

NATURAL HISTORY OF SEEDBANKS OF ARABLE LAND. Carol C. Baskin and Jerry M. Baskin, Professor, Department of Biology and Department of Agronomy, University of Kentucky, Lexington, KY 40506 and Professor, Department of Biology, University of Kentucky, Lexington, KY 40506.

Seeds that remain ungerminated and viable in the soil until the second or some subsequent germination season become part of the persistent soil seed bank. The number of weed seeds in the persistent soil seed bank may be 6500 m⁻² or higher, and, depending on the species, seeds may live in the soil for up to 30-40 years or even longer. It has long been known that if arable soils are disturbed at regular intervals buried seeds of many, but not all, weeds have a predictable germination season. For seeds that are permeable to water, explanations for the various germination phenology patterns have come from studies in which seeds were buried in soil under natural seasonal temperature changes. In these studies, seeds were exhumed at monthly intervals, and their responses to a range of alternating temperatures and to light/darkness were determined. Buried seeds may cycle between dormancy (do not germinate at any conditions) and nondormancy (germinate over a wide range of conditions), or they may cycle between conditional dormancy (germinate at a narrow range of conditions) and nondormancy. The time of year when seeds are nondormant varies with the species, i.e., autumn, spring, or spring-summer. A light requirement for germination plays an important role in preventing nondormant seeds from germinating in the soil. Soil disturbance that exposes seeds to light must occur at a time of year when seeds are nondormant or nearly so, i.e., in late state of conditional dormancy; otherwise, they can not germinate. Buried seeds of some species come out of dormancy and remain nondormant regardless of yearly seasonal changes in environmental conditions. However, these seeds do not germinate in the soil because they require light for germination.

Seeds with water-impermeable seed coats, e.g., weedy members of Fabaceae and Malvaceae, also can form persistent soil seed banks. Seeds of these species have a water gap in the seed coat that serves as an environmental signal detector for them to germinate. Under appropriate conditions, the water gap opens, thereby allowing water to enter, and the seeds germinate. Soil disturbance that results in seeds being brought to the surface, where maximum temperatures as well as the difference between day and night temperatures are higher than those in the soil, can cause the water gap to open. Consequently, the water gap indirectly serves as a depth sensor.

Thus, knowing what regulates the timing of germination of weed seeds buried in the soil allows us to predict when they will germinate if brought to the soil surface.