

OBSERVATIONS ON SELF-PRUNING AND THE FORMATION OF CLEAVAGE PLANES.

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Plants form separation layers and brittle zones for a variety of purposes, and the process is one of great importance in the life of many species, especially in those of a woody nature. The most familiar example is the annual phenomenon of the shedding of leaves and leaflets in our deciduous trees and shrubs. By this means the plant gets rid of useless members or of such as would be injured by long periods of dry or cold weather.

When fruit or seed is developed there is again the necessity for some means by which these bodies may be separated from the parent. In many cases, both in perennials and annuals, the parts are pruned off by the formation of cleavage planes.

The most interesting examples of the development of separation layers and brittle zones are those by which ordinary buds, twigs and branches are cut off or self-pruned. This may be an adaptation for getting rid of leaves which do not themselves have the deciduous habit; for vegetative propagation; for the cutting off of herbaceous stems near the ground, as in certain perennial tumble-weeds and other geophilous plants; or it may be a process whose primary object is simply to rid the plant of surplus branches, thus preventing decay and allowing for the production of more new twigs and leaves the following season.

Whether separation layers are ever produced in roots or underground stems is not known to the writer. But it seems that this would make an interesting though difficult subject for research.

The process of self-pruning has been studied by the writer for several years, and during the past summer further observations were made to supplement previous work on this subject. A number of species were added to my former lists, including members of such widely separated families as Myricaceae, Aceraceae and Vacciniaceae. A number of trees were found to prune abundantly in the spring. The soft maple (*Acer saccharinum* L.) was self-pruning abundantly from the first of May to the first of July. From some trees hundreds and even thousands of twigs from one to ten years old were shed during this period. The formation of the joint and cleavage plane is much the same as in the poplars, and most of the twigs had leaf buds with partly developed leaves. *Acer rubrum* L. also self-prunes in the spring and shed twigs from one to ten years old were collected on May 12th. No evidence of self-pruning was discovered in *Acer saccharum* Marsh. or *Acer negundo* L. *Ulmus americana* L. also sheds twigs in the spring, although autumn is the more usual time for this tree to self-prune. On May 16th a large tree was

seen shedding twigs by the thousands. Sometimes a twig would drop every few seconds. On May 19th the ground beneath this tree was covered with twigs and parts of twigs from one to six years old on an average of about ninety per square yard. When it is stated that the area thus covered was over ten yards in diameter some idea can be obtained as to the number of twigs pruned off in a few weeks. This tree was still self-pruning on June 3d. Many other trees were pruning at this time. The weather was very dry and it is the writer's belief that dry weather accelerates the process of self-pruning.

W. E. Britton* reports that when the fruit of the elm is ripe gray squirrels prune off considerable numbers of branches, and suggests that injury might be done to trees in this way. It would appear, however, that an elm tree which naturally prunes off hundreds of branches a year could not be injured materially by losing a few twigs which squirrels might bite off while feeding.

The slippery elm (*Ulmus fulva* Mx.) does not self-prune branches, but it sheds large numbers of lateral buds every year, and has therefore no need of pruning off surplus branches. Foerster† has observed such a process in a number of trees.

The cottonwood (*Populus deltoides* Marsh.) was found to self-prune occasionally from the time leaves appear in the spring until they are shed in the fall, although the main period of self-pruning is at the time of the shedding of the leaves. In a previous article, the black oak (*Quercus velutina* Lam.) was given in the list of oaks which are supposed not to self-prune. During the past summer, however, the writer found trees, on Cedar Point, Sandusky, Ohio, which were shedding a few small twigs by forming cleavage planes in basal joints. In late autumn the hackberry (*Celtis occidentalis* Mx.) sheds considerable numbers of leafy twigs of the season by means of the formation of a brittle zone in the same manner as was described in a previous article for the fruiting twigs.

The following plants, not mentioned in previous papers by the writer, self-prune by the formation of cleavage planes in basal joints :

Juniperus virginiana L.

Populus balsamifera L.

Populus tremuloides Mx.

Comptonia peregrina (L.) Coult. Mostly twigs of the season are pruned off.

Quercus velutina Lam.

Quercus imbricaria Mx. Self-prunes small twigs, but not abundantly.

Euonymus europaeus L. Twigs from one to eight years old are self-pruned.

* W. E. Britton. The Gray Squirrel as a Twig-pruner. *Science* 25: 950. 1902.

† Aug. F. Foerste. The Identification of Trees in Winter. *Bot. Gaz.* 17: 180-189. 1892.

Euonymus atropurpureus Jacq. Shed twigs from one to four years old were collected.

Acer saccharinum L.

Acer rubrum L.

Polycodium stameneum (L.) Greene. Self-prunes twigs abundantly.

Vaccinium vacillans Kalm.

The following two grapes were studied and found to prune in the normal way for such plants by the formation of cleavage planes corresponding to leaf nodes in twigs of the season :

Vitis labrusca L. Wild variety.†

Vitis bicolor Le C.

As stated in the beginning of this paper cleavage planes are often formed to separate the fruit from the parent plant. It is interesting to note some of the ways in which this is accomplished. In the simplest cases a cleavage plane is formed at the base of the fruit, which falls off while the peduncle dries and decays away. This is the case in *Rhus glabra* L. In others the separation layer is formed at or near the base of the peduncle, as for example in the ground cherry, *Physalis pruinosa* L. In this herb a very perfect cleavage plane is formed in the peduncle. In the apple and pear the separation of the fruit from the tree is accomplished in the same way by the development of a rather imperfect cleavage plane or separation layer. In some plants, as in *Prunus americana* Marsh., or in *Benzoin benzoin* (L.) Coult., the fruit first falls off and afterwards a cleavage plane is formed at the base of the peduncle. In the plum the peduncle sometimes dries off and is not immediately shed, even though the separation layer is formed. When the fruit is produced on panicles or cymes there are also several methods of procedure. In the dogwoods, as in *Cornus asperifolia* Mx., the berries drop off singly, and later the fruiting cyme is closely excised by a smooth cleavage plane; while in the smooth sumac, as stated before, the berries drop off in the same way, but the much branched panicle remains to decay gradually. In the chestnut (*Castanea dentata* (Marsh.) Borkh.), the stems which bear the burs become quite woody, but a cleavage plane is formed and the entire fruiting branch is thus pruned off.

The writer has had some difficulty in looking up the literature on the subject of self-pruning. This may be because no distinctive term has come into use for this common and most interesting phenomenon of our shrubs and trees. The following is a list of recent American papers bearing upon this subject :

1885. TRELEASE, WM. When the Leaves Appear and Fall. Second Ann. Rept. Agr. Exp. Sta., Univ. of Wisconsin, for 1884. p. 59.

1892. FORSYE, AUG. F. On the Casting-off of the Tips of Branches of Certain Trees. Bull. Torr. Bot. Club. 19: 267-269.

1893. FOERSTE, AUG. F. On the Casting-off of the Tips of Branches of Certain Trees—Part II. Bull. Torr. Bot. Club. 20: 157-168.

1900. BESSEY, C. E. Botanical Notes—The Annual Shedding of Cottonwood Twigs. Science. 12: 650.

1901. SCHAFFNER, JOHN H., and TYLER, FRED. J. Notes on the Self-Pruning of Trees. Ohio Nat. 1: 29-32.

1902. SCHAFFNER, JOHN H. The Self-Pruning of Woody Plants. Ohio Nat. 2: 171-174.
