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# THE AZALEAN

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*Journal of the Azalea Society of America*

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June 1985



# AZALEA SOCIETY OF AMERICA

The Azalea Society of America, organized December 9, 1977 and incorporated in the District of Columbia, is an educational and scientific non-profit association devoted to the culture, propagation and appreciation of the series *Azalea* (subgenus *Anthodendron*) of the genus *Rhododendron* in the Heath family (*Ericaceae*).

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# THE AZALEAN

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Volume 7 No. 2

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## IN THIS ISSUE:

### PEST-FREE AZALEAS CAN BE A REALITY

John W. Neal, Jr ..... 25

### LEAF NOTCHING WEEVILS

Deborah C. Smith and  
Michael J. Raupp ..... 30

### 'PRYOURED' AZALEA

Frank S. Santamour, Jr. and  
Robert L. Pryor ..... 32

### LATE FLOWERING JAPANESE AZALEAS

B. Y. Morrison ..... 33

### A SURVEY OF FAVORITE AZALEAS

William C. Miller III ..... 34

### ON ROOTING COMPOUNDS

Ray Maleike ..... 39

### "AZALEA CLASSIC" EFFECTS OF MULCHING ON GROWTH AND WINTER INJURY OF EVERGREEN AZALEAS

John L. Creech and Walter Hawley ..... 40

### ASA NEWS AND VIEWS

President's Column ..... 43

1985 National Meeting ..... 43

Chapter Activities ..... 43

Azalea Calendar ..... 43

Propagation From Damaged Branches  
and Pruning Tall Azaleas ..... 44

**Azaleas** by Fred Galle ..... 44

A Word About Mulching ..... 44

### LETTERS TO THE EDITOR

Deciduous Azalea Sources ..... 45

Pericat and Eden Hybrids ..... 45

Wood's Rooting Compound ..... 45

**THE AZALEA MART** ..... 46

# PEST-FREE AZALEAS CAN BE A REALITY

John W. Neal, Jr.  
Beltsville, Maryland

Pest-free, a relative term, implies an apparently healthy plant. With the exception of the azalea lace bug, which may require spray treatments, azaleas generally are pest-free. In a more pragmatic sense, pest-free plants may have a low level of infestation that is either a short-term invasion or the resident pest may remain chronic and not seriously damage the plant. The mere presence of an insect or mite pest does not necessitate a chemical approach to pest control. Similarly, azalea growers have either experienced or know of azalea disease problems, where only in cases of severe infestations is spraying with fungicides recommended. An example is the fungus *Exobasidium vaccini*, which commonly causes disfigurement of new leaves into swollen and enlarged galls. The control is to hand pick the affected leaves, thus reducing the fungus inoculum. Many pest problems of azaleas are largely cosmetic and can be ignored, or the insects may be picked or pruned from the plant. Azalea pests are generally benign; however as a rule, the severity of the infestation increases in the southern latitudes.

## LACE BUG

In a recent review of research papers, extension leaflets, circulars, bulletins, and garden books, the azalea lace bug (Fig. 1) headed the list of important pests. The Azalea Lace Bug, *Stephanitis pyrioides* (Scott), was inadvertently introduced into New Jersey during a period of extensive plant exploration after the turn of the century (11). Feeding damage by both the immature forms (nymphs) and adults is unsightly and can remain on the evergreen shrub for a year. A severe lace bug infestation may weaken the plant, but plant death rarely results. Plants "killed" by lace bugs are generally suffering from other disorders.

The azalea lace bug is also an annual contender for one of the top ten pests reported by the Maryland Department of Agriculture Nursery Inspectors. The lace bug was the most common arthropod pest detected during 1981 in a survey conducted in six Maryland counties (2). In an expanded University of Maryland urban Integrated Pest Management (IPM) insect monitoring program, the azalea lace bug was the pest most frequently detected, however only nine percent of over 2000 plants required a spray treatment (3).

In southern New Jersey, the lace bug has been reported to pass the winter as the egg stage. Hatch occurs in the latter part of May, with adults appearing in the latter part of June with three generations (1). The discovery of adult lace bugs on azaleas at my home in Laurel, Maryland, during the last week of May and as late as December 6 in 1982, coupled by the ease that azaleas appear so readily infested, raised questions of

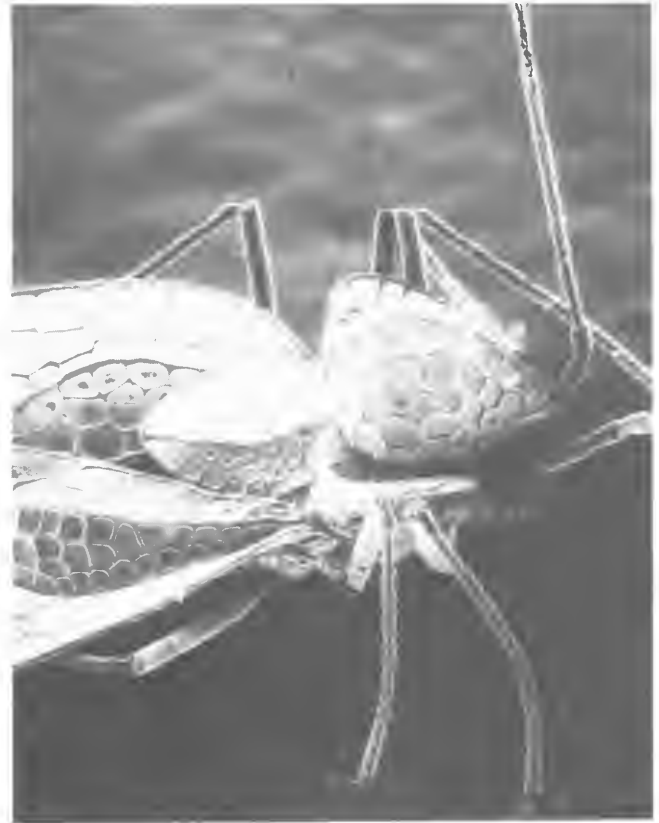


Figure 1. Scanning electron micrograph of an adult lace bug.

possible data gaps in the biology of this pest. This led to the further investigations of the lace bug at the USDA Florist and Nursery Crops Laboratory at Beltsville, Maryland. The findings are summarized in this report.

The development of all life stages of the lace bug occurs on the lower side of the leaf. Spring hatch of overwintered eggs is now confirmed (1983, 1984) to occur at Beltsville, Maryland, during the first week of May, followed by emergence of first generation adults near Memorial Day. Emergence of the second generation adults in late June corresponds with the reported first generation in New Jersey (1). Mating occurs three to four days after emergence by the adult followed immediately with egg laying. Most eggs are inserted by the female into the leaf tissue out-of-sight along the base of the midrib. Under crowded conditions, some eggs may be laid next to lateral veins while other eggs may be scattered or laid indiscriminately. Each egg is covered by a black, shellac-like fecal covering. Lace bug females are voracious feeders and inflict the major damage. Defecation associated with feeding makes it difficult to distinguish the fecal-covered eggs. If adults are found, it is safe to assume the presence of eggs. Field studies at Beltsville have confirmed at least four generations. There is a recent report of adults overwin-

tering in North Carolina (4). The immatures moult five times during their development to become adults. Nymphs, which are highly gregarious, feed together in a tight group and freely come in contact with one another.

In laboratory studies, adults individually maintained were found to live more than a few weeks. New adults held at a constant temperature of 69 degrees F lived from early April to August.

Most species of lace bugs are apparently relatively free of predators and parasites. An extensive study of the biology of seven species of lace bugs in Missouri showed that the few parasites and predators recorded did not significantly affect the population (8). Why is this easily accessible food source not utilized by predators? In some genera of lace bugs, there is a recognized form of parental behavior identified as "maternal care" (10). The adults ward off potential predators. This behavior does not occur in the azalea lace bug. Most species of lace bug nymphs are known to secrete from hairs on the body (Fig. 2) and antennae (Fig. 3) a clear, slightly viscous fluid in the form of micro-droplets. We have studied the chemistry of this fluid in the azalea lace bug and found it to contain a class of compounds known as chromones (7). These compounds are known to be distributed in the plant kingdom but have not been recovered from azaleas. This is the first finding of these products from insects. Studies at Beltsville have shown that azalea lace bug nymphs were found to be repugnant to nine species of foraging ants. The nymphs may be secreting a chemical used in a defense system that

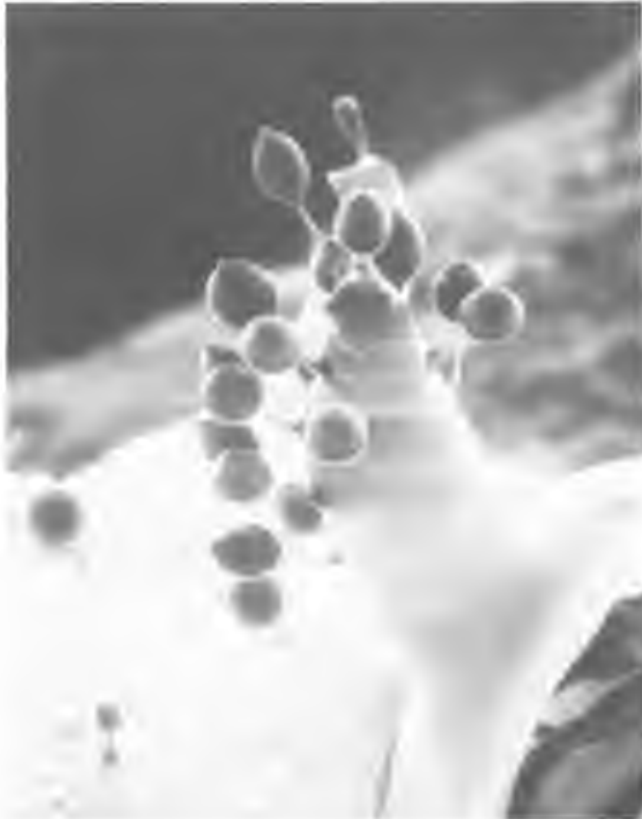


Figure 2. Scanning electron micrograph of a cast skin of a lace bug nymph with one of several abdominal tubercles with globulated hairs (430X).



Figure 3. Terminal segments of antenna of lace bug nymph supporting globulated hairs. Micro-droplets contain chemicals that may be repugnant to predators (340X).

provides a form of self-protection. A second defensive strategy is "strength in numbers." A single predator, in a chance encounter, may disturb the feeding group with the result that nymphs are scattered over the leaf surface. The nymphs always reassemble as a group following a disturbance. A third strategy is protective resemblance. Most feeding insects defecate in such a manner that the material excreted is removed or is dispersed from the feeding site. Lace bug nymphs prefer to defy gravity and defecate on the lower leaf surface. Fecal material of both nymphs and adults becomes shiny and black. The integument or skin of the nymph is semitransparent except for an intense darkening of the dorsal part of the abdomen. This dark area makes it very difficult for the casual observer to distinguish nymphs from fecal spots, particularly in the early instars.

### Control

Adults found on azaleas in the late fall indicates that eggs have been laid that will overwinter. An assumption can be made that nymphs will be present the following spring and an effort should be made to destroy these new nymphs before they become egg-laying adults. Feeding by newly emerged nymphs is slight and generally indistinguishable from nymph and adult feeding damage of the preceding year. A well-timed application of a registered chemical product for azalea lace bugs directed to the underside of the previous year's leaves

(during the third week in May in Maryland) will give excellent control. Insecticide test reports I have reviewed show nymphs to be very susceptible to insecticides tested. Plant reaction or phytotoxicity should always be considered when pesticides are applied to actively growing plants with new leaves. During the growing season, new leaves should be examined periodically for stippling, which results from feeding by migrant adults. These adults may be destroyed by hand and the leaf removed as a precaution, since eggs may be present.

## OTHER INSECTS

### Root Weevils

Black Vine Weevil, *Otiorhynchus sulcatus* (Fab.), a serious pest imported from Europe, is also known as Taxus weevil because the adults feed on yews. This beetle has a more northerly distribution with Maryland as the southern edge. Adults are dark-bodied and feed at night. Only females that cannot fly are known. Adult feeding is characterized by a series of notches on the edge of the leaf. Larvae cause serious damage as root feeders.

The Twobanded Japanese Weevil, *Callirhopalus bifasciatus* (Roelofs), is a commonly encountered pest of ornamental plants. It was accidentally imported in 1914 and is now distributed from New England south to the mid-Atlantic states and west to Illinois. Adults are day feeders and notch the edge of the leaf while feeding. Larvae are destructive root feeders. Only flightless females are known.

The Woods Weevil, *Neocestes incomptus* (Horn), is limited in distribution to the northwestern states. The adult is a small dark beetle. The larvae may girdle the main stem when feeding below the mulch and normally are root feeders.

### Stem and Bark Feeders

The Stem Borer, *Oberea myops* Hald., is a small beetle that is occasionally found in stems of azalea, dogwood, rhododendron, and mountain laurel. The female girdles the tip of the stem before laying an egg. The larva enters the plants near the growing tip and burrows down the center of the stem. At intervals of four to six inches, small holes are made to expel the borings (frass). The larva bores to the vicinity of the crown by late spring and constructs a pupal chamber. The construction of this chamber weakens the plant and often results in breakage at this point. Adults emerge in mid to late spring. The larval development is thought to require two years. The biology is not well known.

Azalea Bark Scale or Louse, *Eriococcus azalea* Comst., is a soft scale that resembles a mealybug on the branches and stems due to secreted wax-like filaments on the female and mats of filaments covering the egg sac. Living females have dark red bodies. Primarily considered a nuisance in the southern states, the scales overwinter as the egg stage in the north and as nymphs in the south (Alabama). Scales are frequently observed

in the axils of twigs. Large infestations may weaken the plant, resulting in an unthrifty appearance. Feeding results in the excrement of a honeydew material on nearby leaves, which develop a sooty mold. Sprays are recommended for large outbreaks, and the addition of a very small amount of surfactant or liquid detergent to the spray mixture generally increases efficacy. A general recommendation for time of pesticide application is inappropriate here due to the various stages that overwinter based on latitude. Check with your local extension agent.

Cottony Azalea Scale, *Pulvinaria ericiola* McConnell, is a soft scale first reported in Maryland in 1949 on the native species *Rhododendron nudiflorum* and has been observed since on Mollis hybrids, Kaempferi hybrids, and Kurumes. The known distribution is spotty with reports from New York and a single finding on huckleberry in Florida. Cottony white egg sacs are generally found near the base of the shrub. Stems may appear white in unusual but heavy infestations. The biology is poorly known. Immature females overwinter and become sexually mature in the spring with egg laying in June.

Peony Scale, *Pseudanidia paeoniae* (Cockerell), is an armored scale that develops primarily on azalea and has been reported occasionally on camellia and ligustrum. Considered to be a southern pest, the scale is distributed from Virginia to Florida. Infestations occur on small twigs and branches up to one-half inch in diameter. Twigs may develop a bumpy appearance due to a local swelling around the scale. The biology is poorly known. The female armor or scale portion may be three to four millimeters in diameter, and the rounded raised tip (which is the first cast skin) is orange-yellow.

Greedy Scale, *Hemiberlesia rapax* (Comstock), is an armored scale with a very large and diverse host range, thus the name. This species is tropical in origin and has adapted to greenhouses and the warm states of California, New Mexico, and Florida. The scale has several generations, and infestations may spill over to azaleas in greenhouses and outdoors in areas of warm climates.

### Bud Feeder

The Green Fruitworm, *Orthosia hibisci* (Guenee), a smooth green larva with a narrow dorsal white median stripe, was first reported feeding on buds of azalea, rhododendrons, and roses in Maryland in 1970 (9). Fruitworms are primarily orchard pests in the northeastern U.S. and lower Canada. The pupa overwinters, with adults emerging in April to lay eggs.

### Foliage Feeders

The most serious pest is the lace bug previously discussed. A large number of species of beetles are general foliage feeders, and on occasion they will feed on azaleas. Homeowners and azalea producers may feel "picked on" by these beetles, because the feeding results in the leaves appearing ragged or full of holes. Furthermore, the feeding is often at night when the

leaves are young and fresh. Feeding on azalea leaves by a beetle is largely by accident, and the amount of damage usually varies annually based on the number of beetles in the area and chance circumstances. Beetle feeding is very difficult to prevent and does very little real damage other than affecting the appearance of the shrub. Control of lawn grubs will reduce beetle feeding. Whiteflies and mites may develop to be serious problems. A spray treatment may be necessary if leaf removal and pruning are judged to be impractical.

The Japanese Beetle, *Popillia japonica* Newman, is another well-known imported pest and general foliage feeder which may be a serious problem when large numbers are present. Shrubs may be dusted (not sprayed) with Sevin® (carbaryl) for excellent control.

The Green Scarab, *Colaspis favosa* (Say), is a small, one-quarter inch green beetle which eats holes in the leaves.

The Brown Garden Beetle, *Autoserica castanea* (Amow), as an adult, feeds on young foliage, eating irregular holes.

The Yellow-Necked Caterpillar, *Datana ministra* (Drury), is widely distributed throughout the U.S. Larvae of this moth have a wide host range. Winters are spent as pupae underground. Spring-emerging adults lay eggs in clusters on the undersides of leaves. The eggs of a single cluster hatch simultaneously. The larvae are gregarious feeders for four to six weeks. When disturbed, the larva rears back both the head and tail as if to strike. All the larvae in a feeding cluster will assume this pose in unison if only one is disturbed. Larvae may be removed by hand and discarded. The older larvae are voracious feeders and may strip a large area on the host plant. The Azalea Caterpillar, *Datana major* G. & R., is a frequent defoliator in southern Maryland and other southern states.

The Azalea Leafminer, *Caloptilia azalea* (Brants), is a small moth that is distributed throughout the range of evergreen azaleas from Florida to Texas, north to New York and through the Ohio Valley. It is also known to occur in northern California and the Pacific Northwest. The number of generations is greatly influenced by the northern or southern latitude. Two generations develop in New York (5). Development may be continuous in a greenhouse. The egg is laid singly on the underside of azalea leaves along a midrib or vein. The newly hatched larva enters the leaf and feeds for the first half of its life as a leafminer. Internal feeding results in brown blisters or patches. The larva emerges from the leaf, crawls to the upper surface and ties several nearby leaves together with silk to form an enclosed area in which it feeds and later pupates. Larvae can move very quickly either forward or backward within the folded leaves if disturbed.

The Southern Red Mite, *Oligonychus ilicis* (McGregor), is an important pest of broad-leaved evergreens with a much wider distribution than the name implies. The mite is found in New England and west to Ohio. Mites feed on both leaf surfaces, rasping as they feed. This causes the

leaves to change their color to a bronze or reddish brown. Severe infestations may result in leaf drop. Young mites are pink in color and darken with age. Heavily infested leaves appear as if sprinkled with a fine red pepper. The greatest reproductive activity occurs in cool weather of spring and fall contrary to popular belief. The egg is the overwintering stage with hatch in early spring. Registered acaricides are quite effective against the motile forms but generally are not effective against the eggs. Schedule two applications five to seven days apart if spraying is necessary. Since mite development time is much shorter than most insects, a repeat application should be made after egg hatch but before females develop.

## CONTROL

DDT, a highly effective, broad spectrum insecticide that costs a nickel a pound to make, became a magical cure overnight for most of our pest problems in the 1940's and 1950's. DDT was soon joined by other chlorinated hydrocarbons that provided additional safe and effective use patterns. (These products were cancelled because of environmental concerns.) This was followed by another family of compounds, the organophosphates (to which malathion and diazinon belong), which increased pesticide versatility through the introduction of systemic pesticides. The families of pesticides continue to grow, and today we have at our disposal the pyrethroids, which are active at one-thousandth the rate of DDT. These highly efficient pesticides have shown us how to grow pest-free food and flowers. As a result, we seem to have forgotten the natural order of life and the real world of species interdependence. We have been conditioned by the success of the pesticides to believe that we must reach for the "flit-gun" when any bug settles on our prize plants. The last 20 years have shown to me that we have developed an unfortunate dependence on pesticides to solve many matters that are of little real consequence. Pesticides should be used when the pest population is or will be a detriment to the plant. The value of this judgment, when applied individually, will vary. Adopting this approach will result in reduced dependence on pesticides. The very best pest control for azaleas is periodic inspection of the plants and the judicious use of sharp pruning shears. Lee (6) addresses many of the major pests of azaleas. Since this book may be a ready reference for control of azalea pests, readers should be aware that only diazinon, kelthane, and malathion remain labeled for use.

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John W. Neal, Jr. is a Research Entomologist with the USDA, Agricultural Research Service, Florist and Nursery Crops Laboratory, (Bldg. 470), Beltsville, MD 20705.



# LEAF NOTCHING WEEVILS

Deborah C. Smith and Michael J. Raupp  
College Park, Maryland

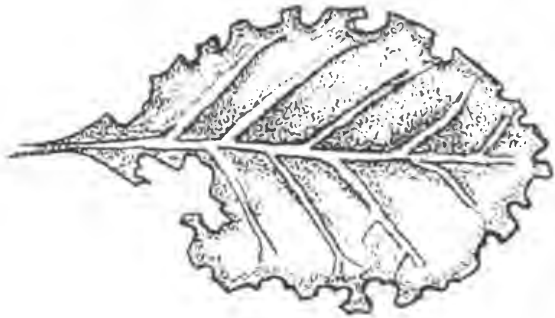
The Twobanded Japanese Weevil and the Black Vine Weevil are two species of flightless weevils which feed as adults by notching leaves and whose immature forms, called grubs, feed on roots. Infestations spread slowly from one area to another since adults do not fly. However, once a plant is infested, the population on that plant may increase rapidly. When feeding adults are disturbed they will drop to the ground and feign death, so observe your plant carefully to detect the insect.

## PLANT ATTACKED

These weevils are pests of over 100 plants, ranging from weeds to shrubs to greenhouse plants. Some of the common host plants in Maryland include: azalea, privet, holly, strawberry, rhododendron, yew and grape.

## DAMAGE

When weevils are present in low numbers only a few notches on the edges of leaves will be apparent. If many weevils are present, the leaves are often scalloped and left with only the main vein (see illustration).



DAMAGE WHEN FEW ADULTS ARE PRESENT



DAMAGE WHEN MANY ADULTS ARE PRESENT

The grubs are highly destructive to plants. When small, grubs consume feeder roots. Larger grubs feed on larger roots, stripping the bark and sometimes girdling the plant crown. This blocks the flow of water and nutrients to the foliage. Infested plants have stunted growth; leaves turn yellow and then wilt.

## LIFE CYCLE

Both weevil species have similar life cycles. In Maryland, adults emerge during mid-June. All adults are females, able to produce fertile eggs without mating. A newly emerged adult requires four to six weeks of feeding before her eggs develop. Five hundred or more eggs are laid, usually beneath or near the host plant. Feeding and egg-laying continue until fall.

Eggs hatch in 10 to 14 days. Newly hatched grubs are legless, C-shaped and off-white in color, with light brown heads. Young grubs tunnel underground and begin feeding on plant rootlets. Grubs feed all summer and into the fall before moving below the frost line for the winter.

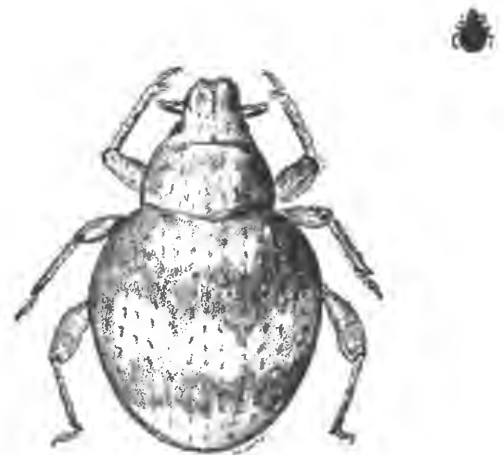
Grubs resume feeding and produce the greatest amount of root damage in the spring. (A small percentage of adults may overwinter and begin feeding and egg-laying much earlier. Therefore, grubs of two different sizes are sometimes found in the soil at the same time.) By late May, grubs have transformed into a resting stage called the pupa. Adults emerge from the soil about two weeks later.

## TWOBANDED JAPANESE WEEVIL

*Callirhopalus bifasciatus*

The Twobanded Japanese Weevil is about 1/4 inch long with a rounded abdomen and short snout. They are frequently overlooked because their brown subdued coloration allows them to blend in with the vegetation. Two mottled bands are distinguishable across the back. Adults are active during the *daytime* and can be found in branch crotches or clinging to twigs and foliage. They deposit eggs in inconspicuous folds of leaf fragments, primarily in litter around the base of the host plant.

Adult Twobanded Japanese Weevil



Most of the adult damage occurs close to the ground, usually on new and inner foliage. Defoliation becomes more evident by late summer as the growth rate of the plant slows down and the effect of continuous adult feeding accumulates. Heavily infested plants may suffer complete defoliation.

### BLACK VINE WEEVIL

*Otiorhynchus sulcatus*

Black Vine Weevils are about 3/4 inch long, oval and dull black in color. Adults feed only at *night*, hiding in debris and loose soil under plants during the day. They seem to prefer feeding on rhododendron, hemlock and yew (or *Taxus*), hence the nickname 'Taxus Weevil'. Adult feeding may detract from the appearance of the plant but usually does not cause significant injury.

With the onset of egg-laying, adult wandering increases. Eggs usually drop to the ground as the adult feeds. Serious damage results when numerous grubs feed on roots. Young plants can be killed by just a few grubs, while mature plants can tolerate a high grub population with little or no visible effect—yet often die when transplanted.

### CONTROL

Control adults when leaf notching is abundant on new growth. Depending on local conditions, this could be from late May to mid-June. Homeowners should use Orthene according to label directions. Certified pesticide applicators can use Orthene, Turcam or Guthion.



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Deborah C. Smith is an Extension Assistant and Michael J. Raupp is an Extension Entomologist and originally published this article in the May 1984 Cooperative Extension Service Entomology Leaflet Number 114 from the Department of Entomology at the University of Maryland, College Park, Maryland.

# 'PRYORED' AZALEA

Frank S. Santamour, Jr. and Robert L. Pryor  
Washington, D.C.

The United States Department of Agriculture, both at the U.S. National Arboretum and at the Beltsville Agricultural Research Center, has had a long and significant history in the development of new and improved azaleas for the nursery trade and home landscaping. Recent research at the Arboretum has concentrated on testing and introducing some of the unreleased hybrids. 'Pryored' is an evergreen azalea with true red hose-in-hose flowers that has proved worthy of introduction.

## Origin

'Pryored' (NA 36544, PI 476758) was a by-product of four generations of controlled crossing designed to determine the possibilities of developing a yellow-flowered evergreen azalea. Previous papers (2,3) have described some of the results of hybridization between evergreen and yellow-flowered deciduous azaleas. 'Pryored' is composed of the following germplasm: 62 percent *prunifolium*, 19 percent *indicum*, and 19 percent from deciduous yellow-flowered Mollis hybrids.

The cultivar name has been registered with the American Rhododendron Society in accordance with the recommendations of the **International Code of Nomenclature for cultivated Plants-1980** (1). Herbarium specimens and photographs are on deposit in the U.S. National Arboretum herbarium. The cultivar name was chosen both to honor the originator, Robert L. "Red" Pryor, and to be somewhat descriptive of the plant.

## Description

'Pryored' is an upright growing evergreen shrub with a rather stiff, well-branched growth habit. The original plant was 1.0 m tall and 0.6 m wide at ten years from seed. The elliptic leaves have a cuneate leaf base and mucronate tip and are about 4.5 cm long and 1.5 cm wide. Both the upper dark green surface and the light green lower surface are only slightly hairy. The tubular, funnel-shaped, hose-in-hose flowers are borne in pairs and are 5 to 6 cm in diameter and 4 to 5 cm long. Each corolla has five lobes with wavy margins. The five stamens are of equal length, and both the filaments and anthers are red, as are the style and stigma. The flower color is Red 42A (4), without a trace of blue or purple pigmentation, and petal spots are merely a darker red.

## Culture

'Pryored' can be grown in the open or in partial shade and is reliably hardy to USDA Zone 5b (5). It can be readily propagated from softwood cuttings.

## Availability

The cultivar was introduced by the National Arboretum in 1984 as NA 36544 and PI 476758. Distributions have been made to a number of arboreta and botanic gardens. Insufficient stock of 'Pryored' is available at the Arboretum for general distribution. 'Pryored' is available however, from commercial sources, including the following wholesale or retail growers:

Phyto Ecology  
P.O. Box 303  
Ridgely, MD 21660

Tom Dodd Nurseries, Inc.  
P.O. Drawer 45  
Semmes, AL 36595

Ingleside Plantation Nurseries  
P.O. Box 1038  
Oak Grove, VA 22443

Mitsch Nursery  
6652 S. Lone Elder Road  
Aurora, OR 97002

Briggs Nursery  
4407 Henderson Blvd.  
Olympia, WA 98501

## References

1. Brickell, S.C., Kelly, A.F., Schneider, F., and E.G. Voss. International Code of Nomenclature for Cultivated Plants. **Regnum Vegetabile**, 104:32 (1980).
2. Pryor, R.L. Hybridization Between Evergreen and Deciduous Azaleas. **Quart. Bull. Amer. Rhod. Soc.**, 27:212-214 (1973).
3. Pryor, R.L. Breeding Azaleas for Evergreen Leaves and Yellow Flowers. **THE AZALEAN**, 6:9-11 (1984).
4. RHS Colour Chart. London: Royal Horticultural Society, (1966).
5. Plant Hardiness Zone Map. USDA Misc. Publ. 814. Washington, D.C.: U.S. Government Printing Office, (1960).

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Dr. Santamour is a Research Geneticist at the U.S. National Arboretum and Mr. Pryor is a retired Horticulturist who worked both at Beltsville and at the Arboretum.

## LATE-FLOWERING JAPANESE AZALEAS

B. Y. Morrison  
Pass Christian, Mississippi

In the group of Japanese azaleas introduced into this country through the Division of Plant Exploration and Introduction of the U.S. Department of Agriculture some years ago, and slowly making a place for itself in this country under the name of "Chugai azaleas," there is a wider range of flowering time than one might suppose from the general catalogue notes. It is true that nearly all bloom in late May and June with straggling flowers well into July, but there is considerable difference among the named clones, so that if one wanted only those that came at the very end of the group it would be possible to choose such. They would have no competition in gardens except from a few other named "macrantha" forms and a few of the Glenn Dale Azaleas that have the same genetic background.

The azalea commonly known in gardens as "macrantha," which botanically is *Rhododendron indicum* in the strict sense of that term, is native to Japan, where it is known as "Satsuki" or "Fifth Month Azalea." Its cultivation falls into two major practices, the use of certain forms in what must be called topiary work for want of a better term and the use of specimens specially grown and trained for pot use.

In the first use, one commonly finds it in gardens where it is used almost as a ground cover, being sheared to whatever level surfaces, or undulating surfaces, the garden scene requires. In such places, the flowering is largely sacrificed, but the effects obtained are well worth while, once one is accustomed to the idea.

In the second use, the plant becomes the almost "sacred object" of a cult, and huge shows are held yearly in which proud owners exhibit their specimens that have been trained in various forms to suggest poetic ideas. Many years of training may have passed before any plant is shown, and the plants as they develop are subjected to pruning, to tying to stakes, to wiring on forms, until the essential skeleton of growth is fixed by the maturing woody stems. After that, pruning is largely resorted to in order to determine the size and location of the foliage masses.

Of the Glenn Dale varieties that are in full show of bloom, now in early June, one can report only 'Fountain' and 'Stunner.' 'Fountain' is a little more than a glorified "macrantha" but 'Stunner' has a larger flower with wider and more overlapping lobes, as well as a stunning rich rose-red color. Other Glenn Dales that flower into June in the North have gone by here, notably 'Eros,' 'Sterling,' 'Sagittarius,' and 'Pearl Bradford,' with 'Aztec' as the most important of them all.

At this writing, June fifth, the "Chugai" varieties that are in showy flower are: 'Shinnyo-no-tsuki,' 'Musa-

shino,' 'Sakura-yama,' 'Otome,' 'Shin-sei,' 'Shun-rei,' 'Shun-un,' and 'Joh-ga.'

Of these, the most spectacular is 'Shinnyo-no-tsuki,' which has large flowers with a wide border of deep crimson about the white centers. It is one of the more tender, however, or, perhaps better stated, more affected by cold, for here, where there rarely are temperatures that would injure its dormant wood, there are temperatures that seem to affect the undeveloped flower buds, so that the blooms appear imperfectly, often not opening as they should and with malformed stamens and pistil. Just what the low temperature may be has not been determined.

'Joh-ga,' which is sometimes catalogued as 'Vogah,' is one of the clones that is imperfectly fixed so that cuttings from one plant may yield several forms. The typical form appears to be a rounded flower of faintly tinted white, with a blush stain on the upper lobe with a varying number of deeper rose-pink dots. We have here a plant raised as a cutting from a shoot that maintains pale pink flowers with the same tinting in a deeper degree, and another plant that has dark rose-pink flowers.

'Shun-rei' bears very flat-faced flowers that are essentially white in garden effect, but that carry a few stripes and a little "sanding" of coral-red color.

'Shun-un' is much like it but gives a considerable number of flowers in which there are six lobes instead of the normal five of the corolla. Its striping and sanding are of Nopal Red which is a slightly browned red.

'Otome' gives both five- and six-lobed flowers of normal azalea form, pure white in color but with occasional sectors, and always a few stripes and a little sanding of rose color.

'Musashino' is much like 'Otome,' but the lobes are more overlapping and there are fewer flowers with sectors of color, and very little striping of rose.

'Sakura-yama,' in its normal form, is a flower with pale coral-pink ground color, so completely covered with sandings and stripes of a color that lies between Ridgway's Old Rose and Eugenia Red, that it makes a very gay appearance. Old Rose in the color chart is a dull pinkish-rose color and Eugenia Red tends toward a brownish tonality. Branches sometimes appear with flowers of solid red.

In the collection here, there seems to be some confusion among the plants under the name 'Shin-sei.' One plant flowers about three weeks ahead of the others, so that it may be the stray or accident. It is pure white with marvellous substance and very little color in odd flakes of rose. The plant now in bloom has a ground color of white, edged with Jasper Red, a slightly

neutralized red. If one could imagine the color as having been applied to the edges of the lobes and then having gradually soaked in toward the center of the flower, one will get an idea of the tinting. There is no sharply defined border as in 'Shinnyo-no-tsuki,' 'Row-getsu,' and others of that type.

None of these varieties has the almost prostrate growth that has become familiar in the earlier flowering

clones as 'Gunrei,' 'Gunbi,' and their like. But in no case does there seem much likelihood that the plants will ever become large bushes, so that foreground planting is quite safe.

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## A SURVEY OF FAVORITE AZALEAS

William C. Miller III  
Bethesda, Maryland

In April 1981, **THE AZALEAN** published the findings of a survey of azalea experts. From the responses to the survey a list of "eye-catcher/good-doer" azalea cultivars was developed, based on the frequency that a cultivar was reported. Limited to Glenn Dale hybrids, the goal was to identify cultivars which, in the opinion of those surveyed, were excellent performers and "of garden merit". I enjoyed reading the "good-doer" survey and decided to conduct a survey of "favorite azaleas."

The strength of the 1981 survey lay in the credentials of the participants. Each had at least ten years experience in growing Glenn Dale hybrids and they had to have grown and tested at least 100 different Glenn Dales. Their aggregate 1400 years of experience gave credibility to the survey.

I decided to take a different approach. I wanted a population sample that resembled the society's general demographic profile. I was interested in covering more than just the Glenn Dale hybrids and I was less interested in the frequency that a cultivar appeared, in the sense that a lot of people liked it (high frequency), than in identifying "favorites" out there that were relatively unknown (low frequency), very new or very old.

A two part survey instrument was developed which consisted of twenty-seven evergreen azalea categories, ten deciduous azalea categories, and a bare minimum of instructions. I was interested in identifying any patterns that might exist. Were there any gaps in hybrid group distribution which might suggest that a given

hybrid group had not penetrated a geographic region? For example, one would not expect Belgian Indian hybrids to have much of a following anywhere but in the Deep South due to hardiness considerations. Were the respondents equally comfortable with deciduous azaleas... with species azaleas? Unfortunately, there is no way to take into account individual specialties, preferences, or limits, so the interpretation of non-responses (represented by \*\*\*\*\*) is problematic.

Out of a survey population of 21 individuals, 16 responses were received. That is better than 75 percent participation with ten of eleven chapters represented. The identity of the participants is not relevant, so the responses are presented by state for geographic perspective. The population surveyed consisted of eleven hobbyists, three horticulturists, and two nurserymen. The survey is proportionately weighted towards the mid-Atlantic region. This is in part by design since, from a demographic standpoint, approximately 40 percent of the society is distributed in or about the mid-Atlantic region.

The value of this survey is to be found in the individual responses themselves and not in the frequency that a cultivar appears. As expected, there are a number of surprises and cultivars that are unfamiliar. How would your response sheet in a survey of favorite azaleas have looked? Do you recognize all of the cultivars? If so, you are quite an expert. If not, then this survey has served you well, and your list of "cultivars-to-try", like mine, is that much longer.

	New Jersey	Maryland #1	Maryland #2
EVERGREEN:			
Favorite Red	'Stewartstonian'	'Red Red'	'Redwing'
Favorite Pink	'Eureka'	'Delos'	'Blaauw's Pink'
Favorite Purple	'Herbert'	'Purple Splendor'	'Zulu'
Favorite White	'Treasure'	'Kehr's White Rosebud'	'Glacier'
Favorite Striped, Flaked, or Sectored	'Geisha'	'Cinderella'	'Cinderella'
Favorite Bordered	'Ben Morrison'	'Margaret Douglas'	'Ben Morrison'
Favorite Foliage	'Stewartstonian'	'Esshio-no-Haru'	'Glacier'
Favorite Early Bloomer	'Dayspring'	'Dayspring'	'Geisha'
Favorite Mid Bloomer	'Geisha'	*****	'Palestrina'
Favorite Late Bloomer	H12G ('Garda Joy', Ed.)	*****	'Beni-Kirishima'
Favorite Fall Bloomer	*****	'Opal'	'Red Slippers'
Favorite Belgian Indian	*****	*****	'Albert-Elizabeth'
Favorite Southern Indian	*****	'George L. Tabor'	'George L. Tabor'
Favorite Pennington	*****	'Beth Bullard'	*****
Favorite Glenn Dale	'Ambrosia'	'Cinderella'	'Cinderella'
Favorite Kurume	'Pink Pearl'	'Ho-oden'	'Cattleya'
Favorite Kaempferi	'John Cairns'	*****	'Eastern Fire'
Favorite Robin Hill	'Frank Arsen'	'Betty Anne Voss'	'Nancy'
Favorite Linwood	'Hardy Gardenia'	'Janet Rhea'	'Garden State Salmon'
Favorite Girard	*****	*****	'Girard's Crimson'
Favorite Gable	'Louise Gable'	*****	'Purple Splendor'
Favorite Greenwood	*****	*****	'Orange Sherbert'
Favorite Harris	*****	'Dorothy Clark'	'Fascination'
Favorite Satsuki	'Gyokushin'	'Esshio-no-Haru'	'Kow Koku'
Favorite Evergreen Species	*****	*****	<i>R. indicum</i>
Favorite Evergreen Hybrid			*****
From Groups Not Listed	'Rosmarinifolium'	'Caprice'	
Most Unusual Evergreen Azalea	Unnamed Glenn Dale Seedling	'Silver Sword'	'Little John'

DECIDUOUS:

Favorite Yellow Native	*****	*****	<i>R. calendulaceum</i>
Favorite Pink Native	<i>R. nudiflorum</i>	*****	<i>R. nudiflorum</i>
Favorite Orange to Red Native	*****	*****	<i>R. prunifolium</i>
Favorite White Native	*****	*****	<i>R. arborescens</i>
Favorite Deciduous Species	<i>R. schlippenbachi</i>	*****	<i>R. japonicum</i>
Favorite Deciduous Hybrid	'Gibraltar'	*****	'Saturnus'
Favorite Ghent Hybrid	*****	*****	'Coccinea Speciosa'
Favorite Mollis Hybrid	*****	*****	'Koenigin Emma'
Favorite Knap Hill, Sloccock, Exbury, or Ilam Hybrid	'Gibraltar'	*****	'George Reynolds'
Favorite Deciduous Hybrid From Groups Not Listed	*****	*****	O.P. seedling of 'Saturnus'

**Maryland #3**

'Stewartstonian'  
 'Coral Bells'  
 'Karen'  
 'Vespers'  
  
 'Vitatta Fortunei'  
 'Martha Hitchcock'  
 'Glacier'  
 'Morning Star'  
 'Elsie Lee'  
 'Sagittarius'  
 \*\*\*\*\*  
 'Cavendishi'  
 \*\*\*\*\*  
 'Aphrodite'  
 'Osaraku'  
 'John Cairns'  
 'Nancy'  
 \*\*\*\*\*  
 'Hot Shot'  
 'Corsage'  
 \*\*\*\*\*  
 \*\*\*\*\*  
 'Gunrei'  
*R. poukhanense*  
  
 'Dawn'  
 'Segai'

*R. flavum*  
*R. nudiflorum*  
*R. bakeri*  
*R. arborescens*  
*R. calendulaceum*

'Exbury White'

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**Maryland #4**

'Rain Fire'  
 'Ellie Harris'  
 'Zulu'  
 'Vespers'  
  
 'Cavendishi'  
 'Martha Hitchcock'  
 'Yuka'  
*R. poukhanense*  
 'Ben Morrison'  
 'Kotobukihime'  
 'Indian Summer'  
 'Albert-Elizabeth'  
 'Cavendishi'  
 'Katherine J. Pennington'  
 'Martha Hitchcock'  
 'Ho-oden'  
 'Indian Summer'  
 'Nancy'  
 'Janet Rhea'  
 \*\*\*\*\*  
 'Herbert'  
 \*\*\*\*\*  
 'Parfait'  
 'Kotobukihime'  
*R. poukhanense*  
  
 'Marian Lee'  
 'Chojuho'

*R. austrinum*  
*R. canescens*  
*R. calendulaceum*  
*R. atlanticum*  
*R. austrinum*  
*R. japonicum* 'Flavum'  
 \*\*\*\*\*

unnamed yellow sdg.

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**Maryland #5**

'Joseph Hill'  
 'Allure'  
 'Zulu'  
 'Vespers'  
  
 'Festive'  
 'Margaret Douglas'  
 'Oldhami'  
 'Dayspring'  
 'Kintaiyo'  
 'Shin Un'  
 \*\*\*\*\*  
 \*\*\*\*\*  
 \*\*\*\*\*  
 'Festive'  
 \*\*\*\*\*  
 \*\*\*\*\*  
 'Conversation Piece'  
 'Dr. Franklin West'  
 'Girard's Pleasant White'  
 'Louise Gable'  
 \*\*\*\*\*  
 \*\*\*\*\*  
 \*\*\*\*\*  
 'How Raku'  
*R. oldhami*  
  
 \*\*\*\*\*  
 'Oldhami'

*R. austrinum*  
*R. prinophyllum*  
*R. prunifolium*  
*R. vaseyi* 'White Find'  
*R. schlippenbachi*

'Salmon Orange'  
 'Narcissiflora'

'Salmon Orange'

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**Maryland #6**

'Red Bird'  
 'Rhapsody'  
 'Zulu'  
 'Swansong'  
  
 'Acrobat'  
 'Margaret Douglas'  
 'Swashbuckler'  
 'Sebastian'  
 'Wanderer'  
 'Beni-Kirishima'  
 'Dorsett'  
 \*\*\*\*\*  
 'George L. Tabor'  
 \*\*\*\*\*  
 'Helen Fox'  
 'Hershey's Red'  
 \*\*\*\*\*  
 \*\*\*\*\*  
 'Girard's Scarlet'  
 'Stewartstonian'  
 \*\*\*\*\*  
 'Miss Suzie'  
 'Tsumo-no-Hikari'  
 \*\*\*\*\*  
  
 'Carillon'  
 'Tsumo-no-Hikari'

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**Northern VA #1**

'Dr. Franklin West'  
 'Betty Anne Voss'  
 'Elsie Lee'  
 'Treasure'  
  
 'Sir Robert'  
 'Margaret Douglas'  
 'Glacier'  
 'Dream'  
 'Easter Parade'  
 'Balsaminaeflorum'  
 'Indian Summer'  
 'Albert-Elizabeth'  
 'George L. Tabor'  
 'Pennington White'  
 'Delos'  
 'Koromo-shikibu'  
 'Cleopatra'  
 'Nancy'  
 'Hardy Gardenia'  
 'Girard's Scarlet'  
 'Rose Greeley'  
 \*\*\*\*\*  
 'Bruce Hancock'  
 'Shinno-no-Tsuki'  
 'Mt. Seven Star'  
  
 'Debonaire'  
 'Silver Sword'

*R. austrinum*  
*R. vaseyi*  
*R. prunifolium*  
*R. arborescens*  
*R. luteum*  
 'Hyatt's Yellow Cloud'  
 'Daviesi'  
 'Samuel T. Coleridge'

'Cecile'

unnamed double yellow sdg.

	Northern VA #2	Indiana	South Carolina #1
EVERGREEN:			
Favorite Red	'Red Slippers'	'Hino Red'	'Red Ruffles'
Favorite Pink	'Betty Anne Voss'	'Hino Pink'	'Grace Freeman'
Favorite Purple	*****	'Herbert'	'Purple Splendor'
Favorite White	'Hardy Gardenia'	'Hino White'	'Delaware Valley White'
Favorite Striped, Flaked, or Sectored	'Gyokushin'	'Festive'	'Yaye'
Favorite Bordered	'Janet Rhea'	'Carie Amanda'	'Martha Hitchcock'
Favorite Foliage	'James Dunlop'	'Lady Louise'	'Robin Hood'
Favorite Early Bloomer	'Quakeress'	'Old Faithful'	'Easter Egg'
Favorite Mid Bloomer	'Betty Anne Voss'	'Elsie Lee'	'Ben Morrison'
Favorite Late Bloomer	'Kotobukihime'	'Eliza Hyatt'	'Higasa'
Favorite Fall Bloomer	*****	'Opal'	*****
Favorite Belgian Indian	*****	*****	'Triomphe'
Favorite Southern Indian	*****	*****	'George L. Tabor'
Favorite Pennington	*****	'Beth Bullard'	CNC #8
Favorite Glenn Dale	'Winedrop'	'Zulu'	'Martha Hitchcock'
Favorite Kurume	'Koromo-shikibu'	'Hino-Crimson'	'Saotome'
Favorite Kaempferi	*****	'Betty'	'Roberta'
Favorite Robin Hill	'Betty Anne Voss'	'Lady Louise'	'Conversation Piece'
Favorite Linwood	'James Dunlop'	'Salmon Pincushion'	*****
Favorite Girard	*****	'Girard's Rose'	'Girard's Fuchsia'
Favorite Gable	*****	'Maryann'	'Corsage'
Favorite Greenwood	*****	'Dolores'	*****
Favorite Harris	*****	'Pink Cascade'	'Pink Cascade'
Favorite Satsuki	'Kotobukihime'	'Miyuno-no-Tsuki'	'Shinnyo-no-Hikari'
Favorite Evergreen Species	<i>R. poukhanense</i> 'Compactum'	<i>R. poukhanense</i>	<i>R. nakaharai</i>
Favorite Evergreen Hybrid From Groups Not Listed	'Debonaire'	'Eliza Hyatt'	'Robin Hood'
Most Unusual Evergreen Azalea	*****	'Kinshibe'	'Robin Hood'

DECIDUOUS:

Favorite Yellow Native	*****	<i>R. calendulaceum</i>	<i>R. calendulaceum</i>
Favorite Pink Native	*****	<i>R. vaseyi</i>	<i>R. vaseyi</i>
Favorite Orange to Red Native	*****	<i>R. bakeri</i>	<i>R. speciosum</i>
Favorite White Native	*****	<i>R. vaseyi</i> 'White Find'	<i>R. alabamense</i>
Favorite Deciduous Species	*****	<i>R. calendulaceum</i>	<i>R. calendulaceum</i>
Favorite Deciduous Hybrid	*****	'Lady Roseberry'	*****
Favorite Ghent Hybrid	*****	'Davies'	*****
Favorite Mollis Hybrid	*****	'Queen Emma'	*****
Favorite Knap Hill, Sloccock, Exbury, or Ilam Hybrid	*****	'Gibraltar'	'Homebush'
Favorite Deciduous Hybrid From Groups Not Listed	*****	'My Mary'	'Windsor Buttercup'



**S. Carolina #2**

**Georgia**

**Alabama**

**Louisiana**

**Oregon**

'Red Ruffles'  
'Pink Pericat'  
'Misty Plum'  
'Delaware Valley White'

'Mother's Day'  
'Hino Mayo'  
'Kiritsubo'  
'Glacier'

'Massasoit'  
'Pink Ruffles'  
'Violacea Rubra'  
'Fielder's White'

'Girard's Unsurpassable'  
'Pink Cloud'  
'Elsie Lee'  
'White Gumpo'

'Ward's Ruby'  
'Betty Anne Voss'  
'Jan'  
'Helen Close'

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'St. James'  
'Content'  
'Dream'  
'Polar Sea'  
'Debonaire'

'Aikoku'  
'Ben Morrison'  
'Kazan'  
'Allure'  
'Margaret Douglas'  
'Eikan'

'Festive'  
'Fawn'  
'Formosa'  
'California Sunset'  
'Pride of Prichard'  
'Cora Brandt'

'Mardi Gras'  
'Fascination'  
'Chinzan'  
'Keisetsu'  
'Janet Rhea'  
'Oh My'

'Eikan'  
'Peggy Ann'  
'Rukizon'  
'Dayspring'  
'Marian Lee'  
'Mt. Seven Star'

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'Mrs. G. G. Gerbing'

'Dorsett'  
'Albert-Elizabeth'  
'George L. Tabor'

'Amethystinum'  
'Triomphe'  
'Elegans Superba'

'Girard's Unsurpassable'  
'Albert-Elizabeth'  
'Cavendishi'

'Indian Summer'  
'Albert-Elizabeth'

'Beth Bullard'  
'Ambrosia'  
'Apple Blossom'  
'Fedora'  
'Gillie'

'Pennington White'  
'Glacier'  
'Pink Pearl'  
'Betty'  
'Watchet'

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'Martha Hitchcock'  
'Pink Pearl'  
'Red Cloud'

'Beth Bullard'  
'Refrain'  
'Yaeshojo'

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'Sagittarius'  
'Coral Bells'  
'Fedora'

'Girard's Pink'  
'Stewartstonian'

'Janet Rhea'  
'Girard's Border Gem'  
'Stewartstonian'

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'Girard's Scarlet'  
'Herbert'

'Watchet'  
'Janet Rhea'  
'Girard's Unsurpassable'  
'James Gable'

'Betty Anne Voss'  
'Hardy Gardenia'  
'Pink Dawn'  
'Caroline Gable'

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'Georgia Giant'  
'Eikan'

'Genie'  
'Fascination'  
'Shinnyo-no-Tsuki'

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'Fascination'  
'How Raku'

'Red Feather'  
'Ming Chu Wen'  
'Gatsum-no-Haru'

'Su Lin'  
'Fascination'  
'Kobai'

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'Kehr's White Rosebud'  
'Rukizon'

'Mt. Seven Star'  
'Ruth May'  
*R. yakuinsulare*

*R. oldhami*  
'Hampton Beauty'  
'El Frida'

*R. oldhami*  
'Easter Parade'  
'Ming Chu Wen'

*R. kiusianum*  
'Anna Kehr'  
*R. yakuinsulare*

*R. austrinum*  
*R. vaseyi*  
*R. bakeri*  
*R. alabamense*  
*R. calendulaceum*  
Choptank  
-----  
'Cecile'  
  
*bakeri* x *viscosum*  
var. *aemulans*

*R. austrinum*  
*R. canescens*  
*R. speciosum*  
*R. arborescens*  
*R. speciosum*  
'Galle's Choice'  
'Daviesi'  
'Hugo Koster'  
  
'Gibraltar'

*R. austrinum*  
*R. canescens*  
*R. speciosum*  
*R. alabamense*  
*R. austrinum*  
'Klondyke'  
'Narcissiflora'  
'Antilope'  
  
'Sylphides'  
  
'Coloratura'

*R. austrinum*  
*R. canescens*  
*R. prunifolium*  
*R. serrulatum*  
*R. speciosum*  
'My Mary'

*R. austrinum*  
*R. vaseyi*  
*R. bakeri*  
*R. canadense*  
*R. luteum*  
'Homebush'

# ON ROOTING COMPOUNDS

Ray Maleike  
Washington State University

Plant growth and development can be explained as a series of chemical reactions within the plant. Plant metabolic processes are governed by complex interactions of chemicals produced by the plant in very minute quantities. These are called plant hormones. By strict definition, plant hormones are those growth regulating substances which are produced by the plant. Synthetic substances applied to plants to modify growth, such as various height control agents, root inducing substances, and fruit/blossom/leaf abscission agents, are usually called plant growth regulators.

Indole acetic acid (IAA or auxin) was found to stimulate adventitious root formation. Since IAA is a naturally occurring plant substance, the plant not only has the ability to produce the material but also to destroy it. Since the discovery of the mode of action of IAA, two other compounds have been found to stimulate rooting of various cuttings. These are indole butyric acid (IBA) and naphthalene acetic acid (NAA). Other materials which have been used for rooting of cuttings are 2, 4-D; 2,4,5-TP; and ethylene releasing compounds. The relatively new phenyl IBA esters show promise for rooting some cuttings better at a lower concentration.

IAA is seldom used in plant propagation except for tissue culture work. The major reason is that the plant can easily destroy this material before it can begin its function of root initiation. IBA is probably the most widely used root stimulating material. It has the advantage of not being degraded very rapidly by the plant. Its major disadvantage is that IBA is a relatively unstable compound. It is rapidly degraded by light and to a certain extent by heat. Solutions of IBA for plant propagation purposes should be kept cold and shielded from light.

NAA is a stable compound both when mixed as a powder or in solution. For a given concentration, NAA will generally have less of a root stimulation ability than IBA. This is generally true, but not always.

Both 2,4,-D and 2,4,5-TP, the broadleaf herbicides, have very powerful root stimulating properties. They should be used with extreme caution, but in some instances may be worth a trial.

Application of these root inducing substances may be by one of three methods. They all have advantages and disadvantages. The most common method is to disperse the rooting compound in a fine powder, such as talc. A fungicide may be included but should be used on a trial basis before going into large-scale production. While this is a relatively easy method of application, there may be variability in the actual amount applied to each cutting because of different degrees of wetness or hairiness of the cuttings. This would lead to variable rates of rooting. Eventually, this could yield nonuniform-sized plants when put into the field or into containers.

The concentrated dip method involves dipping the cutting into a relatively concentrated solution of the root inducing substance for a short time, usually five seconds. Concentrations will vary from 500 ppm to over 20,000 ppm of the root inducing substance. The solvent is usually some proportion of alcohol mixed with water. It is important to stress that the cuttings should not be left in the solution too long. Two commercial preparations, Dip N Grow and Wood's Rooting Compound contain dimethyl sulfoxide (DMSO) and dimethyl formamide (DMF) respectively. Both DMSO and DMF are powerful organic solvents and probably penetrate the tissue more easily than alcohol. This would get the rooting compound into the plant tissue which initiates roots. Concentrated dip applications are generally more uniform than powder applications.

The dilute soak method involves inserting the cuttings into a relatively dilute solution (a few ppm to 200 ppm) for a longer period of time, usually 12-36 hours. This allows more of the rooting compound to enter the plant and is an effective way to root very hard-to-root cuttings. An important point to remember is that the solvent for the solution has to be 95 to 100 percent water. The obvious disadvantage of this method is that it is very tedious and time consuming. However, if nothing else works, it may be worth a trial.

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Ray Maleike is an extension horticulturist at Washington State University and published this article in **Balls & Burlaps** of the Washington State Nursery Association.

# “Azalea Classic”

## EFFECTS OF MULCHING ON GROWTH AND WINTER INJURY OF EVERGREEN AZALEAS

John L. Creech and Walter Hawley  
Beltsville, Maryland and Savannah, Georgia

Mulching with organic materials has been used to improve plant-soil relations by reducing evaporation from the soil, restricting fluctuations in the soil temperature, and suppressing competition from weeds. Because most of the data pertaining to mulching have been derived from field crops or from fruits, the writers made a study at the U.S. Plant Introduction Station, Glenn Dale, Maryland, to observe the effects of mulching on young evergreen azalea plants in the nursery. This paper reports the results of a mulching study using four inches of hay as a mulch particularly in respect to azalea plant growth and degree of susceptibility of the plants to frost damage.

### Literature

References of major significance to this study are those dealing with the influence of mulching on air temperature. Rogers (4) found that any insulating material lessened the heat transfer from the soil and as a result the air temperature over a mulch was 2°F lower than over bare hard soil. He reported greater damage to red currant blossoms in the spring when plants were mulched than when they were growing under clean cultivation. Griffiths (2) stated that in regions having sudden spring frosts lilies shielded by mulches suffered from frost damage. He observed that the temperature over one inch of straw was 4°F lower than over bare ground close by.

Cox (1) presented extensive data on frost occurrence in Wisconsin cranberry bogs. After compiling observations for several years, he stated that the lowest temperatures were always found in exposed places covered by dense low vegetation, thick matting of sphagnum moss, or vines and ferns. The presence of moss caused reductions of 5 to 11°F as compared to bare areas six feet away.

Medcalf (3) found that in coffee plantations in areas of frost danger, injury was greater in mulched plots than in bare soil plots, due principally to the insulating effects of the mulch against transmission of heat from the soil. He recommended that the application of mulches be made after the danger of frost had passed.

### Materials and Methods

Five evergreen azaleas (*Rhododendron* subseries *obtusum*), 'Fashion', 'Gibiyama', 'Mucronatum', 'Omen', and 'Suwanee', were selected to provide a wide range in growth habit and winter hardiness. The plants were lined out in nursery rows and grown for one year without treatment. In May 1956, the nursery was divided into ten

plots of five plants of each variety. The site was split into two replicates and within each the following mulching treatments were randomized:

1. No mulch.
2. Four inches of hay applied in May and removed August 20.
3. Four inches of hay applied in May and removed September 20.
4. Four inches of hay applied in May and removed on date of 1st frost.
5. Four inches of hay applied in May and left on continuously.

The experiments ran from May 1956 to May 1958.

The procedure consisted of removing the mulch according to the schedule given to determine the effect of the mulch on the following: (a) soil moisture, (b) plant growth, (c) air temperature two inches above the soil or mulch surface, (d) degree of winter injury to the plants.

At the beginning of the study, soil-moisture retention data were determined at the U.S. Salinity Laboratory, Riverside, California, as a means of interpreting the soil-moisture samplings taken during the summer. Soil samples, six inches deep, for determining moisture on a dry-weight basis were collected in triplicate at weekly intervals beginning one week prior to the date when the first mulch was removed and sampling was continued until several weeks after the first frost.

Plant growth was determined by collecting leaves from each plant of each variety in November 1957 and measuring their lengths. Since azaleas have dimorphic leaves, sampling was made after the summer leaves had defoliated and only the mature foliage was used in determining leaf growth.

Minimum air temperatures were recorded by placing Weather Bureau type minimum recording thermometers two inches above the mulched and non-mulched plots.

Plant injury was determined in May 1958 when all dead wood was cut back to the first adventitious shoot, and weighed.

### Results

*Soil moisture*:—the use of a four inch hay mulch greatly reduced the loss of moisture from the soil. By comparing the soil-moisture percentages with the moisture-retention data it is apparent that the uninterrupted use of the four inches of hay during the periods under observation maintained the moisture at 12.1 per cent (1/3 atmosphere) or more, while in the non-mulched plots, soil moisture fell to 7.1 per cent, equal-

ent to about 5 atmospheres of tension. In this soil, the permanent wilting percentage is 3.5 per cent.

*Plant growth:*—The growth of the five varieties of azaleas was determined by leaf measurements at the end of the second year (Table 1). The analysis of variance for leaf length except for the varieties 'Omen' and 'Gibiyama' shows all mulching treatments were significantly better than non-mulching. The plants of 'Gibiyama' grew no better when the mulch was removed on August 20 than when there was no mulch. For 'Omen,' the treatments requiring removal of the mulch in either August or September were not significantly better than non-mulching. In no variety was there a significant difference in the leaf size of azaleas in plots from which the mulch was removed on the date of the first frost and of those plots in which the mulch was left on continuously.

Table 1.—Average leaf lengths (cm) of five varieties of azaleas measured at the end of a two year mulching program with four inches of hay, 1956-1957.

Treatment	Fashion	Gibiyama	Mucronatum	Omen	Suwanee
No mulch . . . . .	2.18 a <sup>1</sup>	2.94 a	2.20 a	2.35 a	2.06 a
Mulched—					
5/1 to 8/20/56;					
5/1 to 8/20/57	2.56 b	3.20 a	2.55 b	2.52 a	2.43 b
Mulched—					
5/1 to 9/20/56;					
5/1 to 9/20/57	2.83 c	3.83 b	2.93 c	2.78 a	2.52 b
Mulched—					
5/1 to 10/11/56;					
5/1 to 10/12/57	3.36 d	4.37 c	3.40 d	3.24 b	2.77 c
(dates of first frost)					
Mulched—					
continuously from					
5/1/56	3.25 d	4.56 c	3.48 d	3.38 b	2.76 c

<sup>1</sup>For any one variety, treatments similarly lettered showed no significant difference, 5% level.

*Air temperature:*—The air temperature measured two inches above the soil and the four inch hay mulch surface differed during the period prior to and following the first fall frost. In 1956, minimum temperature readings between October 1 and November 1 averaged 5.1°F lower over mulched than over non-mulched soil. The minimum temperatures over bare soil were consistent with those readings from the official Weather Bureau local station, while over the mulch, the minimum temperature during October 4-November 12, 1957, averaged 5.5°F lower than above the bare ground.

While the officially recorded first frost occurred on October 12, an average low temperature of 28.3°F was recorded above the mulch on October 4. When the temperature fell below freezing to 29°F above the bare ground on October 12, the temperature above the four inch hay mulch was 24.3°F. The frost condition over the mulch was clearly evident in the early morning before the sun rose high enough to melt it. The frost crystals not only covered the mulch, but extended up onto the foliage of the plants as well. The effectiveness with which the four inch hay mulch insulated the ground was demonstrated by nightly alternating removal and re-

placement of the mulch on one plot. When the mulch was present the temperature was that of other mulched plots; when removed, the temperature was equal to that of the non-mulched plots.

*Winter injury:*—Winter injury of azaleas is manifested as flowerbud injury, leaf burning, and bark splitting. Usually plants show these symptoms during the winter, but occasionally the effect will not be noted until the following summer when the plants collapse during a period of drought. Following the first prolonged period of cold weather in October 1957, the mulched azaleas showed frost injury in decreasing amounts according to the time of mulch removal. There was slight damage of the non-mulched plants. On May 15, 1958, the plants were examined for winter injury and the injured stems were cut back to the first new adventitious shoot for weighing (Table 2). The varieties 'Suwanee' and 'Omen' were without sufficient dead wood to make weighings regardless of treatment.

Table 2.—Average fresh weight of dead wood (grams) of three varieties of azaleas as influenced by the length of the mulching period with four inches of hay, 1957-1958.

Treatment	Variety		
	Fashion	Gibiyama	Mucronatum
No mulch . . . . .	0.10	1.58	none
Mulch removed 8/20/57 . . . . .	0.82	3.57	0.08
Mulch removed 9/20/57 . . . . .	1.18	2.40	1.28
Mulch removed 10/12/57 . . . . .	5.92	7.61	3.35
Mulch left on from 1956 . . . . .	7.97	20.75	7.46

## Discussion

Two related effects of mulching azaleas have been established by these studies: (a) the growth of azalea plants is significantly increased by the application of a hay mulch during the summer, and (b) azaleas are subject to increased winter injury when mulched, with greatest damage resulting when the mulch is left on the beds continuously but, with varietal differences.

Under the soil conditions in this experiment, four inches of hay mulch adequately reduced moisture loss from the soil so that the azaleas were under no stress to obtain moisture during the summer. Growth was significantly improved by the application of a four inch hay mulch from May to October but no further increase was noted when the mulch was retained on the beds from one year to the next. Varieties differed in growth response to soil moisture, and varieties which were the least responsive to increased moisture, namely 'Omen' and 'Suwanee,' were also the varieties that suffered the least winter injury regardless of mulching treatment.

The winter injury sustained by the azaleas in this study was governed by two conditions. (a) As the mulching period was extended, the growing season was similarly prolonged. At the time of first frost the summer foliage of non-mulched plants had turned color, while foliage of the mulched plants was still green. The plants

in the plots from which the mulch was removed at progressive dates showed intermediate foliage-coloration behavior. The observed degree of dormancy at frost time was governed by the mulching practices through the sustained higher moisture in the soil and the maintaining of higher soil temperatures later in the autumn. The nutritional effects of the mulch may also have contributed to the sustained growth of the plants. This factor was not considered in this study. (b) The continuously mulched plants suffered greater injury than did plants on plots from which mulch was removed at the first frost. Since both groups of plants had prolonged growing periods and similar amounts of growth, the increased injury of the continuously mulched plants must be the result of the difference in the air temperature at the plant level. This study and the literature confirms the fact that an organic mulch, such as hay, tends to reduce the minimum air temperature immediately over the mulch by several degrees as compared to bare soil during periods when heat loss from the soil is most rapid. When temperatures over bare soil fell close to the point where tissues could be damaged by freezing, temperatures over the mulch went sufficiently lower to injure the azaleas. Furthermore, we would anticipate that the low temperatures over a mulch would be sustained for several hours longer than over bare soil. An earlier date of first frost was also noted over the mulch than over bare ground.

On the basis of these studies, the summer mulching of evergreen azaleas in the nursery in May with four inches of hay and removal of the mulch three weeks prior to the average date of the first frost will result in greatest amount of growth with the least winter injury of the plants. Variation in injury will occur according to moisture and temperature conditions during different years. Furthermore, the influence of tree cover and other barriers against radiation frost such as would occur under landscape conditions would have an effect on the results of mulching. Similar studies should be conducted on other mulches and under additional environmental conditions.

### Summary

Mulching studies of nursery grown evergreen azaleas demonstrated that a four inch hay mulch from May to September 20 greatly benefited the growth of plants but retention of the mulch on the beds until the date of first frost or continuously through the winter resulted in severe injury. Non-mulched plants had the least amount of winter injury and made the least growth.

Soil moisture was well preserved by summer mulching. Azaleas in this study were not under moisture stress during the summer when mulched with four inches of hay while at times non-mulched plants received insufficient moisture to continue growth.

Varieties responded differently to the influence of the mulch. Generally, the varieties mulched until September 20 had significant increases in growth over those on non-mulched plots and less winter injury than those on plots where the mulch was left on until the first frost or continuously.

Air temperatures recorded two inches above the four inch hay mulch averaged 5.5°F lower than above the adjacent non-mulched plots during October and November. Winter injury to buds and bark splitting of azalea stems was attributed to the combined effects of high soil moisture late in the growing season and abnormally low air temperatures during the critical period of first frost brought about by continuous mulching.

These results do not necessarily apply to azaleas grown in landscape plantings, and local conditions will determine the relative merits of mulch removal as compared to degree of winter injury or practicality of mulch removal.

### References

1. Cox, H.T. Frost and temperature conditions in the cranberry marshes of Wisconsin. U.S. Dept of Agri. *Weather Bureau Bull. T.*, (1910).
2. Griffiths, D. The production of lily bulbs. U.S. Dept. Agri. *Circ.* 102 (1930).
3. Medcalf, J.C. Preliminary study on mulching young coffee in Brazil. *IBEC Research Institute Rpt.* 12, New York, (1956).
4. Rogers, W.S. Some aspects of spring frost damage to fruit and its control. *Rpt. 13th Intern. Hort. Cong.* 2:941-946, (1953).

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This article from the U.S. Department of Agriculture together with five figures was originally published in the **Proc. Amer. Soc. Hort. Sci.**, 75:650-657, 1960.

“Azalea Classics” are articles published in the past which **THE AZALEAN** staff deems worthy of being brought to the attention of today’s azalea enthusiasts. Whenever possible “Azalea Classic” will relate to the a feature article in **THE AZALEAN** in order to increase the perspective of the issue. We think this is a valuable way to link the past, present, and future in azalea horticulture.

# ASA NEWS AND VIEWS

## THE PRESIDENT'S COLUMN

What more can I say than I have already said to those of you who attended the National Meeting in Mobile, Alabama, in March. The tours, talks, auction, attendance, food, and weather, all contributed to making the first convention in the "Deep South" a tremendous success. My sincere appreciation goes to all members of the Mobile chapter for their time and effort. A special thanks goes to my dear friends Mary and Russell Scott for a job well done.

Those of you who failed to make the meeting sure missed out on some beautiful sites. Bellingrath Gardens was just about at its peak of azalea bloom as were most of the azaleas in and around Mobile. The weather was super—cool mornings and warm evenings, with no rain the entire weekend. Can you imagine acre after acre of azaleas in containers growing in full sun under sprinkler systems and waiting to be shipped to commercial outlets all over the country. Such was the site we saw on the visit to several of the large wholesale growers in the Semmes area near Mobile.

I must make a few comments on the attendance, for without it there would have been no meeting. Members, you were super—what an attendance, over 110 registered. You came by chartered bus, plane, and car. Thanks again. It was a pleasure meeting you and seeing old friends and acquaintances. All of us, I am sure, will have memories we will cherish for some years to come and will be looking forward to a return visit to Mobile.

John U. Rochester, Jr.

## 1985 NATIONAL MEETING

Amendments to the By-laws, reapportionment of annual dues, and nominees for the Board of Governors previously listed in **THE AZALEAN** were unanimously approved at the Annual Meeting held in Mobile, Alabama on March 23, 1985. Reports on the convention activities will appear in the September issue of **THE AZALEAN**.

## CHAPTER ACTIVITIES

The Brookside Gardens Chapter cordially extends an invitation to all members of the Azalea Society, at-large and other chapter members alike, to attend the seventh annual Brookside Gardens Chapter Azalea Plant and Cutting Auction. It will be held on June 25, 1985, at the Sligo Creek Community Center, located at the corner of Sligo Creek Parkway and Dennis Avenue in Silver Spring, Maryland. The festivities will commence at 7:30

p.m. As in the past, many rare and unusual cultivars and seedlings will be looking for new homes. Don't disappoint them. Come and enjoy the fellowship and good fun. For more information call Bill Miller at (301) 530-7683.

## THE AZALEA CALENDAR

June 25	Brookside Gardens Chapter Seventh Annual Azalea Plant and Cutting Auction. Bill Miller, Chairman, (301) 530-7683.
September 21	Glenn Dale Preservation Project Workday. 9 a.m.-1 p.m. Andy Dietz, (301) 384-2092.
October 19	Glenn Dale Preservation Project Workday. See September 21.
November 16	Glenn Dale Preservation Project Workday. See September 21.

**THE AZALEA CALENDAR** lists upcoming Society and chapter activities. Items to be included should be forwarded to the Editor together with name, address, and telephone number of contact person(s) at least three months prior to the month of publication of **THE AZALEAN** in which the notice is to appear.

## PROPAGATION FROM DAMAGED BRANCHES AND PRUNING TALL AZALEAS

My first experience with propagating azaleas occurred many years ago when a dog ran through my yard in February and snapped off a large branch of 'Hatsushimo'. With no facilities or experience, I improvised. Each distal branch was cut off about four inches proximal to the terminal branches or shoots. The leaves were dipped in Wilt Pruf and allowed to dry. Pots were lined with moist peat, and the center core was filled with sand. Each branch stem was scraped down to green wood on each side—about 1/8 inch wide to expose the cambium. Rootone was applied lightly, and each branch was buried in the sand up to distal shoots. They were placed under a fluorescent light in my basement (average temperature 60-62 degrees F) and given about 18 hours of light daily. The peat was watered but not the sand. Much to my surprise, every one rooted. One has to allow two to three months, and new growth is not an indication of rooting but rather of water moving distally. Such a method could not be commercially feasible, but if one of your prized plants is damaged perhaps you can salvage some of it. Do not expect 100 percent results.

Many years ago, I purchased a 'Constance' (Glenn Dale) from Milo Perkins. This was pruned to a low spreading mound, and it was years before it sent up its characteristic long shoots (it is now six feet). A tall growing azalea should not be pruned like a Kurume. Tall growing plants are often planted behind lower growing ones, and pruning retards the upright growth. Mr. Morrison did not prune any of his Glenn Dales.

Neil P. Campbell  
Washington, D.C.

## A WORD ABOUT MULCHING

Spring is the best time to apply mulch. This early mulch will keep the roots cool in summer and also moist. It will also have a chance to rot down by fall. If the mulch is applied in the fall, it is like putting a blanket on the ground and it will prevent the earth's radiating heat from protecting the plant from winter's cold. It is a well known fact, when there is a cloud cover at night, it is warmer. On a clear night the earth's heat escapes, and it is much colder. When the upper part of the plant bud blasts, but the lower part blooms, it is due to the blanket of mulch preventing enough of the earth's heat from protecting the whole plant. REMEMBER. If you wish to fertilize, do it before you apply the mulch. BONO AMMONIUM PHOSPHATE is the best fertilizer at this time.

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Reprinted from Bulletin No. 5 of the Verde Vista Preservation Society, Spring Grove, Pennsylvania.

## AZALEAS by Fred Galle

Timber Press has advised us that Fred Galle's new book, **Azaleas**, will be available about September 1, 1985. The book will contain 438 pages with 108 of the pages being color plates. The pre-publication price for orders received prior to September 1, 1985 is \$58.50 plus \$2.50 UPS delivery charges. The price after September 1 will be \$65.00 plus \$2.50 UPS delivery charge. Books may be ordered by sending your check directly to the publisher, Timber Press, 9999 S.W. Wilshire, Portland, Oregon 97225. If you wish to use a credit card, you can order the book from the distributor, ISBS, by calling their toll free number, which is 1-800-547-7734.

For ASA members desiring a copy of *Azaleas* autographed by Fred Galle a one time special price of \$52.50 including handling has been arranged for the society by Bob Barry. The offer is limited to one autographed copy per active ASA dues paying member unit (individual, couple, family, household, business, garden club, etc.) on record as of August 15, 1985.

To order your autographed copy of *Azaleas* send a 3X5 inch card with your name, address, telephone number and inscription desired (less than ten words) together with your check in the amount of \$52.50 made out to Robert K. Barry — ASA to: Azalea Book, c/o Robert K. Barry, 9322 Caroline Avenue, Silver Spring, Maryland 20901. Be sure to write *Azaleas* by Galle on the lower left portion of your check and include the 3X5 card.

It is anticipated that the autographed books will be available for pickup by members or their chapter representative at the October 1985 meeting of the Brookside Gardens Chapter in Silver Spring, Maryland. Autographed books for members residing outside the middle atlantic region will be sent to you via UPS.

Your order must be received before August 15, 1985. Checks received after August 14 will be returned. This special offer will not be repeated.

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Chapter and member activities for inclusion in **ASA NEWS AND VIEWS** should be sent to the Editor three months prior to the month of publication desired in **THE AZALEAN**.

## LETTERS TO THE EDITOR

### Deciduous Azalea Sources

The U.S. National Arboretum is currently compiling a source list of nurseries that offer native American and other deciduous azalea hybrids. If your nursery would like to be included, please send a copy of your catalog or a listing of the azaleas you offer for sale to:

Ronald Bare  
Curator of Rhododendron  
and Azalea Collections  
U.S. National Arboretum  
3501 New York Ave., N.E.  
Washington, D.C. 20002

### Pericat and Eden Hybrids

In a recent article by Henry W. Ridgway in **THE AZALEAN**, it was stated that the parentage of the Pericat hybrids is unknown. This might be of interest. When one makes hundreds of crosses, as I have, it is almost inevitable that one will duplicate a cross made by another. Early in my hybridizing efforts, I made an elemental cross ('Sherwood Red' with 'Pink Pearl'). Result of this cross—two cultivar siblings saved were Eden 'Amanda Perry' which is identical with 'Madame Pericat' and Eden 'Ida Perry' identical with an azalea which I acquired as 'Pink Pericat'. Both Pericats were purchased from Semmes Nurseries, Alabama in 1955. The Edens are doing well in the gardens at Verde Vista but have not been distributed because of the existing Pericats.

W. David Smith  
Spring Grove, Pennsylvania

### Wood's Rooting Compound

This is to introduce you to Wood's Rooting Compound. After many years of experimentation with concentrated liquid dip rooting hormones, I feel that I now have a formulation to offer to the grower that is the safest, most effective, and cheapest way to take advantage of rooting stimulants available.

This formulation consists of 10,000 ppm of indole-3-butyric acid, 5,000 ppm 1-naphthaleneacetic acid in approximately 20 percent dimethylformamide and 80 percent ethyl alcohol. This combination has consistently given us better rooting than any other combination we have tried.

There are several advantages to concentrated liquid dips. One of the foremost is to let the propagator easily select the exact concentration for each of his crops. Since climate, age of stock plant, and hardiness of the cutting can all influence the best concentration to use, I would recommend that to determine the best concentration for any variety a bracketing of three concentrations be tried on several cuttings each. For instance, on a hardwood cutting try 1:5, 1:10, and 1:15. This kind of trial has led to many surprises. I have found in perlite at 70 degrees bottom heat that soft greenhouse cuttings of *Abutilon* root best at 1:10, in contrast to *Berberis* 'Crimson Pigmy' (outside plants) taken in late July which roots best at 1:40. Another thing to remember is that a liquid dip tends to form roots as deep as you dip the cutting, so control your depth of dip to the height that roots are desired. I have had better results with dipping just long enough to wet the cuttings. Longer soaks may be advantageous in very hard to root cuttings or cuttings when it takes longer to penetrate the tissue.

This product has not only gone through many rooting effectiveness tests but also has gone through many types of mammalian toxicity tests in order to provide as safe a product as possible. It has been cleared by the Environmental Protection Agency for nationwide distribution.

I believe this will be a useful tool for the propagator and will be glad to assist with any information I can.

Ed Wood  
Wilsonville, Oregon

Wood's Rooting Compound can be ordered from Earth Science Products Corporation, P.O. Box 327, Wilsonville, Oregon 97070. Prices are: 4 oz \$4.00. Pint \$15.50. Gallon \$90.00.