BOTANY

Leaves Brighten Autum

When summer ends in a shower of leaves, the brilliant colors of autumnal foliage are unmasked by the fading of stronger green of living chlorophyll. Earth's fertility renewed.

See Front Cover

By WATSON DAVIS

➤ THE BRIGHT colors of autumn leaves which everyone admires have actually been there all summer. Every leaf, no matter how brilliantly green during the verdant growing season, has within it the bright colors that appear when the shorter, cooler days bring the changes to autumn foliage.

One of the changes that occurs in the leaves when autumn comes is chemical breakdown of the chlorophyll. This material is involved in capturing the summer sunlight. It uses its energy to transform the carbon dioxide of the air and the water from the soil into food. The sugar, starch and protein thus make green growing things luscious food for animals.

At the coming of autumn a chemical transformation takes place in the leaf as the tree puts the liquid foodstuffs of its foliage back into its limbs and trunk. The green matter, the all-important chlorophyll, breaks down and becomes colorless. The bright leaf colors that have been hidden in the growing season become unmasked and shine forth.

Two general classes of chemical compounds are responsible for the coloration of the dying leaves. These are carotinoids, which are responsible for the yellows, and anthocyanins, which gives the reds and the purples.

Chlorophyll Masks Colors

The carotinoid pigments present in all the leaves do not have a chance to show themselves when, during the summer, the chlorophyll, with its abundant green coloring, is dominant.

Chlorophyll is always being both formed and destroyed in leaves, but in autumn destruction goes on faster than formation, finally reducing it to a low point that permits the yellow carotinoids to be seen. If no other masking pigment is present, such leaves become pure yellow or orange, like tuliptree, willow and sassafras.

The other class of pigments, the anthocyanins, are dissolved in the cell sap. With the exception of a few purple-leaved or bronze-leaved plants, these pigments are also concealed by the more abundant chlorophyll, and show themselves only when it has been sufficiently broken down. At the same time, certain changes in the carbohydrate content of the leaves may cause an actual increase in the amount of the anthocyanins present. Thus we get the strong reds and purples of sumac, blackberry, sweet-gum, the oaks, etc.

Trees like maples, which sometimes show a gorgeous mottling of yellows and reds, may have local patches of anthocyanins masking out the carotinoid ground-color.

Combinations of the purples, purple-reds, oranges and true reds make all the varied colors we find in autumn leaves—and in the skins of autumn fruits as well. Leaves of a clear yellow, such as you sometimes find on hard maples, have no purple pigment in the sap. Leaves of a strong, deep wine-red are colored by a combination of purple sap-pigment and red carotin in the cells. The changes that may be rung on this color-chime are literally endless.

Even more remarkable than the wonder of leaf coloring, though much less conspicuous, is the provision made by the leaves for their falling off. They do not just snap off and drop, as a dead twig might. That would leave the tree covered with thousands of tiny, open wounds through which bacteria and fungus spores might enter, thus causing disease and decay. At the point where the leaf-stem is later to detach itself from the twig, a double layer of specialized, corky cells forms, finally cutting off the sap flow to and from the leaf. When it is complete, the union between the two layers becomes dried out and weak, and finally a little puff of wind finishes the job, letting the dead leaf drift down to earth, as shown on the cover of this week's SCIENCE NEWS LETTER.

Botanists have given this double layer a special name, "absciss layer." But that is only Latin for cut-off layer, and that is exactly what its function is. The tree or shrub is thus able to bandage its wounds before they actually exist. That is a trick that surgeons and first-aiders would give a good deal to be able to do for humans.

Bonfires Rob Soil

Poetically there may be sadness because leaves must die, fall from the trees and molder in the earth. Such a view does not fit in with the cycle of life in forest and field. The dead leaves must return to the soil the substances that the soil originally gave them, if the earth is to remain fruitful and new crops of leaves are to be produced in succeeding springs.

Leaves, despite their beauty and brilliance, become a nuisance when they fall

END OF A SEASON—To the tree shedding its foliage after a growing season, autumn is but a natural turning point. The living plant prepares for winter ahead and the spring that lies beyond.

to the ground. The brisk autumn chill may be pleasantly warmed by bonfires of leaves, but this mode of leaf disposal is frowned upon by firemen, health officials and good gardeners. There is a real danger of setting off forest or field fires when leaves are carelessly burned. A little smoke may give a spicy odor to the autumn air, but too often leaf-burning pollutes the atmosphere with smoke and smog. The real crime of burning leaves is that they cannot then be used in the green growth of future years.

Life Giving Humus

Trees are the reincarnations of their own dead forebears. Without the decaying leaves of yesteryear and the moldering logs and stumps of the last generation, there would not be life enough in the soil to sustain the new trunks that grow out of it.

The mass of dead but life-giving material is called humus. The enriching processes of the forest soils are actually different from those of garden and field. In open spaces bacteria largely attend to the task of returning dead things to the dust whence they came, but in the forest the work is done primarily by fungi. A large share is done by the higher fungi, the large showy plants that we call mushrooms, which are sometimes edible and sometimes poisonous.

Bacteria do play a small part, and insects, millepedes, worms and microscopic forms do their share. The dark world of the humus upon the floor of the forest is really a seething complex of life.

Getting rid of the leaves in yard and garden tempts the tidy householder to use the torch or otherwise dispose of leafy litter, but the cult of the compost heap is growing. More and more, where there is space for it, this place for the regeneration of fertile material will be found tucked away unobtrusively and frugally.

The dead leaves can be added, covered with a layer of soil, and in not many months, almost by the time a new growing season comes, the nuisance of fall can be converted into the fertile humus so much needed in spring.

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PLANT PATHOLOGY

Plant Hormone Checks Tumor-Like Growths

➤ A POTENT, new plant "hormone," which helps plants to grow normally, was reported to the American Institute of Biological Sciences meeting at Madison, Wis.

R. H. Roberts and Miss B. Esther Struckmeyer, University of Wisconsin horticulturists, have found that the hormone has the physiological property of regulating some tumor-like growths made by plants. The hormone is as yet only partly identified chemically.

The hormone was isolated during investigations conducted to find the growth substance which causes plants to blossom. The new hormone appears in plants at the time the blossom stage starts.

The scientists found the hormone would inhibit heavy callus growth in wounded plants with resulting smooth healing. Many chemicals or so-called growth regulators cause distortion of plant growth. An example is the weed-killer 2,4-D. The new hormone will inhibit the injurious effects of this growth substance. It actually has the effect of keeping tissues normal and preventing uncontrolled division of cells.

This may be interesting in cancer research and the possible role of the new plant hormone in animal tumor work is being investigated.

Research in the use of the hormone is being handicapped because it is not water soluble. Injections in plants to date have been in crystalline form. A search is being made for a way to convert the substance into a more soluble form.

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