

# AZALEADENDRON BREEDING

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The first successful hybrid ever recorded in rhododendrons is said to have been an azaleadendron. This hybrid was a natural cross between *Rhododendron nudiflorum* x *R. ponticum*. Although it has little to recommend it as a plant to include in most gardens, this cross still persists in the trade as 'Azaleoides.'

Of the approximately 7,200 hybrids named, only about 20 or a very small fraction of 1 percent are azaleadendrons. From these statistics one may conclude that this method of breeding has an extremely low probability of successful results. In my opinion, a serious hybridizer should avoid such wide crosses, and confine his efforts to hybridizing within one of the five classes of rhododendrons, i.e., deciduous azaleas, evergreen azaleas, nonscaly rhododendrons, Malesians, and scaly rhododendrons (except malesians).

In figure 1 is shown the crossibility of the five classes of rhododendrons, with the arrows indicating the direction of pollen movement - arrows point to female or seed parent in all cases. The solid lines indicate some hybrids have been successfully made, but with difficulty, while broken lines indicate the successful hybrid is an exceptional case and instances of successful hybridizations are rare. With few exceptions, unless the parents used are both tetraploids, azaleadendrons are completely sterile. I will mention the exceptions later in this talk.

To my knowledge, no successful crosses have been made to date between the Malesian rhododendrons and any of the other four classes. Many attempts have been made; all of which have proven failures. Some hybrids involving Malesians have been reported prior to 1900, but none of these reports have been

verified, and almost certainly were not inter-class hybrids.

In searching the available literature, I could find few instances of true interclass hybrids in which an evergreen azalea was the seed or female parent. In the chart following you will find one example of a cross in which an evergreen azalea was a successful seed parent, but this one exception is at least a partial backcross involving some evergreen germplasm.

As a matter of interest, figure 1 also shows some reported crosses of rhododendrons to plants outside the genus. Like azaleadendrons, time expended in such hybridization is counter productive.

Despite this, there are some bona fide reasons in special cases to attempt azaleadendron breeding. I would like to list these reasons as follows:

- 1) To transfer desirable genetic characteristics from one class to another class of rhododendrons,
- 2) To study taxonomic and evolutionary relationships and associations,
- 3) For the fun of doing it.

Of these reasons, the first two represent serious and worthy research, while the latter is exactly the reason most of us get involved in hybridization in the first place.

I should now at this point like to describe my own attempts to transfer desirable genetic characteristics from deciduous azaleas to evergreen azaleas.

As you know there are no true yellow evergreen azaleas. Those approaching yellow are really ivory whites. These ivory whites

contain a water-soluble pigment, probably a flavone. Attempts to develop higher levels of yellow color by intensifying these water soluble pigments have failed, and this method is therefore not a promising one.

On the other hand bright yellow, but water insoluble, pigments are known to occur in the flowers of species found in each of the other four classes of rhododendrons. For several years I have worked at transferring the water insoluble pigments from deciduous azaleas to evergreen azaleas. As parental stock I am using all tetraploids, including *R. calendulaceum* 'Colossus' as the source of the bright yellow pigments; and 'Tahei' and 'Gettsu-toku' as the evergreen azalea parents.

Crosses between *R. calendulaceum* 'Colossus' 9 and Tahei or Gettsu-toku are easy to make and one obtains large quantities of viable seed. The seedlings appear normal, but are very weak. Because of their lack of vigor, seedling mortality is high and I have

succeeded in flowering very few hybrids.

Despite this, all first generation (F<sub>1</sub>) hybrids obtained to date have been highly fertile, and can be used as either pollen parent or seed parent. The F<sub>1</sub> hybrids cross readily to the deciduous parent, but to date I have not succeeded in crossing the F<sub>1</sub> back to the evergreen parent. However, in the last year I have obtained many seedlings with the following pedigrees:

'Tahei' x [*calendulaceum* x (*calendulaceum* x 'Tahei')]

'Gettsu toku' x [*calendulaceum* x (*calendulaceum* x 'Tahei')]

These seedlings (now just forming true leaves) offer my best prospects to date, to transfer the yellow water insoluble pigments from deciduous azaleas to evergreen azaleas - a program in which I have worked since about 1965.

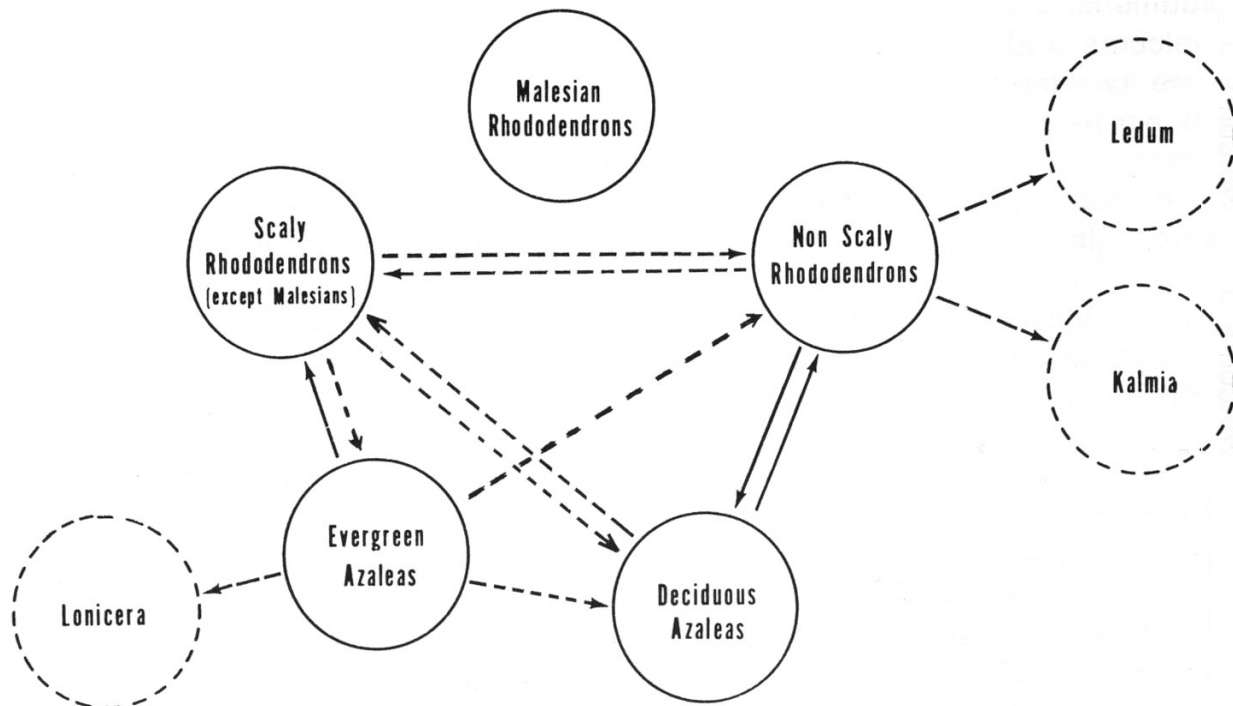


Figure 1 Crossability of five classes of Rhododendron and other genera Solid lines indicate successful crosses can be made with difficulty, broken lines indicate rare successes. Arrows point to female or seed parent in all cases.

If anyone is interested in pursuing the project of developing a yellow-flowered evergreen azalea, I can suggest other approaches than the one I have outlined. As mentioned above, yellow-flowered species occur in all the other four classes. Consequently, these yellow characteristics could potentially be transferred. My own program deals only with the transfer from deciduous azaleas. There still remains the possibility of transfer from 1) the Malesians, 2) the scaly rhododendrons, and 3) the non-scaly rhododendrons. Of these, the most exciting is the transfer from the Malesian class. In addition, a cross between *R. keiskei* and a Satsuki evergreen azalea has been reported.

In preparing for this talk, I have prepared 12 tables showing details on all the azaleadendrons which I could locate. These 12 tables are attached. Undoubtedly I have overlooked many additional azaleadendrons, and I will welcome additions to the list at any time, or information in instances of unknown parentages or unknown developers.

In studying these tables there are several interesting observations. First is that *R. occidentale* appears to accept pollen quite readily from both evergreen azaleas and non-scaly rhododendrons. One such hybrid named 'Martha Isaacson' has been quite successful and has been distributed quite widely by nurserymen.

A second observation is that crosses between non-scaly rhododendrons and deciduous azaleas succeed rather frequently, although such hybrids most commonly are lacking in vigor. Surprisingly these are exceptions which are vigorous and have proven quite successful to the point of being handled by commercial nurserymen in the

United States. Chief among these are 'Broughtonii aureum' and 'Glory of Littleworth.' Without exception all are completely sterile to the best of my knowledge.

Another observation is that *R. racemosum* crosses rather readily with evergreen azaleas. Several of these crosses have been named and are exceedingly successful plants.

As a general rule, azaleadendrons are completely sterile. The one exception I know of are those in which both parents are tetraploid, the other exception being the hybrid of *R. carolinianum* x *R. roseum*, named 'Carolina Rose.' The latter is fully fertile. If one considers the chromosome numbers of the two parents to be diploid as reported in the literature, the resultant F<sub>1</sub> hybrid would be expected to have one single set of chromosomes from *carolinianum* and one single set from *roseum*. If so, I would certainly have anticipated that the hybrid would have been sterile in exactly the same manner as are all other azaleadendrons involving diploid parents. As a geneticist, the fertility of this azaleadendron is difficult to explain.

Finally, the cross between *Ledum* and 'Elizabeth,' which resulted in the clone now sold under the name of 'Brilliant,' appears to resemble more a miniature 'Elizabeth.' It is suggested that 'Brilliant' may be a haploid plant which arose from the functioning of the pollen grain from 'Elizabeth' to form a plant known as an androgenetic haploid - a plant with the chromosome set from *only* the male parent. Such haploids are rare, but have been reported occasionally in other plants. This hypothesis can be resolved only by a count of the chromosomes found in 'Brilliant,' and would represent a nice study for a graduate student.

Parents (Female Parent listed first in all cases)	Cultivar Name (if any) Or Source	Developer and Date
<b>I(a) Deciduous Azalea x Evergreen Azalea</b>		
1. <i>R. calendulaceum</i> 'Colossus' x 'Tahei'	Plants very weak, do not persist-but some do flower	A. Kehr, 1955
2. <i>R. calendulaceum</i> 'Colossus' x 'Gettsu toku'	Plants very weak, do not persist-but some do flower	A. Kehr, 1955
3. <i>R. occidentale</i> x <i>R. kaempferi</i>	Univ. Wash. Arb. Acc. 1334-40	Unknown, 1940
4. <i>R. occidentale</i> x Beni Gasi'	Carl Deul Garden	C. Deul, 1976
5. <i>R. amagianum</i> x 'Marion Lee'	About 8 seedlings, plants retain some foliage overwinter G. Ring Garden	G. Ring, 1975
6. <i>R. amagianum</i> x 'Kiujimo-no-suki'	About 10 seedlings G. Ring Garden	G. Ring, 1976
<b>I(b) Deciduous Azalea x Non Scaly Rhododendron</b>		
1. <i>R. occidentale</i> x 'Azor'	'Avita' Univ. Wash. Arb. Acc. 1013-52	L. Brandt, 1952
2. <i>R. occidentale</i> x 'Tally Ho'	Univ. Wash. Arb. Acc. 1012-52	L. Brandt, 1952
3. <i>R. nudiflorum</i> x <i>R. ponticum</i>	'Azaleoides'	Thompson ca 1820, Mile End, London Unknown
4. <i>R. occidentale</i> x 'The Monitor'	'Nellie'	
5. <i>R. nudiflorum</i> x <i>R. ponticum</i>	'Odoratum' (Syn) 'Hybridum'	M. Young, before 1875
6. <i>R. occidentale</i> x 'Mrs. Donald Graham'	'Martha Isaccson' P.A.	E. Ostbo, 1956
7. <i>R. occidentale</i> x 'Corona'	'Hazel Smith'	V. Wyatt, 1951 Union, WA
8. <i>R. occidentale</i> x 'Fusilier'	'Samurai'	L. Brandt, 1950
9. An Azalea x ( <i>R.</i> <i>catawbiense</i> x <i>ponticum</i> )	'Governianum'	<i>T. Methven</i> , 1868-1869
10. <i>R. occidentale</i> x 'Purple Splendor'	North Willamette Expt. Sta.	R. Ticknor, 1974
<b>I(c) Deciduous Azalea x Scaly Rhododendron</b>		
1. <i>R. occidentale</i> x <i>R. trichostomum</i> var. radinum	Univ. Wash. Arb. Acc. 1011-52	L. Brandt, 1952

Parents (Female Parent listed first in all cases)	Cultivar Name (if any) Or Source	Developer and Date
<b>II(a) Evergreen Azalea x Deciduous Azalea</b>		
1. 'Tahei' x [ <i>R. calendulaceum</i> x ( <i>R. calendulaceum</i> x 'Tahei')]	<i>Seedlings appear to be normal hybrids</i> -A. Kehr Garden	A. Kehr, 1976
2. 'Gettsu-toku' x [ <i>R. calendulaceum</i> x ( <i>R. calendulaceum</i> x 'Tahei')]	<i>Seedlings appear to be normal hybrids</i> -A. Kehr Garden	A. Kehr, 1976
<b>II(b) Evergreen Azalea x Non Scaly Rhododendron NONE</b>		
<b>II(c) Evergreen Azalea x Scaly Rhododendron</b>		
1. Indian azalea x <i>R. edgeworthii</i>	'Furstin Bariatinsky'	Unknown
<b>III(a) Non Scaly Rhododendron x Deciduous Azalea</b>		
1. <i>R. maximum - ponticum</i> x <i>R. molle</i>	'Broughtonii aureum' (Syn) 'Norbitonense aureum'	Broughton ca 1830
2. <i>R. maximum - ponticum</i> x <i>R. molle</i>	'Norbitonense broughtonii' (Syn) 'Smithii aureum'	W. Smith ca 1930 Norbiton Surrey
3. <i>R. arboreum</i> x <i>R. molle</i>	'Williamsonii'	B. Williams, before 1890
4. 'Little Pudding' x Exbury Azalea	'In Tune'	A. Martin, 1963
5. 'Debbie' x <i>R. viscosum</i>	<i>U.S. Nat. Arb. Acc. 9610</i>	F. Coe
6. 'Prince Camille de Rohan' or 'Leopold x <i>R. japonicum</i>	'Dr. Masters'	G. Vander Mailen, 1892
7. 'Goldfort' x Exbury azalea	Un-named, Martin Garden	A. Martin, 1970
8. 'King of Shrubs' x Exbury azalea	Un-named, Martin Garden	A. Martin, 1970
9. 'Atroflo' x Berry Deciduous Seedling	Un-named, Furman Garden	F. Furman
10. ('Seattle Gold' x <i>yakusimanum</i> ) x Berry Deciduous Seedling	Un-named, Furman Garden	F. Furman
11. 'Chinoides' x 'Gibraltar'	Un-named, Schannen Garden	H. Schannen

Parents (Female Parent listed first in all cases)	Cultivar Name (if any) Or Source	Developer and Date
<b>III(a) Non Scaly Rhododendron x Deciduous Azalea (continued)</b>		
12. 'Mrs. Donald Graham' x <i>R. occidentale</i>	'Mary Harmon'	Ostbo, 1962
13. <i>R. yakusimanum</i> x 'Adrian Koster'	U.S. Nat. Arboretum	F. Santamour
14. <i>R. macrophyllum</i> x <i>R. occidentale</i>	'Oregon Queen'	Unknown
15. <i>R. griersonianum</i> x <i>R. occidentale</i>	'Helen Vandevere'	Unknown
<b>III(b) Non Scaly Rhododendron x Evergreen Azalea</b>		
1. 'John Waterer' x 'Lilacina'	Un-named, Martin Garden	A. Martin, 1956
2. 'Vulcan' x 'Gunrei'	'Abundant Life'	A. Martin, 1961
<b>III(c) Non Scaly Rhododendron x Scaly Rhododendron</b>		
1. <i>R. griersonianum</i> x <i>R. dalhousiae</i>	'Grierdal'	Heneage Vivian, 1937
2. <i>R. arboreum</i> x <i>R. racemosum</i>	University of Minnesota Arb.	R. Mullins, 1964
<b>IV(a) Scaly Rhododendron x Deciduous Azalea</b>		
1. <i>R. mucronulatum-</i> <i>chapmanii</i> x <i>R. molle</i>	Plant lost	A. Kehr, 1962
2. <i>R. carolinianum</i> x <i>R. roseum</i>	Planting Fields Arb. Acc. 64-92	D. Hardgrove, 1964
<i>R. carolinianum</i> x <i>R. roseum</i>	'Carolina Rose' (fertile cross)	D. Knippenburg ?
3. <i>R. carolinianum</i> x <i>R. mollis</i>	Un-named in Martin Garden	A. Martin, 1970
<b>IV(b) Scaly Rhododendron x Evergreen Azalea</b>		
1. <i>R. keiskei</i> x Satsuki azalea	Un-named, Kodachrome picture	Masaki Kuneshige, ca 1965
2. <i>R. mucronulatum</i> x <i>R. yedoense</i>	Arnold Arboretum	Unknown
3. <i>R. racemosum</i> x ? 'Hinomayo'	'Martine'	W. Hardijzer, ca 1965
4. <i>R. racemosum</i> x ? 'Himomayo'	'Hardijzers Beauty'	W. Hardijzer, 1965
5. <i>R. racemosum</i> x 'Hinode-giri'	'Ria Hardijzer'	W. Hardijzer, 1965
6. <i>R. mucronulatum</i> x 'Tahei'	Plant lost	A. Kehr, 1963

Parents (Female Parent listed first in all cases)	Cultivar Name (if any) Or Source	Developer and Date
<b>IV(b) Scaly Rhododendron x Evergreen Azalea (continued)</b>		
7. <i>R. ovatum</i> x <i>R. obtusum</i>	Plant lost	J. Gable, ca 1950
8. <i>R. micranthum</i> x <i>R. mucronatum</i>	'Margot'	C. Ingram, 1937
9. <i>R. racemosum</i> x ? 'Hatsugira'	'Lilian Harvey'	W. Hardijzer, 1966
10. <i>R. racemosum</i> x Kurume azalea	'Madame Loth'	W. Hardijzer, 1965

<b>IV(c) Scaly Rhododendron x Non Scaly Rhododendron</b>		
1. <i>R. moupinense</i> x <i>R. fargesii</i>	Univ. Wash. Arb. Acc. 2219-45 Hanley	
2. <i>R. racemosum</i> x <i>R. arboreum</i>	Univ. Minn. Arb. Acc. 5720	Dr. Kraus, 1957
3. <i>R. carolinianum</i> x 'Sappho'	Dr. Fred Coe Garden	A. Martin
4. 'Rose Elf' x <i>R. arboreum</i>	Dr. Fred Coe Garden	W. Moyles

#### V Other

1. <i>Lonicera sempervirens</i> x <i>R. mucronatum alba</i>	Plant died as seedling	G. Sawada, ca 1945
2. <i>Ledum groenlandicum</i> x 'Elizabeth'	'Brilliant'	Unknown
3. <i>Kalmia latifolia</i> x <i>R. maximum</i> ?	Found occasionally in wild Acc. 30148 - Nat. Arb.	Natural hybrid or possibly only aberrant form of <i>R. maximum</i> - never has flowered
4. <i>Kalmia latifolia</i> x <i>R. williamsianum</i>	L Pierce Garden	H. Lem, ca 1965

#### Azaleadendrons with Parentage Unknown

'Cameronian'	- Unknown
'Fran Minna Hartl'	- A "crossing" with <i>R. ponticum</i> Hartl, 1891
'Jackie'	- Unknown
'Nellie'	- Unknown
'Torlonianum'	- M. Young
'Dot'	- Unknown
'Galloper Light'	- Sloebek, 1927
'Glory of Littleworth'	- Mangles, 1911
'Pink Parfait'	- Senko, 1962
'Totenham'	- Unknown