RHODODENDRON WINTER INJURY

Rhododendrons have been seriously injured during the past winter. In fact, a cursory investigation seems to indicate that the injury will be as widespread as it was after the winter of 1940-41. Injury has been noted in Philadelphia, northern New Jersey, New York and Boston, undoubtedly indicating that rhododendrons growing in a wide area have suffered. As many home owners will be disappointed with their plants this spring, and because of this widespread injury, this issue of Arnoldia is devoted to a discussion of some of the factors that might have been the cause. (For notes on the injury occurring three years ago, see Arnoldia vol. 1, 33-36, April 29, 1941.)

The injury became evident in the Arboretum about two or three weeks ago. Prior to that time, the plants were apparently in good condition, though it is admitted that we did not make minute examinations. The greater number of the evergreen rhododendrons are growing at the base of Hemlock Hill. This spot is frequently very cold and very windy at times during the winter, and wind has caused freakish injuries to rhododendrons and other plants as well.

The injuries this spring are varied. A branch here and there may have been killed on a plant while the remaining branches are in a healthy condition. Sometimes only a few leaves are injured; sometimes half the plant is killed. Several large plants in the collection, plants which have been growing there for ten or fifteen years, are completely killed, while their immediate neighbors are apparently unscathed. Of course there are many varieties of rhododendrons growing in the Arboretum with varying degrees of exposure. Most of the plants are mulched well with oak leaves, and those with the worst exposure were protected from winter winds by pine boughs, set and tied in place during December and removed the first week in April.

How did the damage occur?

Obviously, the temperature records should be consulted first to determine
whether the injury was caused by low temperatures. This was not the cause of injury in the Arboretum last winter for several reasons.

Records of maximum and minimum temperatures are recorded daily at our greenhouses. Only once did the temperature drop below zero (December 24) when it was $-10^\circ$ F. and only five times did it drop below ten degrees above zero. From the standpoint of winter cold, this was a mild winter, and accurately kept temperature figures are not the only criterion. Plants themselves tell the temperature story. For instance, the flower buds of *Viburnum fragrans* are very much in evidence all winter long. These are frequently injured by low temperatures. However, *Viburnum fragrans* in the Arboretum is in full bloom now with hundreds of beautiful pink flowers, not one of which shows any winter injury. In fact, the flowers of this plant have not looked so well for many years.

*Corylopsis* flower buds are frequently injured by cold winters, but none were affected in the past winter. Forsythia flower buds also are frequently injured by low temperatures, but these are in splendid condition and soon will begin to open in all their golden splendor. The flowers of our cherished native dogwood, *Cornus florida*, are not injured, and, incidentally, the trees throughout this area are loaded with flower buds giving promise of a gorgeous display in May. It may be remembered that the previous winter (1942–43) was a severe one with respect to many woody plants and that in many cases the outer bracts of the dogwood "flower" bud were injured to such an extent that when the "flower" was fully open, only two bracts were a normal white, the other two were grayish and stunted or else had dropped off altogether by flowering time. Such is not the case this year and it is safe to predict that dogwoods will produce in another month one of the best flowering displays in years.

And as a final example (there are many more which could be mentioned), the flower buds of the rhododendrons themselves are in splendid condition, except on those branches or plants that have been completely killed. In severe winters, the flower buds show considerable injury at this time, but such is not the case, at least in the Arboretum collection. Of course, these plants will not bloom for six weeks, and complications in the injured water systems of the plants may arise which might cause some of the flower buds to die before they open, but now, the majority of the plants that are uninjured are well covered with perfectly normal well filled flower buds. These plants, too, will produce a splendid display of flowers this season.

Consequently, from the temperature records taken in the Arboretum and from the fact that other plants with tender flower buds were uninjured, low temperatures alone were not responsible for the peculiar and disappointing type of winter injury which is so evident on rhododendrons.

**High winds**

High winds are frequently the cause of winter injury, and often a contributing cause. This was not the case in the Arboretum last winter. One has only to im-
spect the plants in the collections to be convinced. Here it would be quickly evident that injured branches are not those that are most exposed. On the contrary, the injured branch as evidenced in our collection may be the branch most protected from sun and wind! Entire plants in the center of the collection have been killed, whereas those on the outside of the collection, those most exposed, have not been injured. Hence it is not possible to blame the injury to high winds. This fact is borne out by an examination of the official weather bureau reports for the months in question (November '43 to March '44) which show that the wind velocities for each of these months has been about normal.

It may be remembered that in March of 1941 there were several days when there were comparatively high temperatures, some slight wind, full sunshine and rather remarkably low humidities, factors which combined to make a condition most unfavorable to rhododendrons at that time of year. No such correlation of temperature, humidity and sunshine existed during this past winter; consequently, with these factors in mind, it would seem logical that injury was not caused by high winds or a combination of low humidity and high temperature.

Rainfall

If there is any one factor which can be singled out as being responsible for the injury, it might well be the rainfall, or better, the rainfall and the snowfall. In the first place, there was practically no protecting blanket of snow on the ground all winter. The one major snow storm occurred March 20, a ten-inch fall which did no good as a ground cover for it melted in a few days.

In Boston the annual rainfall amounts to about 40 inches each year. By the end of December, 1943, there was an 8 inch deficit in this expected amount. November and December are actually the critical months for it is during these months that the ground freezes. Once this occurs, the ground water becomes unavailable to plants. If the soil freezes at a time when the plants themselves have not had sufficient water, injury may occur. Especially is this true of broad-leaved evergreens for their stomates are continually exposed to the atmosphere and must give up water on warm or windy days, even though the ground remains frozen. Injury occurs when no more "stored" water is available from plant parts above the ground, and with the ground frozen, the plant gives up water essential to the life of the plant cells.

During November and December of 1943 there was a rainfall of only 3.15 inches —less than half the normal amount for those two months. By November there was already a 3 inch deficit in the rainfall. Hence the rhododendrons went into the winter (after the soil had frozen) in a very dry condition. With practically no snow cover, and evaporation of water from the soil surface throughout the winter, the situation was aggravated. With the first occurrence of high temperatures in March, increased evaporation occurred from the leaves but water could not be taken up from the soil, hence injury occurred. It is extremely difficult to explain the unequal injury of these plants; i.e., why only a branch was killed
here and there on one plant. It is likely that unequal absorption of water by various plant parts, unequal root distribution, and unequal freezing and thawing of the soil are all related to the problem.

It is interesting to note that very few plants other than rhododendrons have been injured here this past winter.

**Care of injured rhododendrons**

Now that the injury is evident, what steps should be taken to help the rhododendrons back to good growth? All dead wood should be cut out, the plants given plenty of water and the tops sprayed with water occasionally (except in bright sunshine when the temperature is high). Everything should be done to aid the plant into vigorous growth early in the season. The only thing which might have prevented injury to rhododendrons this past winter (presupposing normal cultural methods were followed) would have been a thorough watering of the plants throughout late October and November, or during the several week period prior to the time the ground froze.

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