

THE EFFECT OF POLLEN REMOVAL
ON THE DURATION OF THE STAMINATE PHASE
OF *CENTROPOGON TALAMANCENSIS*

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ABSTRACT

The flowers of *Centropogon talamancensis* are protandrous. A field experiment demonstrated that pollen removal during the initial male phase hastened the onset of the subsequent female phase. These results agree with those of Devlin and Stephenson (1984) and suggest that this a response typical of the family Lobeliaceae.

Flowers of many plants in the Lobeliaceae are dichogamous and long-lived, frequently having a lifespan of several days. The first phase is male, with pollen released in some species only when a valve is opened by pressure on a cluster of brushlike hairs (e.g., *Lobelia* and *Centropogon*) (Fig. 1); in other species, no valve is involved (e.g., *Burmeistera*). After the staminate phase, the style elongates until the stigma protrudes and then reflexes, becoming receptive to pollination (Fig. 1). This mechanism (protandry) promotes outbreeding (Darwin, 1876), and may be somewhat labile with respect to pollinator visitation.

Devlin and Stephenson (1984) found that *Lobelia cardinalis* flowers have shortened staminate phases if pollen is removed. The flower's pistillate phase is shortened by either pollination or an increase in the duration of the staminate phase. The duration of the phases in *Lobelia cardinalis* is therefore controlled by pollinator activity.

Centropogon talamancensis is a tropical lobeliad indigenous to the Cordillera de Talamanca of Costa Rica. The large, bright pink flowers of this species are pollinated by hummingbirds (Wolf, Stiles, and Hainsworth, 1976; Colwell *et al.*, 1974; Stiles, 1983). Our objective here was to examine if pollen removal influences the length of the male phase in *C. talamancensis* in order to test the generality of the findings of Devlin and Stephenson (1984) for the family Lobeliaceae.

Methods

The study was done at Villa Mills on the Cerro de la Muerte, in the Cordillera de Talamanca of Costa Rica. On 8 July 1985, we selected 94 staminate flowers from approximately 30 plants which looked fresh and were likely to have pollen. We divided the flowers into two groups, assigned equally among the individual plants: a control group and an experimental group. Flowers of the control group were bagged with "Pollen-tector" paper bags which protect flowers from pollinators and the elements. The experimental flowers had their pollen removed by brushing the anthers repeatedly with a small paint brush, and were then similarly bagged.

Two days later (10 July 1985), we revisited the flowers and recorded the sex of each one. We classified the flowers as pistillate if there was noticeable stigmatic protrusion, and as staminate if there was not.

Results and discussion

Two days later, more flowers in the experimental group were pistillate than in the control (64% vs. 35%; Table 1). The chi-square value of 8.36 is significant at the .05 level.

We interpret the results to indicate that pollen removal does hasten the change from staminate to pistillate phase in *Centropogon talamancensis*. As in *Lobelia cardinalis*, the activity of pollinators can influence the duration of the male phase; the flowers respond to pollinators by becoming female more quickly (after pollen has been removed and the Chances for self-pollination thereby reduced).

Resumen

Las flores de *Centropogon talamancensis* son proteandrias. En un experimento de campo es demostrado que el alejamiento del polen desde la fase inicial masculina acelera el comienzo de la fase femenina. Estos resultados están de acuerdo con los obtenidos por Devlin y Stephenson (1984) y sugieren que esta es una réplica típica de la familia Lobeliaceae.

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Table 1

FLOWER SEXUAL PHASE AFTER TWO DAYS

	Number of flowers		
	Staminate	Pistillate	Total
Controls	32 (65%)	17 (35%)	49
Experimentals	16 (36%)	29 (64%)	45
Total	48	46	
$X^2 = 8.36$ ($p < .05$)			



Figure 1: Flowers of *Centropogon talamancensis*. The open flower in the center is in the staminate phase (note white tuft of hairs at tip of fused black anthers); the flower on the right is pistillate (the style has elongated through the anthers and the stigma has opened). The bar scale in the photo is 2 cm in length.