'Fred Cochran' Carla Azalea

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The release of *Rhododendron* L. 'Fred Cochran' as breeding stock with resistance to phytophthora root rot concludes the Carla (Carolina-Louisiana) azalea breeding program at North Carolina State Univ. This selection is the last of 14 cultivars introduced since 1968 through this program. A primary objective of the azalea breeding program at North Carolina State Univ. was to develop breeding lines with resistance to *Phytophthora cinnamomi* Rands, the cause of phytophthora root rot (Fantz et al., 1989). This disease is the most serious threat to azalea culture in the nursery and landscape (Benson et al., 1982; Hoitink et al., 1986). Cold hardiness, floriferousness, and root rot tolerance will enable this azalea selection to compete effectively with mid-season Kurume-type azaleas presently on the market.

Origin

The original selection was made by F.D. Cochran from seedlings of 'North Carolina Red' × 'Morning Glory' and tested as 56-30. Galle (1985) cites 'North Carolina Red' as a southern Indian 'Mucronatum' hybrid and 'Morning Glory' as a Pericat hybrid. 'Fred Cochran' was named in honor of Fred D. Cochran for participating in the program and achieving its major goal—development of a hybrid with superior tolerance to phytophthora root rot.

Description

'Fred Cochran' is a low-growing shrub with ascending-spreading branches (Fig. 1). Stems grow 30 to 70 mm per year. Leaves are crowded toward the apex, scattered strigose on both surfaces, dark green adaxially, pale abaxially, elliptic to elliptic-obovate, broadly acute to obtuse and mucronate apically, cuneate basally, and 25 to 60 mm long by 10 to 25 mm wide. Petioles are 4 to 8 mm long. Winter leaves are somewhat thicker and less pliable than summer leaves. Inflorescences are two-flowered. Outer bracts are broadly ovate to suborbicular, concave, strigose, and

elliptic-ovate lobes 25 to 30 mm long and 23 to 26 mm wide. The five calyx lobes are broadly obovate, obtuse, 5 to 6 mm long × 3.5 to 4 mm wide, the calyx tube reaching a length of 1 mm. The eight to 10 stamens have filaments 30 to 40 mm long, magenta, and purplish anthers 2 mm long. The pistil has a pale pink style tinged purple 40 to 45 mm long and a 2-mm-diameter, shallowly five-lobed stigma. Holotype: Fantz 4404 (NA).

Culture

'Fred Cochran' has been tested at North Carolina State Univ. Research Unit 4 (USDA plant hardiness zone 8a) for the past decade. Plants exhibit resistance to stem splitting and winter leaf kill. Flowering time is mid-season and blooming occurs simultaneously throughout the canopy. A few mature flowers of smaller size that open to only 40 mm

9 to 12 mm long × 8 to 10 mm wide, whereas inner bracts are linear to lanceolate, 10 to 16 mm long × 1 to 6 mm wide. Pedicels are strigose, 12 to 20 mm long. Flowers are single, expanding to 65 mm in diameter, magenta (moderately purplish red), Munsell 5RP 5/10 (Wilde and Voigt, 1977) with dense spotting of deeper magenta on both the terminal corolla lobe and each adjacent lateral lobe. The corolla is campanulate with conspicuous blotches, 17 to 20 mm long with

Table 1. Response of 'Fred Cochran' azalea to phytophthora root rot caused by *P. cinnamomi* in nursery experiments.

Azalea	Top fresh wt (g) ^z		Root rot rating ^y		Isolation ^x (%)
	Inoc	Uninoc	Inoc	Uninoc	
Nursery 6/81					
Fred Cochran	39 ^{NS}	43	1.0 ^{NS}	1.0	n.d.
Formosa	74 ^{NS}	77	1.0 ^{NS}	1.0	n.d.
Redwing	28 ^{**}	48	2.2 ^{**}	1.0	n.d.
Nursery 6/88					
Fred Cochran	68 ^{NS}	52	1.0 ^{NS}	1.0	60
Jan Cochran	138 ^{NS}	137	1.7 [*]	1.0	100
Rachel	125 ^{NS}	131	2.3 [*]	1.0	100
Hindogiri	31 [*]	104	3.3 [*]	1.6	100

^xPlants were of different ages (initial sizes) for each experiment. Nursery experiments were in 3 pinebark : 1 sand (by volume) in 1.6-liter containers under overhead irrigation at the rate of 9 mm per day. Inoc refers to inoculated plants, while Uninoc refers to uninoculated control plants.

^yRoot rot rating scale: 1 = healthy roots, 2 = fine roots necrotic, 3 = coarse roots necrotic, 4 = crown rot, and 5 = dead plant.

^zIsolation is the percentage of plants by cultivar from which *P. cinnamomi* was cultured from the roots on isolation medium. n.d. = not detected.

NS,*,**Not significantly different from the untreated control for each cultivar or different at *P* = 0.05 or 0.01, respectively, according to an analysis of variance (F test).

Fig. 1. Habit of 'Fred Cochran' in full bloom.

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in diameter are also borne sporadically at this time.

Various breeding lines and cultivars have been evaluated for resistance to phytophthora root rot under controlled conditions (Benson and Cochran, 1980). A known quantity of inoculum of *P. cinnamomi* was added to containers of plants in a medium of 3 pinebark: 1 sand (v/v) in the present study. Plants were observed for symptoms and rated at the end of the growing season for growth and severity of root rot. The study included for comparison purposes a moderately resistant cultivar such as 'Hinodegiri' and a highly resistant cultivar such as 'Formosa'. Data for 'Fred Cochran' from replicated experiments over several years are presented in Table 1 along with data for the standard cultivars and breeding lines.

Inoculated plants of 'Fred Cochran' weighed 68 g (mean of 10 replications) at the end of the growing season (in test 6/88), as compared to 52 g for uninoculated (control) plants. The difference was not significant. Likewise, root rot ratings were 1.0 (healthy) for both inoculated and uninoculated plants. In comparison, the standard cultivar Hinodegiri weighed 104 g for the uninoculated plants, but only 31 g for inoculated plants, a highly significant difference. The corresponding root rot ratings were 1.6 and 3.3 (moderate-severe root rot) for

the uninoculated and inoculated plants, respectively. Response of 'Fred Cochran' was similar to that of 'Formosa' (test 6/31), a very resistant cultivar.

'Fred Cochran' should be considered highly resistant, but not immune to *P. cinnamomi*. *Phytophthora cinnamomi* was cultured from roots of inoculated plants in 60% of the samples, although visually the root system appeared healthy. Apparently, the pathogen is able to infect but not colonize the root system, presumably due to a superior plant defensive system.

'Fred Cochran' has proven to be the most phytophthora-resistant of any Carla breeding line tested in the North Carolina State Univ. program. A plant with this high level of resistance to *P. cinnamomi* will benefit the azalea industry.

Registration

This cultivar will be registered with the International Registrar for the genus *Rhododendron* at the Royal Horticultural Society's Garden, Wisley, Surrey, England. A herbarium specimen is being deposited at the U.S. National Arboretum Herbarium.

Availability

'Fred Cochran' was released in 1989 by the North Carolina Agricultural Research

Service. One thousand liners are being propagated in 1989 by the North Carolina Seed Foundation in cooperation with the North Carolina Assn. of Nurserymen. These will be distributed to nurserymen in 1990 for purposes of propagation and distribution in the nursery industry. Information on sources of propagules can be obtained from W.A. Wilder, Jr., Executive Secretary, N.C. Assn. of Nurserymen, Inc., P.O. Box 400, Knightsdale, NC 27545.

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