

Introduction

One for the **buzzard**, One for the crow, **One to rot**, and One to grow!

The farmer hopes for better seed germination rates than the gardener in this old poem by Fay Yauger. But the fact is that **most plants compensate** beautifully by **producing** seeds in great **abundance to assure survival** of their species despite the formidable odds. And each seed that does survive is capable of producing a plant, more seeds, and still more plants and seeds to come. Deep within the seed are its own development forces, nutritive elements, and time and place mechanisms that signal the next growth stage. The seed itself is designed to disperse and scatter, using other forces of nature-wind, water, insects, birds, and animals.

Seed husbandry formed the basis for early agriculture and eventual civilization. As people learned to plant, harvest, and preserve the seeds of certain grasses for winter, they abandoned the nomadic life to build permanent settlements. All the major civilizations throughout history have been founded on the **culture of cereal grains**, **because these staples** have high food value **and are easily stored**. **The Mesopotamians planted wheat** along the banks of the Tigris and Euphrates. The Chinese grew rice along the banks of the Hwang Ho and Yangtze. And the Mayans cultivated corn along the dry flat plains of the Yucatan.

Seeds for Survival and Subsistence

Seeds have been, and still are, the mainstay of the world's diet. The Poaceae, or large seeded grasses, collectively **known as cereals**, contribute more food seeds than any other plant family. Cereal grains comprise by far the greatest share of all cultivated seeds. They provide people with their most important source of carbohydrates, as well as some protein and other vital substances. As in ancient times, rice, wheat, and corn are the three major grains. Oat, barley, sorghum, millet, and rye are other important food and feed grains.

The second most critical food family, the Fabaceae, **provides crops such as peanut, soybean, lentil, bean, pea, and chickpea**. Legume seeds generally **contain more protein than** cereal seeds, and the protein has a better balance of amino acids for human nutrition than that **in cereals**.

In addition to being used directly as foods, seeds play other roles in human diets. Many seeds are used whole or ground as spices. The popular beverages coffee, cola, and cocoa are **derived from seeds**. **Beers and ales are brewed** from barley, and whiskey and gin are distilled **from fermented mashes of cereal grains**. Edible oils are obtained from seeds of corn, soybean, canola/rapeseed, cotton, peanut, coconut, palm, sunflower, and safflower. And seeds are used in the **manufacture of some drugs and medicines**.

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The Mayans cultivated corn along the dry, flat plains of the Yucatán. Improved varieties of corn are now the major cereal grain of the United States, with production exceeding 6 billion bushels annually.

In addition to being the most important source of food for human beings, seeds serve many commercial functions as well. Cotton, a major fiber, is spun from the cellulose hairs that surround the seeds of cotton plants. Seeds are also used in the manufacture of soaps, paints, varnishes, linoleum, jewelry, buttons, and many other products.

The beginnings of the seed lie deep within the burgeoning flower, where tiny structures begin to grow and develop to form the integument, the seed coat. This outer covering provides protection for the mature seed; it may even contribute nutritive support for the embryonic seed. This package also furnishes the ideal environment for the development of the embryo and the endosperm of the young seed.

From Orchids to Coconuts

Seed size is every bit as varied as the end products of the seed. An orchid species boasts the smallest known seed—a dust-like particle hardly visible to the naked eye. Seeds of tobacco and Kingston velvet bent grass are so minute that one-half million of them weigh only an ounce. Perennial plants (usually woody) claim the largest seeds, including acorns, walnuts, and coconuts.

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Seed shape runs the gamut from round, oval, triangular, elliptic, and elongated to irregular. Predominant colors are black and brown, but hues of red, yellow, purple, green, and white are also found. Some seeds are multicolored. Seed surfaces may be smooth, rough, or textured, with silky hairs, cottony masses, hooks, bristles, or wing-like structures. The intricacies of seed surfaces are often functional, serving as the mechanisms that ensure seed dispersal and survival.

'Blowin' in the Wind

Not all **seeds are** distributed in brightly colored packets from Burpee Seed Company. The wind is probably the most **effective agent in seed dissemination**. **It blows and scatters seeds in various ways—the cottony masses attached to cottonwood seeds**, the hairy **tufts** of the dandelion and milkweed, the wing-like appendages of the ash and maple seed, and the dust-like seed of the orchid. When **the Russian thistle, the legendary tumbleweed, breaks** off at the soil surface, the wind catches at the plant, blowing it across the western plains; it disperses seeds as it tumbles. Since seeds of almost all species will float on water, many that land in **streams** will sail from their home site. Farmers and gardeners extend the territory of useful plant seeds. Animals

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The legendary tumbleweed breaks off at the ground surface and tumbles across

the fields with the wind, dispersing seeds as it goes. Some of the weeds have lodged against a barbed wire fence in this field in southwestern Nebraska.

Introduction and insects may also help seeds along their travels. Squirrels and packrats are notorious seed gatherers, while ants seem to be the most active seed collectors in the insect world. Innumerable plant species have fruits that are eaten by birds and animals. If the seeds pass through the digestive tracts, they may be transported great distances before being dropped to the ground to give rise to new plants.

Some tenacious seeds manage to adhere to people's clothing or to animal's furry coats. Those who have tried to disengage the seeds of the beggar-tick from their clothes, cheatgrass from their socks, or cockleburs from the coat of their Irish setter know just how effective this dispersal method can be. Other seeds come equipped with spines or thorns that enable them to attach themselves to animals' feet and spread that way. The fruit of the mistletoe scatters its seed in a remarkable fashion. It is equipped with a propulsion mechanism that ejects the seed into the air. The seed is covered with a sticky substance that enables it to adhere to branches of trees and to the feet of birds. Birds carry the seed from one tree to another, where it germinates and begins to grow.

Just as seeds feature external structures that aid in dissemination, so they are equipped to germinate and resume their growth at a time and place that ensures the survival of their kind. Some seeds possess the ability to germinate and grow the instant they are dispersed. Others display almost uncanny mechanisms that prevent their germination until the time and place are right for continued growth. Some, especially weed seeds, may lie dormant in the soil for many years before they germinate.

Birds relish the purplish-black fruits of the mulberry tree, and they drop the seeds in fencerows and hedges, giving rise to new trees that grow as weeds.

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When seed pods of the milkweed dry and split open in the fall, the white hairs attached to the brown seeds spread out into rounded tufts and are wafted away in the breeze, carrying some of the seeds a long distance.

In many ways, the seed is a microcosm of life itself. The seed is a neatly wrapped package containing a living organism capable of exhibiting almost all of the processes found in the mature plant. By studying the seed or the germinating seedling, we have gained much of our knowledge about **growth regulators**, **respiration**, cell division, morphogenesis, **photosynthesis**, and other processes.

But most of the seed research has been done in just the past century. While humankind no longer prays to the goddesses of grain (Demeter the Greek, and Ceres the Roman), we have a long way to go to unravel all the mysteries of the seed.

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The winged seeds of the Ural maple may blow many

yards in a strong wind, but most reach the ground near the tree.