



WSSA FACT SHEET

About Weed Seeds and Their Longevity

Weeds can be prolific seed producers, which means if a single plant is allowed to go to seed, its impact may be felt for many years to come. One example: the broadleaf weed Palmer amaranth has been found to produce as many as [a million seeds per plant](#).

To compound the problem, the seeds produced by many weed species can remain dormant – hidden away in the soil for extended periods of time – and then sprout when conditions are right. While [seeds of most annual weedy grasses die after two or three years](#), scientists have discovered that some broadleaf weed seeds can remain viable for many decades.

Scientific Proof of Longevity

One of the most famous [experiments](#) illustrating the longevity of weed seeds dates back to 1879. Professor William Beal at Michigan Agricultural College set out to determine how long seeds could be buried in the soil and still remain able to germinate.

Beal started with freshly grown seeds from more than 20 common weed species and buried them in 20 sand-filled bottles about three feet below the soil surface. At five- to 10-year intervals throughout his career, he would dig up a bottle to see if the seeds it held would germinate. Many did.

When Beal retired, he passed the torch to fellow scientists at what now is Michigan State University. They've continued Beal's research, and what they've found is bad news for farmers and home gardeners alike. More than 130 years after Beal's experiment began, some of the seeds he planted are still able to germinate. The heartiest has been moth mullein, a flowering biennial weed from the figwort family.



Moth mullein germinated from seeds buried in 1879 and excavated in 2000. *Courtesy of Frank Telewski, Ph.D., professor and curator, W.J. Beal Botanical Garden, Michigan State University.*

Why Some Weed Seeds Are Long-Lived and Others Aren't

While some weed seeds will survive for long periods, many others will die within a few days or weeks if they aren't in an environment suitable for germination. Why the difference?

[Seed coats are an important factor](#). The hardest coats provide the best protective barrier and promote longevity. These tough coats may also help to [keep the seed hidden from predators](#) by keeping it from giving off any odors that might be detected. Burial in the soil also enhances seed survival by inhibiting germination and protecting seeds from predators and environmental stresses.

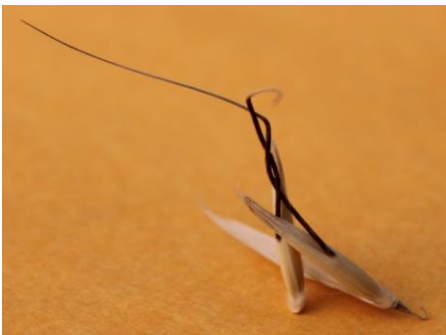
Interestingly, scientists have discovered some weed species produce seeds that vary widely in size and dormancy periods. Examples include [poison hemlock](#), jointed goat grass, [twoscale saltbush](#) and common cocklebur. By staggering germination throughout the growing season, the likelihood is greater that at least some plants will emerge to favorable conditions, enhancing overall survival.



Fruit of the Venice mallow weed can house [3,000 or more small hard-shelled seeds](#). Photo courtesy of Greta Gramig, North Dakota State University.

What Causes Seeds to Germinate – or Keeps Them from Doing So

A number of factors can trigger weed seed germination, including changes in temperature, moisture, oxygen and light. Tillage is an especially common trigger. It exposes buried seeds to warming sunlight and aerates the soil.



Wild oat seeds have prominent hairs that [bend and straighten in response to moisture](#) and can bury freshly scattered seed in soil. Above, two seeds are intertwined. Photo courtesy of Eric Johnson, University of Saskatchewan

There also are factors that can *inhibit* germination. The soil is a factor – especially for smaller seeds. It serves to block the light signals the seeds need in order to determine they are close enough to the surface to germinate. Some small seeds can't emerge if they are more than 5 centimeters (about 2 inches) underground.

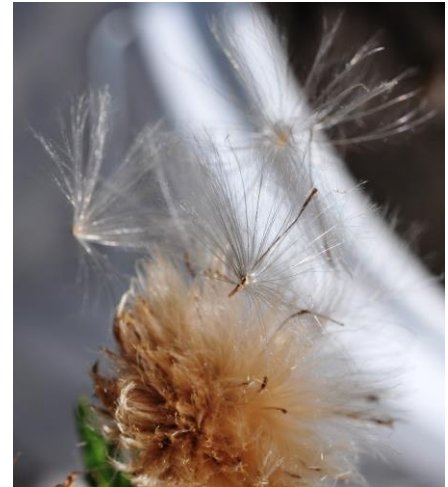
The same seed coat that protects seeds from destruction can also inhibit germination. These hard barriers can prevent the seed from getting the moisture or oxygen needed to germinate and can forcibly enclose the embryo. Physically scratching the seed coat to weaken it makes germination more likely.

Another factor that can impact germination is [allelopathy](#), a biological phenomenon that involves one organism producing biochemicals that positively or negatively influence the growth, survival and reproduction of other organisms. For example, crops like rye, sorghum, rice and wheat release biochemicals that can suppress weed seed germination.

How Weed Seeds Travel

Weed seeds can be spread in feed grain, straw and hay and can be transported by birds, animals, water and wind. But they also can travel in other less expected ways. Seeds can stow away on farm machinery, off-road vehicles and cars. They can hitch a ride with container-grown ornamentals or travel the country in a package of wild bird feed. Seeds with burr-like surfaces can travel attached to your clothes or to animal fur. [Earthworms](#) are known to collect weed seeds and move them into their burrows. In fact, scientists say more than two-thirds of all giant ragweed seedlings emerge from earthworm burrows. [Seeds consumed by livestock](#) can often survive and can be transported in manure.

The award for longest-traveling weed seeds would likely go to horseweed. Tiny horseweed seeds have tufts that act like a parachute and help them travel vast distances by air. Specially equipped model airplanes have discovered horseweed seeds in the [earth's planetary boundary](#).



Tiny Canada thistle seeds have feathery tufts that help them disperse by air. *Photo courtesy of Erin E. Burns, Ph.D. student at Montana State University.*

How to Reduce the Number of Weed Seeds in the Soil

Whether your weed control method of choice is your hand, a hoe, a plow or an herbicide, it is important to control weeds that sprout before they mature and go to seed. If you are careful about weed management, over time you'll reduce the number of viable seeds in the soil and make life in your garden a bit easier. Here are some of the techniques that have been shown to help:

- Some growers attach a [chaff cart](#) to the back of their harvester to ensure seeds on weeds remaining in the field at harvest time aren't dispersed and left to sprout in subsequent growing seasons. It's a technique common in Australia.
- Australian grower Ray Harrington has [created a system](#) that mills the chaff collected from the field to destroy weed seeds. Residues can then be dispersed directly onto the field so moisture and nutrients are conserved.
- [Carabid beetles](#) have been shown to reduce the number of weed seeds in the soil bank. They are voracious eaters and can consume large quantities of seed.
- Diversified cropping systems can result in a high microbial biomass in the soil that [promotes the decay of weed seeds](#).

- [Deep tillage](#) can reduce germination by burying weed seeds deep beneath the soil. Unfortunately, future tillage may simply bring them to the surface again. One alternative is to superficially disturb the soil to cause seeds to germinate, and then treat the seedlings that emerge with herbicides.

What If a Weed Grows from Tubers?

Seeds are not the only source of new weeds. Many perennial weeds can reproduce from stems, roots, leaves and underground roots or tubers. Frequent removal of the shoots of perennial weeds will eventually starve and kill the underground tissues. In some cases, herbicide applications at timely intervals after emergence can also help control underground tissues. You'll need to be persistent and will likely need to use a variety of control methods to reach your goal whether using tillage, physical removal or herbicides.

For More Information

To learn more about weeds and recommended best practices in weed management, visit www.wssa.net.