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Collecting Cuphea, Sanvitalia and Zinnia in Mexico*

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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 Plan 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.

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 phenomena 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-Californiana (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 species.
Table 1. Seed collections of Cuphea, Sanvitalia and Zinnia from Mexico

<table>
<thead>
<tr>
<th>Taxon</th>
<th>No. of collections</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wild populations</strong></td>
<td></td>
</tr>
<tr>
<td>Cuphea aequipetala Cav.</td>
<td>2</td>
</tr>
<tr>
<td>Cuphea lanceolata Alton f.</td>
<td>20</td>
</tr>
<tr>
<td>Cuphea wrightii A. Gray</td>
<td>5</td>
</tr>
<tr>
<td>Cuphea wrightii var. alba S. Graham</td>
<td>1</td>
</tr>
<tr>
<td>Cuphea wrightii var. venusta (Koehne) S. Graham</td>
<td>1</td>
</tr>
<tr>
<td>Sanvitalia angustifolia Engelm. ex A. Gray</td>
<td>4</td>
</tr>
<tr>
<td>Sanvitalia ocyoides DC.</td>
<td>4</td>
</tr>
<tr>
<td>Sanvitalia procumbens Lam.</td>
<td>3</td>
</tr>
<tr>
<td>Zinnia acerosa (DC.) A. Gray</td>
<td>4</td>
</tr>
<tr>
<td>Zinnia angustifolia Kunth</td>
<td>2</td>
</tr>
<tr>
<td>Zinnia bicolor (DC.) Hemsley</td>
<td>4</td>
</tr>
<tr>
<td>Zinnia citrea A.M. Torres</td>
<td>1</td>
</tr>
<tr>
<td>Zinnia haageana Regel</td>
<td>4</td>
</tr>
<tr>
<td>Zinnia juniperifolia (DC.) A. Gray</td>
<td>3</td>
</tr>
<tr>
<td>Zinnia microglossa (DC.) McVaugh</td>
<td>1</td>
</tr>
<tr>
<td><strong>Cultivated populations</strong></td>
<td></td>
</tr>
<tr>
<td>Cuphea hyssoptilofila Kunth</td>
<td>2</td>
</tr>
<tr>
<td>Zinnia violacea Cav.</td>
<td>4</td>
</tr>
</tbody>
</table>

The table demonstrates the variety and number of wild and cultivated populations of Cuphea, Sanvitalia, and Zinnia species from Mexico. The table includes the number of collections available for these species, which range from 1 to 20.

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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**References**


Crops & Products 1:5-10.