BOTANY

Autumn: Season of Seeds

Autumn is a summing up, a storing of the essence of plant life into tiny capsules that inundate fields and woods with abundance. Autumn is a time of harvest and new, hidden life.

By BARBARA TUFTY

See Front Cover

➤ NOW AS THE northern pole of the spinning earth turns farther from the sun, the sun's rays fall more at an angle over the Northern Hemisphere, casting a mellow amber light across the land and bringing cool nights, fading flowers and falling leaves.

To the casual eye, the world of nature seems to be slowly dying.

Gone are the wild blue gentians from the woods, the Queen Anne's lace from the fields. Many migrant geese, ducks and songbirds have already departed for greener areas to the South, the buzzings of the katydids and cicadas are silent now, and chipmunks and woodchucks prepare for their long winter sleep in hollow trees and soil.

Each day the sun sinks more to the south on the horizon and the mystic feeling of sadness and death seems to fill the blue hazy air.

Yet autumn is not the season of death and decay. On the contrary, it is one of the busiest, most fruitful seasons of the year. With extraordinary precision and economy, each dogwood, cattail, oak, goldenrod, ragweed and other tree or plant packs a condensed image of itself into a capsule, and then in paradoxical, wild extravagance scatters it high into the air, drops it into the sea or flings it one way or another across the land.

Millions, billions, trillions of these seeds —each outfitted with potential ingredients of its parent plant, plus stored food and a hard outer shell to help it survive the winter—are cast over the earth in an effort to guarantee survival of each species. Most of this scattering takes place in late summer and autumn, but many seeds are also strewn in April and May.

Plants Established on Land

A few hundred million years ago, after plant life had crept from the salty oceans and become established on land, relatively few kinds of simple seed-bearing plants existed. Then there were enough nutrients as well as space, water and sunlight to go around. The naked seeds merely dropped from the parent gymnosperms or cycads and flourished in the ample space below. But as the world became crowded with vegetation, the plants evolved into more complex forms and developed new devices for sending their offspring away from crowded areas into faraway places where chances were better for survival.

Many ingenious mechanisms of the immovable, seemingly helpless plants make use of wind, water, animals and even unsuspecting man for dispersing their compact progenies.

The seeds designed to catch the wind and ride its currents are some of the most beautiful. These seeds produce fine silky fibers that spread out in rays, looking like fragile umbrellas, parachutes or sails. Everyone knows the parasols of the seeding dandelion, irresistible to children who blow them to make their wishes come true, quite unaware that they have just become accomplices to dandelion propagation.

Another familiar sight along country roads is the silky down of the purple thistles, the softness compensating for their formidable stickers.

When the weather turns cold and the hours of light become shorter, the ugly warty milkweed pod splits open to release glistening masses of white down attached to flat brown seed, as shown on this week's front cover.

Tiny parasols of goldenrod and aster waft carelessly across sunlit fields, as do the wind-blown seeds of the more humble goat's beard, willow herb and salsify.

Other Wind-Catchers

Other wind-catching devices are wings, the stiff fragile projections attached to the seeds of such trees as the sycamore, maple and elm. When the moment of rupture from the parent tree arrives, the air catches the underside of the wing, and the tiny bundle of life glides or spirals gently to the ground, several paces away. Plants such as lilies and begonias have paper-like borders that act like tiny kites.

Another system nature has devised to harness the wind is to use the rolling plant as a whole to shake out the seeds. These plants are the tumble weeds and tumble grasses — lightweight, many-twigged and somewhat circular in shape. When the seeds are ripe, the whole plant breaks off at the root, and the wind rolls it gaily across prairies and fields, scattering seeds in its wake. Not all seeds spill at once—they shake out gradually as the pods dry out, split open and the plant tumbles on.

Some seeds, such as those of the iris, poppy and the prolific orchid, are so fine that a good huff of air will scatter them across the land.

Another natural vehicle, water, can carry certain seeds with waterproof coats for long distances, sometimes hundreds of miles. This system of seed transportation occurs mainly along the oceans or water courses of the tropics, areas of perpetual summer where water does not freeze.

Coconut trees bending over the water's edge drop their heavy seeds into rivers, bays and estuaries where they are wafted by currents and waves into the great oceans and so to other shores.

The largest seed in the world, the 40-pound Seychelles nut or sea coconut, mystified people around the Indian Ocean for centuries. These seeds were found awash on shores and beaches and no one knew where they drifted from, or upon what kind of tree they grew. Finally in the mid-18th century, sailors discovered the goliath seeds growing on coconut trees on the Praslin Island, one of 29 islands in the Seychelles in the Indian Ocean.

Indian mulberry seeds are housed in a sort of bladder-like sack that floats like a small buoyant raft across the water. Japanese black currants often wash ashore on the Oregon coast, thousands of watery miles from their homeland.

The freshwater water lily bears seeds in a spongy belt filled with air chambers like a life preserver. When the belt finally rots and decays, the seeds sink to the mud bottom and take root.

Some plants use neither wind nor water, but have evolved their own built-in ejection system of shooting out their seeds. This system works on the principle that while certain natural fibers dry out, they often shrink, twist and split. As the fiber pods mature, they become dryer and slowly twist, then suddenly burst open and eject their seeds.

The flat, dark seed pods of the bright yellow broom, for instance, split open with small explosive pops that sound like a series of tiny firecrackers in the still warm afternoon. When the pod splits, each half twists sharply around like a corkscrew, snapping the thin stalks by which each seed is attached, and catapulting them out with a snap.

The pods of the common witch hazel shrub explode and send their round seeds rattling among the autumn leaves five to ten yards away. This surprising behavior on the part of a docile plant so astounded certain puritanical forefathers that they believed the shrub was hexed or bewitched—hence the name.

Shooting Seeds

The Virginia knotweed grows a group of elastic cells at the base of each fruit. At the slightest touch on the hook part of the dried flower, these cells uncoil and throw their seeds. The touch-me-not or jewel weed is another impatient plant that shoots its seeds by means of coiled up filaments.

One of the strangest mechanisms of a plant to perpetuate itself belongs to the wild geranium or crane's bill. Attached to each seed is a long thread-like tail that is coiled into a spring-like spiral and covered with silky hairs. When the weather is wet or damp, the spiral tail stretches and straightens out. When the air is dry, the tail curls up like a corkscrew, pulling its precious living burden behind it. During a series of curlings and uncurlings, the seed-carrying tail crawls along the ground in

worm-like fashion, until it reaches suitable soil where its sharp point drives downward, dragging the seed to its winter resting place.

Many seeds develop sticky or hooked appendages of spines, hooks or awns that catch on to the fur of a passing rabbit, dog or sheep and hitchhike a ride for a while before they drop off or are brushed off. Autumn fields are filled with the waiting seeds of burdock, cockle-burr, stick-tight, Spanish needles, goose grass and many others.

Some plant appendages can cause painful suffering and even death. The stiff cruel spikes of such plants as the grapnel, African devil's horn or the feathergrass of Russia can work themselves deeply into an animal's flesh. When this happens where the flesh is especially sensitive or the barb cannot be removed, infection and death can follow.

Seeds are transported by animals in many other ways. The tempting fruit of the wild black cherry, the succulent gooseberry or bright red dogwood are always in demand among the birds, which swallow them whole. The seeds of these fruits or drupes as they are called are indigestible and protected by a strong covering. They pass through the food-canal of the bird and are deposited many miles away.

Bright-eyed bluejays and tufted titmice are tireless planters of nuts and grain, tucking them away in secret holes in trees and crevices where they are soon forgotten and left to sprout in the spring.

Then of course there are the busiest planters of all—red, grey and black squirrels which bound after acorns, beechnuts, walnuts and other nuts. Each bushy-tailed, short-memoried fellow seems to know what he's doing as he hunches over the hole he digs in the ground, drops his seed, gives it a pat, and goes away, leaving a potential tree snug in the ground.

Man, of course, is probably the most efficient seed planter of all in today's present world, with his scientific methods that produce great harvests of hybrid wheat, golden corn, orange pumpkins and other prosperous fruits of autumn. Yet, unwittingly, he also continues to transport the more humble seeds of nature—burrs stuck to his clothes after an afternoon's walk through the woods, blackeyed Susan and ragweed seeds tucked in crannies of his much-traveled car, and dandelion, yarrow, bouncing Bet and shepherd's purse seeds riding as stowaways on ships and planes.

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AGRICULTURE

Control Japanese Beetle

➤ JAPANESE BEETLE DISEASE, which is doing about $25 million damage every year in the eastern part of the United States, is moving west, but U.S. Department of Agriculture scientists in Illinois are getting ready to fight it.

For the first time, says USDA bacteriologist Harlow W. Hall of the Northern Utilization Laboratory, Peoria, Ill., spores (a dormant stage) of the milky disease bacterium *Bacillus popilliae,* have been produced in liquid nutrients as a method of killing the beetles. This is a major advance toward low cost biological control of these pests.

USDA

JAPANESE BEETLES—Disease caused by Japanese beetles does about $25 million damage every year in certain parts of the eastern United States. But for the first time, spores of a milky disease bacterium have been produced in liquid nutrients, presenting a method for beetle control.

In the first successful production of *Bacillus popilliae* spores in liquid media, Dr. William C. Haynes and Lenora J. Rhodes added activated charcoal to the medium.

This nutrient solution also contained corn sugar, yeast extract, potassium phosphate and tryptone, a substance made from protein by enzymatic digestion.

The yield of laboratory-produced spores in the present experiment is only about three percent. USDA scientists have found that the spores survive long periods of drying and exposure to temperatures that are fatal to bacterial cells.

Although the yield of spores is low and still impractical from an industrial standpoint, the laboratory accomplishment marks progress over the present method of adding milky disease spores to the soil. These spores must be produced in diseased beetle grubs, each inoculated with a hypodermic needle. This method, of course, is not practical for producing spores in the quantities needed by farmers and plant pest control officials.

Very few microbiological insecticides are now being mass produced by way of fermentation processes.

One of the best known, a report in Chemical and Engineering News, Aug. 30, 1965, stated, is based on the bacterium *Bacillus thuringiensis,* which is used to control insects such as the cabbage looper and the alfalfa caterpillar.

Other biological pest controls include insect attractants, insect parasites and predators, and pest-resistant plants.

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