

Notes on phenology and pollination of *Xanthosoma wendlandii* (Araceae) in Costa Rica

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Abstract: The phenology of the aroid *Xanthosoma wendlandii* (Schoot) Standl. was studied on several populations in the Pacific drainage in Costa Rica. The species survives the severe dry season (December to April) as corms and seeds. Above-ground parts appeared after the first showers of the rainy season in May (Fig. 1).

Plantlets did not reach adulthood in one season and it probably takes several years to complete development. Adult foliage was different from juvenile (Fig. 2 and 3); blooming extended from late June to late September and mature fruits were observed in late July and October.

Inflorescences were visited by species of scarab beetles of the genus *Cyclocephala*, which appeared to be the main pollinators.

Low seed production might be a characteristic of the genus *Xanthosoma*, while other aroids from the same areas, like *Dieffenbachia oerstedii* Schott and *Philodendron tripartitum* Jacq., produce large numbers of viable fruits.

INTRODUCTION

In spite of the high diversity of aroids in the Neotropics, phenological data are very scarce. Some species of *Anthurium* (Croat 1980; Valerio and Villalobos 1980) and *Dieffenbachia* (Valerio 1983) have been studied, and the revisions of *Monstera* (Madison 1977) and *Syngonium* (Croat 1982) include information on reproduction for some of the species.

I report here on phenological aspects of the herbaceous *Xanthosoma wendlandii* Schott Standl., a widely distributed species in the Pacific drainage of Costa Rica.

MATERIAL AND METHODS

The aroid *Xanthosoma wendlandii* is a common herbaceous plant (reaching some 75 cm. in height) that grows under moderate shade, on slopes, particularly associated with disturbed forests.

Observations were made in an area of approximately 1 ha of secondary forest, dominat-

ed by *Heliocarpus appendiculatus* Turcz (Tiliaceae) and *Cecropia obtusifolia* Bertol. (Moraceae), in a bank along Quebrada Mina, in Granadilla, Curridabat (San José Province), at a 1300 m. elevation. The area was checked every two weeks from May to November 1981 and 1982. Each time, the number of plants, number and types of leaves per plant and presence of inflorescences were recorded. Blossoms were inspected for insect visitors and floral behavior. All sprouts reaching 50 cm or more were individually marked (132 in total) during the last week of May 1982.

Additional observations were made on unmarked plants in the following localities: Santo Domingo (Heredia Province), near Alajuela (Alajuela Province), Nicoya and Carmona de Nandayure (Guanacaste Province). All of these localities are under the Pacific weather regime, with a dry season from December to early May, a period during which above-ground parts of *X. wendlandii* are not observed.

Voucher specimens are deposited in the Herbario de la Escuela de Biología, Universidad de Costa Rica.

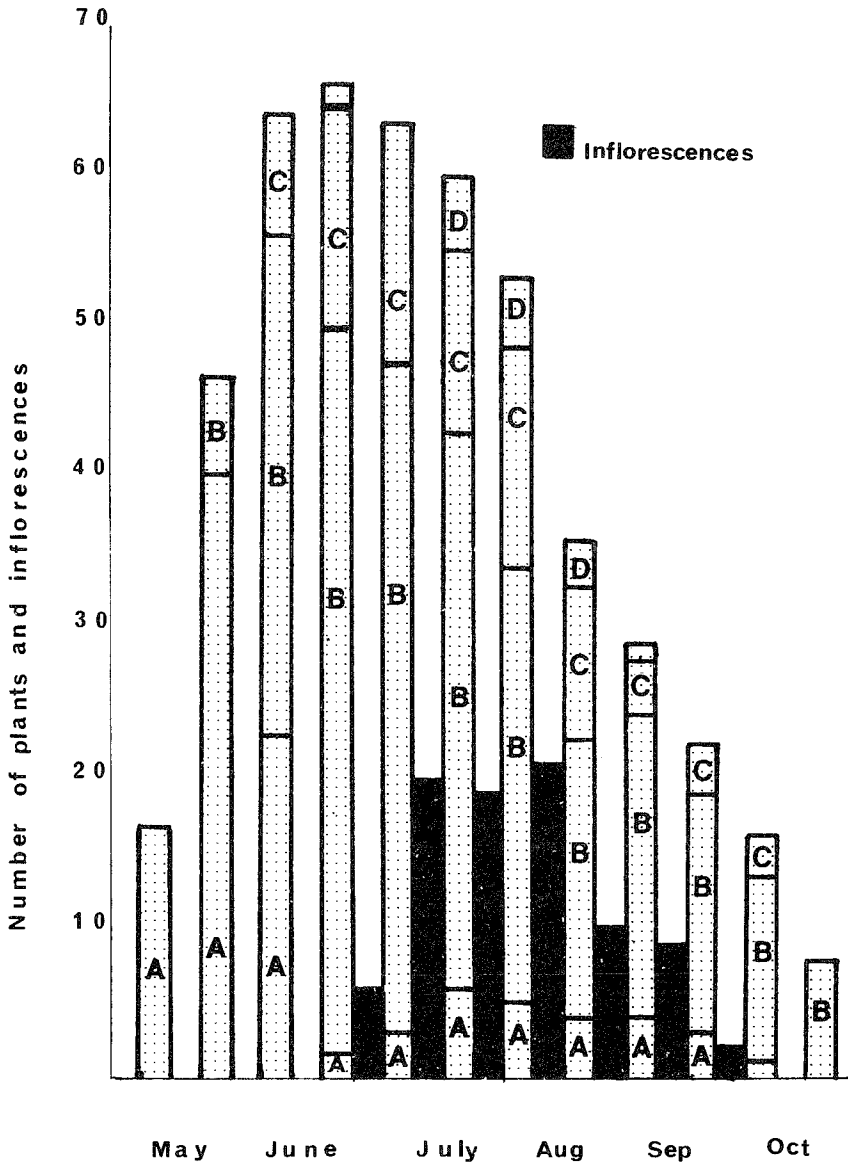


Fig. 1. Frequency distribution of mature plants and inflorescences of *Xanthosoma wendlandii* throughout the rainy season of 1982. A. plants with one leaf; B. with two; C. with three; D. with four leaves.

RESULTS

Phenology: The first foliage was observed during the second week in May after the first showers of the rainy season. Some plants were seedlings and some were sprouts from tubers from the previous year. The bloomig period extended from late June to late September with a peak early in August (Fig. 1). None of the 71 inflorescences in the study area in Granadilla

set fruit, in spite of pollinator abundance. Ripe infructescences were observed in Nicoya during the third week in July, and in Alajuela by the end of October. By the second week in November all the plants in the study plot had died.

Juvenile foliage: Seedlings and plantlets growing from small propagules were seen from May to September; they did not reach maturity (*i.e.*, did not produce foliage characteristic

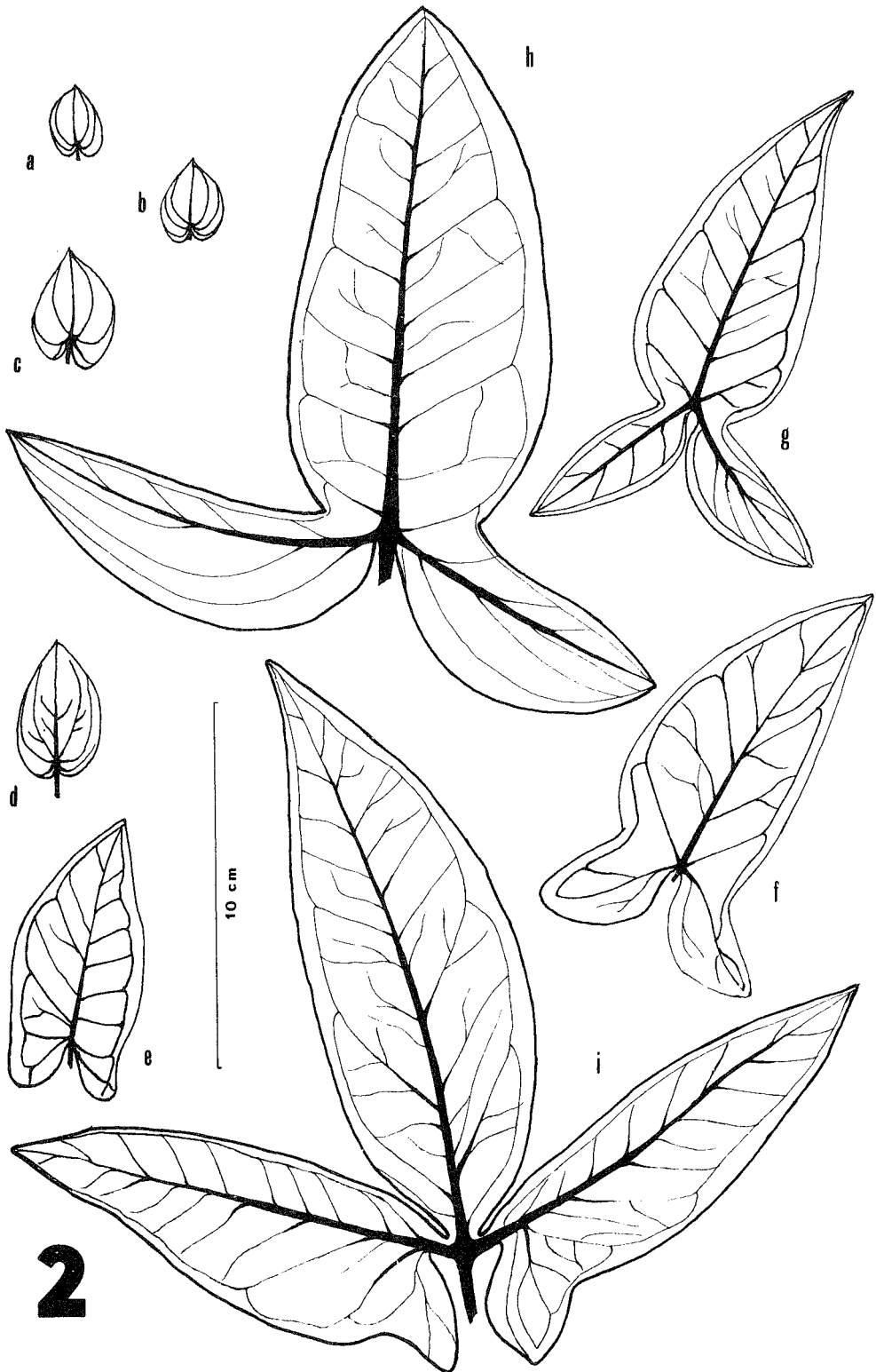


Fig. 2. Shape and size of juvenile blades in *Xanthosoma wendlandii*. Letters indicate the ontogenetic order of appearance, A, first, B, second, etc.

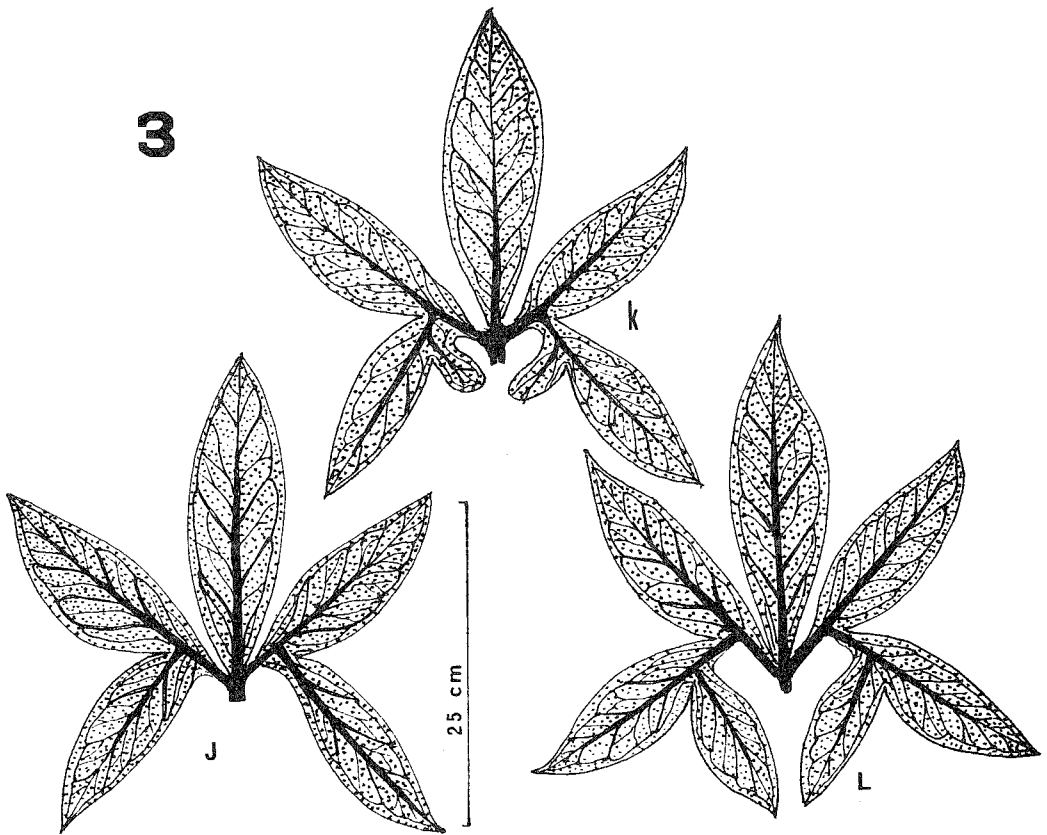


Fig. 3. Shape and size of adult blades in *Xanthosoma wendlandii*.

of flowering plants, see below) during one season. Various types of leaves were observed in the immature plants (Fig. 2) according to age, varying from simple and oblong to trilobed and trifoliolate. Petiole lengths ranged from 25 to 42 mm in the first four leaves (a, b, c, d in Fig. 2), and averaged 75 mm in the fifth (e, in Fig. 2), 160 mm in the sixth (f), 190 mm in the seventh (g), 240 mm in the eighth (h) and 280 mm in the ninth (i). There were several hundred seedlings in the study area.

Adult leaves: Leaves observed in flowering plants had 5 or 7 foliate blades (Fig. 3). An intermediate type (k, in Fig. 3) with five segments and basal auricles was the most common shape. Many of the plants with this "mature" foliage (42.2% , 61 of 132) did not bloom during the season.

In 7 (15.2%) plants the inflorescence was accompanied by one leaf only and no more

leaves were produced afterwards. In these cases the blade was always five-parted. In the rest of the blooming plants, 76 (57.5%) had two leaves, 36 (27.3%) had three and 13 (9.8%) had four (Fig. 1). One plant with five leaves, observed in 1982, did not bloom during the season. Some plants had as many as three 5-foliate blades, but most common was a combination of types j, k, l. Length of mature blades ranged from 120 to 440 mm and that of petioles from 620 to 795 mm.

Floral behavior and pollination: The blossoms remained open for three days. The undeveloped spathe was green and inconspicuous. At maturity, the distal end (staminate section) opened widely showing the white inside surface as a conspicuous flag (Fig. 4). The first day corresponded to the initiation stigmatic secretion in this protogynous species. During this and the second day the inflorescence was visited by

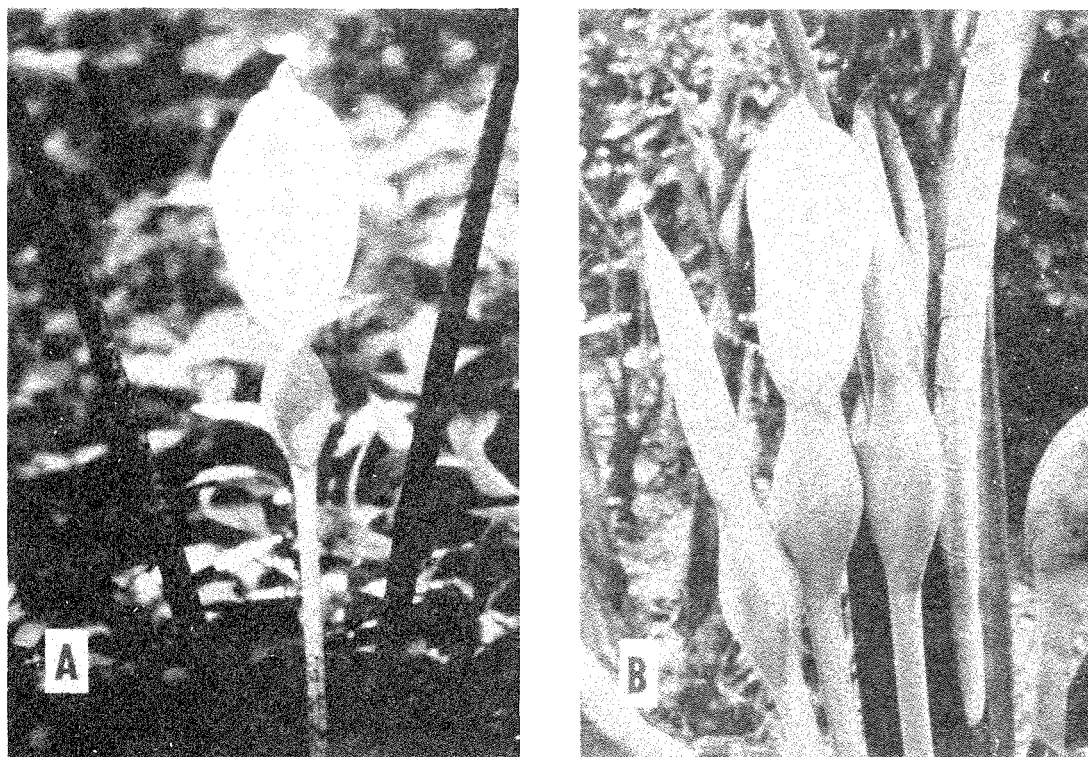


Fig. 4. Two common species of *Xanthosoma* in the Central Valley, Costa Rica. A. *X. wendlandii*, a geophyte with solitary inflorescences (Length of spathe 21 cm) B. *X. robustum*, a perennial plant with multiple inflorescences (length of spathe 25 cm).

beetles of the genus *Cyclocephala* (Scarabacidae), that penetrated the closed portion (pistillate tube) of the spathe, pushing their way through a narrow constriction which practically obliterates the space between the spathe and the spadix (Fig. 5). The beetle species varied from one area to another: *C. pubescens* Burm. and *C. amblyopsis* Bates in Granadilla, *C. sexpunctata* Cast. in Santo Domingo and Alajuela, *C. mafaffa* Burm. in Nicoya and an undetermined species in Carmona. During the third day of anthesis the anthers dehisced, pollen covered the spike and the beetles emerged, getting dusted with large amounts of pollen. The beetles were 20 mm in length, with only slight variations.

Dispersion of corms: Production of asexual propagules was an important activity in the large plants. There is a preference for slopes in this species and rain water sometimes caused erosion around roots and even transport of small corms downhill. Many plants were observed unrooted in Nicoya and Carmona, with obvious indications of pluvial effect.

Fruiting: Although not directly observed, other evidence indicates that some plants fruited outside the study plot. Seeds of *X. wendlandii* were collected from droppings of the bird *Momotus momota* (Momotidae) under a perching site located some 200 m from the center of the study area in Granadilla.

DISCUSSION AND CONCLUSIONS

Seedlings of *X. wendlandii* grow little during the first season and several years may be required to reach adulthood. In another herbaceous aroid, *Dieffenbachia oerstedii* Schott, a succulent that grows sympatrically and in similar conditions, but does not die during the dry season, some five years are needed to bloom (Valerio 1983).

Low seed production in *X. wendlandii* is probably balanced (in terms of population density) with asexual reproduction. This contrasts with two other common aroids in the Central Valley, *Dieffenbachia oerstedii* and *Philoden-*

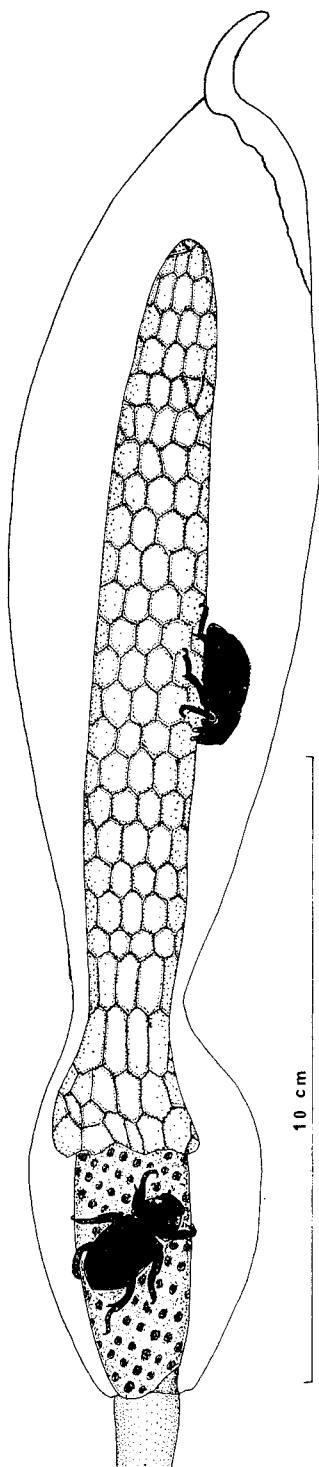


Fig. 5. Inflorescence of *Xanthosoma wendlandii*, notice the narrow middle constriction of the spathe, the basal pistillate chamber and the apical staminate spike. Two specimens of the pollinator *Cyclocephala pubescens*, are illustrated.

dron tripartitum (Jacq.) Schott, which are pollinated by *Cyclocephala* beetles but produce large numbers of infructescences (Valerio 1983 and unpublished observations). This condition of low fruit set has been observed in other species of the genus in Costa Rica, *X. robustum* Schott (Fig. 46) *X. mexicanum* Lieb. and *X. violaceum* Schott (Valerio, unpublished).

The presence of juvenile foliage is a good indicator of immaturity, but plants with "mature" foliage might not bloom (in fact, only 53.8% of them did).

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RESUMEN

Aspectos fenológicos de *Xanthosoma wendlandii* (Schott) Standl. (Araceae) fueron estudiados durante 1981 y 1982, en varias poblaciones en Granadilla de Curridabat, Santo Domingo de Heredia, Alajuela, Nicoya y Carmona (todas en la vertiente del Pacífico de Costa Rica, ámbito de distribución natural de la especie). La especie subsistió durante la época seca (diciembre a abril) en forma de tubérculos y semillas. El follaje apareció después de los primeros aguaceros de la época lluviosa en mayo (Fig. 1). Las plantas juveniles no alcanzaron el estado adulto y posiblemente requieren varios años para la madurez. Se presentaron drásticos cambios fenológicos en forma y tamaño de las hojas (Figs. 2 y 3), el período de floración se extendió desde fines de junio hasta fines de setiembre (Fig. 1) y los frutos maduros aparecieron durante la tercera semana de julio y en octubre.

Las inflorescencias fueron visitadas por varias especies del género *Cyclocephala* (Coleoptera, Scarabeidae), aparentemente los polinizadores principales.

La baja producción de semillas parece una característica común en el género *Xanthosoma* y contrasta con el gran número de frutos viables en otras aráceas, como *Diffenbachia oerstedi* Schott y *Philodendron tripartitum* Jacq., de las mismas zonas.

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