

# Science for Environment Policy

## Some plants are more sensitive to herbicides during reproductive stages of life cycle

**This study assessed the effects of herbicides on non-target plants** in Denmark and Canada. The findings showed that some plants are more sensitive to herbicides in the reproductive stages of their life cycle and can experience delays in flowering and reduced seed production. The authors say future ecological assessments should consider reproductive outcomes.

**Herbicides are some of the most widely used chemicals in agriculture**, and have been critical to the increase in [crop productivity](#) witnessed in the past 50 years. They are sprayed several times a year on crop fields in most European countries<sup>1</sup>.

As well as killing 'target' unwanted plants, herbicides can drift into nearby habitats and affect [non-target species](#). This study assessed the effect of herbicides on non-target plants during different stages of the plant life cycle, in an effort to determine when plants are most susceptible. The research was conducted in sites in Canada and Denmark, which offer diverse types of vegetation.

The Canadian sample comprised three sections of typical woodland adjacent to fields planted with soybean, corn and wheat. The researchers recorded whether plants were in the vegetative or reproductive (e.g. flowering) stages before the herbicide was applied, and compared vegetation before and after spray.

In Denmark, the researchers surveyed a total of 40 typical hedgerows. The hedgerows were adjacent to both organic and conventional farming systems, allowing the researchers to compare the effect of herbicide use between the two systems.

In Canada, 35 of the 104 total woodland species showed marked herbicide effects, 13 of which exhibited symptoms of herbicide poisoning.

Herbicide use also affected flowering. In the Danish hedgerows, herbicide use impeded reproduction, causing effects (for example, severely impaired berry production in hawthorn) that could be observed up to a year later. The authors therefore recommend that [risk assessments](#) consider the chronic impacts of herbicides, as well as the effect of short-term exposures.

Furthermore, the number of species in flower during the growing season was significantly higher in hedgerows adjacent to organic fields than conventional fields. Organic farming promoted plant diversity and flowering capacity, while conventional farming inhibited and decreased flower production.

The researchers also conducted greenhouse studies, which are required to assess the effects of herbicides on non-target plants within the vicinity of crop fields for [regulatory purposes](#). They measured the onset of flowering and number of flowers after exposure to herbicides. Herbicides caused significant delays in flowering and reduced flower production in many species, including shepherd's-purse (*Capsella bursa-pastoris*), buckwheat (*Fagopyrum esculentum*), the common sunflower (*Helianthus annuus*) and tomato (*Solanum lycopersicum*). Changes to the timing of flowering may have important consequences for pollinating insects, and may expose flowers to unfavourable weather conditions.

Finally, the researchers compared the effects of herbicide spray during different stages of the plant life cycle. They found that plant species in Canada and Denmark were at various life cycle stages during spraying, including in the reproductive stages.

*Continued on next page.*



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<http://www.sciencedirect.com/science/article/pii/S0269749113005290>

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1. Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides. <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:02009L0128-20091125>

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In over half (58%) of the cases they recorded in six experiments, reproductive endpoints (such as flowering) were more sensitive than vegetative measures (such as biomass). Vegetative measures were more sensitive in only 32% of cases, and there was no difference in 10% of cases. The authors recommend that ecological assessments, which currently only assess sensitivity to herbicides in the young, vegetative stages are extended to test plants for longer periods in order to assess impact on reproductive outcomes.

They also recommend measures to reduce herbicide use and drift to non-target organisms, which has important implications for plant survival, seed production and, ultimately, [biodiversity](#).

