical may be dangerous to plants in estuaries.

Glyphosate, a broad-spectrum [herbicide](#), is used to kill weeds around the world. Marketed under the trade name Roundup in the 1970s, this herbicide was rapidly adopted by farmers, a process accelerated by the development of glyphosate-resistant crops, allowing farmers to effectively kill weeds while their crops remained unharmed.

After being sprayed on agricultural fields, glyphosate can leach out into water, and has been found in streams around the world. It can also be used directly in aquatic environments to control weeds and manage wetland, exposing aquatic flora to high concentrations of the compound.

Glyphosate can have several negative effects on aquatic plants. Studies have reported mortality in common duckweed (*Lemna minor*), an effect on growth in gibbous duckweed (*Lemna gibba*) and changes in the chlorophyll contents of paddle weed (*Halophila ovalis*) and water hyacinth (*Eichhornia crassipes*).

This study examined the effects of glyphosate on a less well studied flowering aquatic plant species called *Ruppia maritima*, a seagrass which grows in saline environments. The meadows it forms are important in coastal environments, where they provide feeding and breeding sites for many species, perform nutrient cycling and generate biomass. The particularly rapid growth and high biomass production of *Ruppia* seagrass meadows make it extremely valuable for sustaining wildlife in saline environments.

The researchers collected *R. maritima* specimens from Jansen Lagoon in São Luís Island in Brazil. This lagoon is situated near to one of the most populous Amazon coastal zones, where most cities use glyphosate for weed control, and is therefore at high risk of toxicity.

After collection, the specimens were acclimatised under laboratory conditions for 30 days. The plants were kept in conditions that allowed them to produce sufficient biomass for growth and toxicity tests. Following this, branches were transferred to solutions of glyphosate at a range of concentrations (0.005, 0.05, 0.5, 5 and 50 milligrams per litre). These varied chemical concentrations replicated exposure via surface water after application of the chemical at the shore — where there are high concentrations, as well as runoff from the land — where there are low concentrations.

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After seven days of exposure, the researchers measured the numbers of new and dead leaves, root and leaf length, chlorophyll content and the weight of branches, variables that were also measured before exposure.

Comparisons showed that glyphosate had considerable effects on the plant. It caused significant decreases to wet and dry weights, the number and length of leaves, and chlorophyll content. At the end of the exposure period, some leaves even showed signs of chlorosis, a potentially fatal condition in which leaves do not produce enough chlorophyll.

Indeed, at the highest concentrations, glyphosate was lethal. Only one specimen in the highest concentration group was still alive at the end of the seven day period, and was unable to produce new leaves.

The finding that high concentrations of glyphosate can impede the growth of *R. maritima*, demonstrated by a reduction in biomass and chlorophyll *a* content, is important for policy and regulation.

Glyphosate could impede the development of *R. Maritima* seagrass meadows, which are important for [biodiversity](#). It is also likely to compromise other estuarine plants.

The authors say there is a clear need for warnings against the use of herbicides near watercourse regions. However, they also say further studies are needed to assess the effects of long-term exposure, and whether plant species are able to recover.

