The Growth Cycle of Evergreen Azaleas

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The growth of an evergreen azalea over a period of years will show noteworthy changes. A plant that has attained moderate size and maintained its compactness for many years may "take off," becoming taller and less dense. Why? Was the acceleration in growth a matter of maturity? Was it the result of changes in climate? We may never find definitive answers. But we can turn our attention to the annual growth cycle of evergreen azaleas, learn some essential details about that cycle, and become aware of ways in which the gardener can assist a plant to flourish.

The "timeline" in the figure touches only highlights of the changes that occur during the course of a year. Understanding the basic sequence of events heightens awareness of the need for care throughout the season. Although many people dote on azaleas during the blooming season, foliage quality is an important consideration throughout the year. Beyond the week or two when a plant is clothed with flowers, an azalea is generally not a focus of attention. Yet the plant is an integral element of the landscape, where its size, shape, and foliage contribute to harmony (or, if the plant is scraggly, to disharmony) some fifty weeks of the year.

Before continuing, it will be helpful to become familiar with the stages of growth outlined in the figure. The following notes briefly expand upon the **major stages of growth** listed on the "timeline," keyed to the letters identifying stages on the timeline:

A. The dimorphic nature of evergreen azalea foliage needs to be understood. When many people see the normal process of spring leaves' turning yellow or red and falling as winter approaches (**H**), they tend to believe that the plants are "sick." Because the summer leaves are smaller and tend to be concentrated below the terminal buds, the dimorphism (two forms of leaves; **D,F**) usually results in a "fuller" appearance from late spring through fall than in winter and early spring. For some cultivars, this difference is marked and may be a factor in selection for landscape use.

B. The "show color" stage of bud development (when petal tips are revealed by the opening bud) is critical. In areas subject to *Ovulinia* petal blight, the plant should be sprayed at this stage with a fungicide approved for combating the blight. Many growers have successfully used *triadimefon* (Bayleton®, for example). This fungicide reportedly has somewhat longer-lasting effect than *chlorothalonil* (Daconil®, for example), another widely used spray.

Petal blight may not develop if the weather remains dry, but the utility of spraying must be carefully weighed in areas subject to sudden change to damp or wet conditions,

An Evergreen Azalea "Timeline"

FOLIAGE		FLOWERS
"Summer leaves" from last year's growth remain on plant, especially those below terminal buds.	-A-	Buds emerge from dormancy, swell, and shed protective bracts.
New vegetative growth emerges from terminal buds (in some cultivars ahead of flowers; in others, after the flowers).	-B-	Buds continue to swell, "show color" as petals begin to emerge. Period of vulnerability to *Ovulinia* petal blight.
	-C-	Flowers open fully (anthesis); anthers release pollen, stigmas are receptive. Pollen transferred to stigma (usually by insects) leads to fertilization of ova.
New branchlets are clothed with "spring leaves"; these are relatively large and thin.	-D-	Depending on weather and/or lack of effective fungicidal counter-measures, petal blight may reduce corollas to "mush."
"Summer leaves," which persisted through last winter, fall off.	-E-	Corollas fade and fall off; ovaries begin to expand and ripen into capsules.
As branchlets approach the end of their growth, "summer leaves" are produced; these are smaller and thicker than the "spring leaves."	-F-	Terminal buds form on the new branchlets; certain cells will lead to production of flowers next spring; others will lead to next year's vegetative growth.
	-G-	When seeds are mature, capsules split open, releasing seeds.
As winter approaches, abscission layers form between the petioles of "spring leaves" and the branchlets; these leaves then turn yellow or red and fall off. The speed of this process depends on genetic characteristics of the plant, as well as on the severity of the winter.	-H-	Seasonal change triggers the "hardening off" processes that enables the plant (and the buds) to survive the low temperatures of winter.
	-I-	With the approach of spring (higher temperatures, longer days), reversal of the hardening off process occurs. Plant tissues, especially in the buds, are particularly vulnerable to severe temperature drops at this time.

which favor rapid development of the blight. Where the plants in a garden offer a succession of bloom spanning several weeks, it may be desirable to spray again as buds show color on the later plants.

On some cultivars, the early emergence of spring foliage partially hides the flowers and militates against selection for landscape use.

C. This is the time for the adventurous to try their hand at hybridizing (see A. Kehr in Galle's *Azaleas* [rev. ed.], pp. 341-350). When pollen from one clone is applied to the receptive stigma of another clone, the resulting seed (**G**) will carry a mixture of genes from the two clones—a new plant!

Branches bearing flowers not representative of the described cultivar should be tagged for avoidance if cuttings are to be taken later for propagation (**F**). In this way, propagation of "sports" is less likely to occur.

D. Especially in sunny locations, foliage should be checked throughout the season for presence of lace bugs on the undersides of leaves; if not controlled, these sucking insects can substantially damage azaleas.

If petal-blight damage is severe, make a firm resolution to spray at "show color" time next year!

E. After the spring flowers fade, pruning may be done to shape the plant (plants may be pruned before blooming, but flowers will be lost).

F. It is important to note that the buds for next year's flowers and vegetative growth are initiated as the current year's new growth matures. An important factor in plant performance is a continuing adequacy of moisture supply in fall and early winter.

When the new vegetative growth has matured to the point at which it will snap when bent, cuttings may be taken for rooting. From cuttings (asexual propagation), the resulting plants will be genetically identical to the plant from which cuttings were taken.

G. If seed is to be collected, the capsules should be picked shortly before they begin to split open naturally—usually around the time of first frost in northern and mid-Atlantic areas. In the South, capsules may mature and split open long before the advent of frost. Collection may be timed by watching for the capsules' darkening in color, eventually turning brown. A grower near Atlanta collects in early November; but one north of New Orleans finds mid-to-late July appropriate. The rationale for collection this early is that a hot, dry spell following a rainy, humid period can rapidly dry the capsule tissues, leading to sudden splitting and loss of seed.

H. As day length shortens and temperatures fall, physiological changes prepare the plant to resist the effects of freezing temperatures: turgidity in the plant decreases, cell walls toughen, and cell contents concentrate. Hardening off will be most successful in preventing damage if the early winter decline and early spring rise in temperature are relatively smooth.

I. The reversal of the hardening-off process, often accelerated by unseasonably warm late-winter to early-spring weather in some areas, increases turgidity in the plant. At this stage, sharp drops in temperature may damage or kill buds and—in extreme cases—the freezing of liquid in a plant's vascular system results in bark split and varying degrees of dieback.

Plants don't read reference books

When the author saw plants of *Picea glauca* var. *conica* (Dwarf Alberta Spruce) at his favorite nursery in the early 1960's, he checked Liberty Hyde Bailey's *The Cultivated Conifers in North America* (1933). At page 274 of that impeccable reference, he learned that for this plant: "The largest specimens observed measure fifty-two inches in height." Planted in a spot where a five-foot height would have been ideal, the plant is now eleven feet tall.

Over the years, it dawned on the author that published descriptions of plant growth based on experience in one part of the country must be viewed with caution when planting in a different region is contemplated. (The care with which nursery stock has been propagated is also a factor. Some plants may vary in form, depending on whether cuttings were taken from upright or horizontal growth. Color patterning in azaleas may vary if cuttings are taken from "sporting" branches; i.e., bearing flowers differing from the norm of the cultivar). Several of the factors that may account for variation in the performance of a cultivar in different areas of the country are noted below.

Geographic considerations

In selecting evergreen azalea cultivars for landscaping, it is important to consider that the growth and appearance of a plant are influenced by many factors related to geographic location. A landscape designer will generally select cultivars (or species) for consistent, known performance. This is fine so long as what is "known" is based on observation and experience with the plants *in the area where the plants are to be used.*

Solar radiation, temperature, rainfall, cloud cover, and wind—as well as soil and other local conditions affecting growth—interact to affect plant growth. These influences vary between geographic areas. Thus, the *calendar* timing of the stages of plant growth through the year in the New York City area will differ markedly from that experienced around New Orleans.

In addition, there may be some differences in the *sequence* depicted in the timeline. For example, some cultivars that in the North flower only in spring may in the South set new buds by early summer, some of which flower in late summer and fall. But note also that very small environmental differences (microclimates)—even in an individual garden or neighborhood—may have important effects on performance of a given cultivar.

Among the factors affecting plant performance, insolation (the amount of solar radiant energy received) is important not only for photosynthesis (the plant's mechanism for producing food) but also for heating of the ground and the atmosphere. Geographic differences in day length and in the intensity of solar radiation thus contribute to the various temperature regimes encountered.

The seasonal ranges of temperature in an area are important when considering plant hardiness. Some cultivars are much more sensitive than others to winter cold or summer heat. The timing of physiological processes (hardening off) leading to dormancy or to the breaking of dormancy may be strongly influenced by day-night differentials in temperature.

Many azalea cultivars seem to be relatively more stable than others in responding to differences in cultural conditions. For some, flower form and coloration, as well as foliage and plant habit, may vary little between areas of the country that favor evergreen azalea culture. Other cultivars may show considerable variation based on regional influences. For the azalea aficionado (nut), such variations provide added interest and challenge as the years unfold.

Some conditions disruptive of normal growth

Mother Nature — A sequence of conditions likely to disrupt the normal development of an azalea may include insufficient rainfall during the period of bud formation and development, interference with the hardening-off process brought about by seesawing temperatures in a mild winter, and subjecting the plant to sub-freezing temperatures following a period of warmth in the late winter or spring.

That prescription was filled for my northern Virginia garden (10 miles west of Washington, DC) by the 1998-1999 fall-winter-spring sequence of weather. There was drought in the fall of 1998 and little winter precipitation. In early spring, temperatures yawed; after the daytime temperature reached 68° F. on March 3, a nighttime low of 16° F. occurred March 8 (amidst a 10-day run of subfreezing nighttime lows).

Anomalies were observed. A much greater than normal fall and early winter leaf drop left plants more sparsely clothed than previously observed. When spring came (cool at first), there were some shifts between cultivars in the sequence of blooming. On several plants, a large proportion of the buds did not open until about a week after the initial flush of bloom. On some plants, the amount of aberrant flower form and coloration ("sporting") seemed to be greater among the flowers that opened early than among those that opened later. A highly speculative inference is that the buds which opened early had not hardened off during the foregoing winter as completely as the others and, hence, suffered more damage from freezing temperatures.

Through the entire season—from 'Dayspring' to 'Blue Tip'—the flowers on some plants had petal surfaces abnormally puckered in a texture recalling seersucker fabric. Irregular doubling (petaloidy of stamens) was encountered in normally single flowers ('Red Tip', for example). On the plus side, the relatively cool and dry weather in the early spring of 1999 led to long blooming periods and relatively little petal blight.

The flower colors on some cultivars appeared somewhat deeper than normal, and substantial differences from the past were noted in color patterning. Flecks, stripes, sectors, and "selfs" were prominent on some plants that usually have flowers nearly uniform in color. The flowers on 'Red Tip' are usually white with margins (petal tips) of strong purplish red or deep purplish pink. In 1999, many were self-colored or had very small white centers. 'White Moon', normally white with occasional sectoring of deep yellowish pink, displayed a full range of color patterning. 'Sir Robert', normally a pale purplish pink with a slight axial flush of light purplish pink, bore a full panoply of color patterns, including several flowers that earlier in the season might have been mistaken at a quick glance for those of 'Whitehead'.

Another peculiarity observed was a delay in new growth, again a probable result of bud damage. At the end of June, 1999, some cultivars showed only an inch or less of new growth, while nearby plants that bloomed about the same time had new shoots nine inches long. The author had not previously noted such disparity in the development of new growth.

Human intervention — Many azaleas can thrive under a wide range of environmental and cultural conditions, but they can be (and have been) "killed by kindness." Improper practices in watering, chemical application to modify pH, fertilizer application, and pruning can endanger azaleas. Perhaps the rule should be: "When in doubt, don't!" Not addressed here are ways in which selection of plants inappropriate for an area or for a planting site can doom a planting.

As noted in connection with the timeline, azaleas require adequate soil moisture on a continuing basis for best performance, but they can be injured by excessive rainfall or overwatering. Azaleas hate "wet feet." The gardener cannot control rainfall, but he can emend soil texture and provide drainage.

Under-watering is frequently encountered when container-grown azaleas have been planted. This problem can be minimized by

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spreading the roots and shaking out much of the container potting mix, replacing it with soil. But even when the root balls of container-grown plants (these are often badly potbound) have been spread in planting, roots will not quickly extend into the surrounding soil. For the first year or two, careful attention to moisture supply is required.

Azaleas prefer slightly acid soils, with pH in the 4.5 to 6.0 range; some do well in neutral soil (pH=7). If adjustment of soil pH is necessary, it should be undertaken with great care. Azaleas can be killed by well-intentioned but overdone dosing of the soil, even when using a slow-acting chemical like sulfur.

The question of fertilizer use is more complex. In many soils, azaleas can thrive for years without application of fertilizer. If soil nutrients are low, however, a plant may benefit from application of a fertilizer appropriate for azaleas. Sparing application and avoidance of high-nitrogen fertilizers (these may stimulate vegetative growth at the expense of flowering) are two good rules of thumb to follow when fertilizing azaleas. An essential consideration is to avoid stimulation of growth in the fall and early winter—a result that would interfere with the essential hardening-off process and increase the plants' vulnerability to winter damage.

As noted in discussion of the timeline (**E**), shaping of evergreen azaleas is best accomplished shortly after the blooms fade. A broken branch or an occasional unsightly "water sprout" (an overly vigorous branch—usually vertical—extending well beyond the general contour of the plant) may be removed at any time.

Major late-season pruning, however, presents a much greater threat than just the loss of next spring's flowers. When the plant is heavily pruned, vegetative growth will be stimulated. New branchlets will develop from adventitious buds in the stems, and this new growth will face the rigors of winter in an immature condition. Worse, the stimulation of growth will delay the normal hardening off, putting the entire plant at risk of damage from freezing temperatures.

Can these observations be refined?

The relations set forth above between environmental factors and cultural practices on the one hand and the growth responses of azaleas on the other hand reflect observations by the author and others with whom he has discussed them. Given the large numbers of evergreen azalea species and cultivars (and the complex genetic backgrounds involved), scientific tests of the posited relations under controlled conditions would be a formidable task. Tests covering the broad range of geographic, climatic, and cultural conditions under which the plants are grown would be costly indeed.

Nevertheless, a confluence of expert opinion could do much to refine understanding of the relationships under discussion. A symposium at an annual convention or in **THE AZALEAN** could pool the experience and knowledge. Plant scientists familiar with plant physiology and genetics, nurserymen who have observed azalea growth under a variety of geographic and cultural conditions, and collectors with experience in growing a wide range of species and cultivars are encouraged to undertake such a synthesis.

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