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Introduction

Cuphea, *Sanvitalia* and *Zinnia* germplasm collections are maintained by the North Central Regional Plant Introduction Station (NCRPIS), Ames, Iowa, as part of the National Plant Germplasm System of the United States. A cooperative project was established by the NCRPIS and the Botany Department of the Universidad Nacional Autónoma de México (UNAM), Mexico City, to organize a collecting trip for these genera. This report summarizes the reasons for, and initial products of, the resulting expedition.

Rationale

Cuphea is a promising new source of medium chain-length fatty acids as an alternative to coconut and palm kernel oils and to petroleum derivatives for soaps and detergents (Thompson 1984). An extensive germplasm collection and evaluation program has been conducted at the NCRPIS to domesticate this genus as a new agronomic crop (Roath *et al.* 1992). From 1987 to 1991, five missions to collect *Cuphea* were undertaken in the United States, Brazil and Mexico (Roath *et al.* 1993). *Cuphea lanceolata* Aiton, a Mexican species recently used as a parent of interspecific hybrids that show promise as commercial oilseeds (Knapp 1993), was not collected in these first five missions. This species is known to be allogamous with considerable isozymic variability (Knapp *et al.* 1987). But before our trip, seed samples representing only two documented wild populations of this species were held at the NCRPIS.

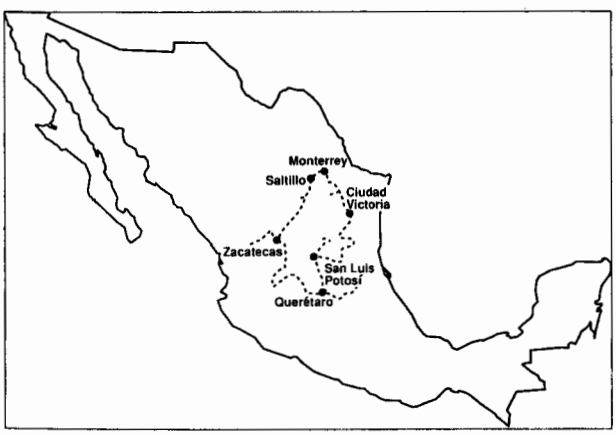

Fig. 1. Route taken for 1993 collecting mission (dashed lines)

Sanvitalia and *Zinnia* are popular bedding plants, grown for their colourful flowers in temperate and subtropical regions. Most *Zinnia* species are insect pollinated, with allogamy promoted through genetic self-incompatibility (Boyle and Stimart 1986). We have found no published reports of self-incompatibility in *Sanvitalia*, but noted in Mexico that single, isolated plants of *S. procumbens* produced few seeds. In 1992, collections of these two genera in the NCRPIS were fragmentary, representing only two of the seven species of *Sanvitalia* and five of approximately twenty species of *Zinnia*.

The native range of *C. lanceolata* (Graham 1988) and the ranges of many species of *Sanvitalia* and *Zinnia* (Torres 1963a, 1963b, 1964) overlap throughout much of northern and central Mexico. In addition, the reproductive phenologies of *C. lanceolata*, *Sanvitalia* and *Zinnia* (generally summer and fall flowering with fall seed production) were sufficiently similar to justify a joint expedition.

Potential collection sites were identified by consulting studies of *Cuphea* (Graham 1988), *Sanvitalia* (Torres 1964), *Zinnia* (Torres 1963a) and *Tragoceras*, once considered a separate genus but now treated as a section of the genus *Zinnia* (Olorode and Torres 1970, Torres 1963b). Records are listed in the *Flora Novo-Galiciana* (McVaugh 1984) and herbarium specimens held by Iowa State University, University of Minnesota, University of Texas and UNAM. Based on these records, we developed a tentative itinerary, which was modified on site for logistical reasons.

Expedition and samples collected

Fieldwork in Mexico was conducted by the authors between 29 September and 17 October 1993, and approximately 5600 km were traveled by four-wheel drive truck during this period. We traveled through nine Mexican states: Aguascalientes, Guanajuato, Hidalgo, Jalisco, Nuevo León, Querétaro, San Luis Potosí, Tamaulipas and Zacatecas (Fig. 1). Diverse plant communities, including oak, pine, thorn and tropical deciduous forests, grasslands and xerophilic scrub (Rzedowski 1978), ranging in elevation from about 350 to 2900 m asl were visited.

The mission personnel collected seed samples from 65 geographically distinct populations representing four *Cuphea* species, three *Sanvitalia* species and eight *Zinnia*

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Table 1. Seed collections of *Cuphea*, *Sanvitalia* and *Zinnia* from Mexico

Taxon	No. of collections
Wild populations	
Cuphea aequipetala Cav.	2
Cuphea lanceolata Aiton f.	20
Cuphea wrightii A. Gray	5
Cuphea wrightii var. *alba* S. Graham	1
Cuphea wrightii var. *venusta* (Koehne) S. Graham	1
Sanvitalia angustifolia Engelm. ex A. Gray	4
Sanvitalia ocymoides DC.	4
Sanvitalia procumbens Lam.	3
Zinnia acerosa (DC.) A. Gray	4
Zinnia angustifolia Kunth	2
Zinnia bicolor (DC.) Hemsley	4
Zinnia citrea A.M. Torres	1
Zinnia haageana Regel	4
Zinnia juniperifolia (DC.) A. Gray	3
Zinnia microglossa (DC.) McVaugh	1
Cultivated populations	
Cuphea hyssopifolia Kunth	2
Zinnia violacea Cav.	4

species (Table 1). A few observations about these collections follow. Morphological variability observed among sampled *C. lanceolata* populations was considerably greater than expected, based on our knowledge of pre-existing NCRPIS holdings. The collection of *C. wrightii* var. *venusta* (Ames 21524), made near Valparaíso, Zacatecas, is new to the NCRPIS collection. This variety has previously been collected only twice (Graham, pers. comm., 1993), once near the city of Durango by E. Palmer in 1896 and again in Durango State by Pennell about 1930.

Sanvitalia ocymoides and *Z. acerosa, bicolor, citrea, juniperifolia* and *microglossa* were all new taxa for the NCRPIS. *Zinnia microglossa* is of particular interest in that it is the first NCRPIS representative of section *Tragoceras*. Of the four landrace collections of *Z. violacea*, the population from Ocampo, Tamaulipas (Ames 21585) showed no symptoms of powdery mildew (*Erysiphe cichoracearum* DC. ex Merat), even though it was growing under humid conditions that should favour disease expression. We are unaware of any documented sources of resistance to *Erysiphe* among populations of *Z. violacea* (Boyle, pers. comm.). Collections of two wild populations of *Z. angustifolia* from Jalisco should be useful for breeding because of reported genetic resistance to three major diseases (powdery mildew, alternaria blight, and bacterial leaf and flower spot) that can be transferred to *Z. violacea* (Boyle *et al.* 1987, Terry-Lewandowski and Stimart 1983).

All but the three smallest seed samples (one of *Sanvitalia* and two of *Cuphea*) were evenly divided between the NCRPIS and UNAM for maintenance. The three smallest samples were retained by the NCRPIS and will be shared with UNAM after successful regeneration. Samples of *C. aequipetala, lanceolata* and *wrightii* are undergoing both greenhouse and field multiplication in 1994. Samples of *Sanvitalia* and of annual species of *Zinnia* are being regenerated by insect pollination in cages (Ellis *et al.* 1981) at the NCRPIS in 1994. Samples of perennial *Zinnia* will be multiplied on an experimental basis beginning in 1995. These small shrubs are adapted to xeric conditions (Torres 1963a) and are probably poorly adapted to field conditions in Ames, Iowa (mean annual precipitation 790 mm). After successful multiplication, these collections will be made available for research purposes at no cost to the requestor. Herbarium voucher specimens were also collected for most samples and were deposited at UNAM (all genera), Kent State University (*Cuphea*) and Iowa State University (*Sanvitalia* and *Zinnia*). Complete collection information is stored on the Germplasm Resources Information System (GRIN) database or can be obtained from the authors.

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