

## Biological and cultural aspects of marigold (*Tagetes* spp.) at mixe communities in Oaxaca (Mexico)

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**Abstract.** The marigold (*Tagetes* spp.) is commonly used by "mixe" people, an ethnic group from Oaxaca (Mexico), during the "Day of the Dead", a traditional celebration held annually throughout Mexico. Biological, management, and cultural aspects of marigold are little known. We present the information collected at the Yacochi and Tuxtepec communities, obtained applying some interviews, observing the compositions of different offerings in cemeteries, and recording thirteen inflorescence characteristics, which were analyzed using the principal component multivariate analysis.

**Key words:** Marigold, Mexican germplasm, Mixe, Oaxaca, *Tagetes* spp.

**Resumen.** Poco se conoce de la diversidad biológica, manejo tradicional y de la cultura relacionada con la "flor de muerto" (*Tagetes* spp.) durante la festividad de "Días de Muertos" en México, aspectos que se estudiaron en dos comunidades mixes (Yacochi y Tepuxtepec) de Oaxaca, grupo étnico que vive exclusivamente en ese estado. Se aplicaron entrevistas, se registró la composición de las ofrendas en el cementerio y se tomaron mediciones de trece características florales de inflorescencias de *Tagetes* que se analizaron mediante la técnica de componentes principales.

**Palabras clave:** Flor de Muerto, Germoplasma mexicano, Mixe, Oaxaca, *Tagetes* spp.

### INTRODUCTION

During the "Día de los Muertos" ("Day of the Dead" or "All Saints Day" holiday), celebrated in November 1st and 2nd in Mexico, the use of offerings made with flowers in home altars and at cemeteries, is considered a traditional practice of ritual use, with a deep cultural meaning for Mexican people (CASTRO 1994). The flowers of marigold ("flor de muerto", "flower of the dead") or "*cempoalxochitl*" (*Tagetes* spp.) are important components of many such offerings, including species such as *T. erecta* L., *T. patula* L., *T. tenuifolia* Cav, and *T. jalisciensis* Green (NEHER 1966). Despite the fact that Mexico is considered the center of origin and diversification of many *Tagetes* species, biological and cultural aspects related to these species have been poorly described. There are scarce reports on biological diversity of "flor de muerto", which includes different locations in Mexico, such as the southern area of Chiapas state (SERRATO *et al.* 1992), western communities at

Mexico state (SERRATO *et al.* 1991; GALICIA 1995), and the Chatina region in Oaxaca state (SERRATO & RIOS 1998). Although Mexico has a rich cultural and environmental diversity associated to "flor de muerto", there is very poor information about management practices by indigenous people groups to obtain flowers to be used in the constructions of offerings (CASTRO 1994). The collection of flowers from the offerings at the cemeteries during the first days of November, a period when the biological and cultural diversity associated with the plant's use is most evident, is the best approach to obtain more precise information on biological and evolutionary aspects (SERRATO 1990).

In Oaxaca state, there are eight different ethnic groups, of which the mixe represent 1% of the indigenous population in the state (BASAURI 1990). The mixe live only in Oaxaca, and they have been living there since 1,000 B.C. At the present, they are settled in 240 small towns, surrounded by "zapoteca" communities, which include

contrasting environments that go from mountains at 1,800 meters over the sea level to low lands at less than 1,000 meters (GONZALEZ 1989). In November, mixe celebrate the "Dia de los Muertos" ("Day of the Dead" or "All Saints Day") festivity, using both cultivated and wild flowers in their offerings. Little is known about morphological traits of the "flor de muerto", the composition of the offerings, management practices, and cultural aspects of this plant. Consequently, in this study we tried to describe some of these aspects observed among the mixe communities.

## MATERIALS AND METHODS

This study was carried out during October 31 to November 2<sup>nd</sup> of 2000 at two mixe communities from Oaxaca state: 1) Santa Maria Yacochi, a small town from the Santa Maria Tlahuitoltepec municipality located in the district of Santiago Zacatepec; and 2) Santo Domingo Tepuxtepec. The first community is located in a temperate zone with an altitude range of 2,250 to 3,500 meters over the sea level, with 1,400 mm of annual rain; while for the second location, it is located at 1,800 to 2,400 m altitude, with 300 mm of annual rain.

The information was collected using different approaches: 1) attending popular celebrations, some - like home altars and prayers - performed in private by community members, and others - such as church masses and processions to the cemetery - performed in public, and promoted by religious and municipal authorities; 2) visiting cemeteries to directly observe floral offerings in all tombs (57 in Yacochi and 199 in Tepuxtepec), noting the species used, and collecting samples of the inflorescences of "flor de muerto" in order to be able to measure some morphological traits; and 3) applying ten interviews among older people in order to gain insights regarding the cultural aspects, management practices and ritual use of "flor de muerto".

Observations of floral offerings included the following: 1) the relative composition of plant species used, including known and unidentified *Tagetes* species, as well as other species; 2) flower traits like shape and colour of the inflorescence

(single or double corolla, and colour). Thirteen morphological traits of the inflorescences were measured: individual flowers in the inflorescence, length, width, and colour of the involucre; length and width of liguled (disc) flowers; achene length, diameter of the inflorescence, number of liguled and tubular flowers; length of long pappus, length of short pappus, and color of the flowers in the disc. The taxonomy identification guide presented by NEHER (1966) was used to characterize the different *Tagetes* species. The morphological diversity was analyzed using the multivariate analysis procedure by principal component (SAS 1986). A descriptive approach was used to record information related to management practices and cultural aspects of the plant.

## RESULTS AND DISCUSSION

In the cemeteries located in Yacochi and Tepuxtepec, the presence of the "flor de muerto" (*Tagetes* spp.) as an important part of the plant offerings (Tab. 1) confirmed its cultural value for mixe people, as it has been the case with the nahuatl group settled in Mexico valley (SAHAGUN 1999).

Floral offerings made with flower species different from *Tagetes* were also found. Most of them used wild flowers available at the end of October. The particular colors and shapes of these wild flowers probably influence their selection by mixe people at that time. *Tagetes* species were distinguished by their yellow and orange colors, and especially by their strong and aromatic odor. The flowering stage of *Tagetes* wild types ends at the end of October, therefore their availability for the "Dia de Muertos" festivity in November is expected. At the same time, some cultivated forms of *Tagetes* were identified (Tab. 1), raising the question about how mixe people domesticated them.

The wide diversity of *Tagetes* species used in the confection of plant offerings (Tab. 1) indicates a deep cultural persistence of the use of "flor de muerto" plant by mixe communities in Yacochi and Tepuxtepec, as has been reported for the nahuatl of the highlands of Mexico (SERRATO *et al.* 1991).

The taxonomical identification of some of the

Tab. 1 - Plant offerings composition observed in cemeteries from Santa María Yacochi and Santo Domingo Tepuxtepec mixe communities, at Oaxaca state. November 1<sup>st</sup> and 2<sup>nd</sup>, 2000.

	Communities	
	Yacochi	Tepuxtepec
Number of visited tombs	57	199
Other species <sup>†</sup>	38 (66.6%)	126 (63.3%)
<i>Tagetes</i> spp. <sup>†</sup>	32 (41.0%)	156 (43.84%)
<i>T. erecta</i> L. <sup>**</sup>	16 (20.5%)	91 (25.5%)
<i>T. patula</i> L. <sup>**</sup>	26 (33.3%)	92 (25.8%)
<i>T. tenuifolia</i> Cav. <sup>**</sup>	4 (5.1%)	17 (4.7%)

<sup>†</sup> wild plants; <sup>\*\*</sup> cultivated plants

wild plants with inflorescences formed by five liguled flowers was difficult. Some of these wild types also had inflorescences with more than 10 liguled flowers. This last group, together with identified five liguled flowers of *T. tenuifolia* were the most prominently used in the construction of offerings, compared to the cultivated types *T. erecta* and *T. patula* with big bright orange and yellow inflorescences. This result could be explained by the natural abundance of wild forms of "flor de muerto" on "Dias de Muertos". For further studies on the domestication process of "flor de muerto", it would be interesting to dedicate more time to study the unidentified wild *Tagetes* species, because of their predominance in the cemeteries (41-43%) (Tab. 1). These wild forms could also be considered as an important biological chain to link them with other wild types of *Tagetes* previously described by SERRATO *et al.* (1998), to enhance the knowledge about "cempoalxochitl" species complex referred by RZEDOWKY & RZEDOWSKY (1985).

When morphological traits of 10 materials from Yacochi and 17 from Tepuxtepec were analyzed using principal component analysis, five different types in Yacochi and six in Tepuxtepec were detected. These results confirmed the presence of unidentified *Tagetes* species, different from *T. erecta*, *T. patula* and *T. tenuifolia*, which will require additional taxonomical work.

The mixe people at Yacochi and Tepuxtepec identified only three different types of "flor de muerto": 1) "*Tsi'm py*", wild plants with single inflorescence of five ray or liguled flowers (*Tagetes* sp.); 2) "*Pop' pi'x*", wild plants with sin-

gle inflorescence of five ray flowers and a red spot in the basal zone of the flower (*T. tenuifolia*); and 3) "*Majk py*", both wild plants with inflorescence of more than 10 ray flowers (*Tagetes* sp.) and cultivated plants with double inflorescence (*T. erecta* and *T. patula*). The indigenous names of the different types reflect a deep knowledge on plant parts: "*aay*" (leaf), "*y'um*" (immature inflorescence), "*tsom*" (node), and "*pijy*" (opened inflorescence).

Most of the mixe offerings made of *Tagetes* species consisted of yellow inflorescences rather than orange ones, a tendency which has also been observed in some indigenous communities from Chiapas state (SERRATO *et al.* 1992). Offerings using orange inflorescences of "flor de muerto" are common in nahuatl dominated highlands valleys of central Mexico (SERRATO 1990; GALICIA 1995).

In Yacochi and Tepuxtepec, not all people cultivate "flor de muerto" (*Majk py*), but those who do plant both orange and yellow types. People who collect wild flowers prefer yellow wild types, which could explain the abundance of yellow flowers on the tombs.

Although the percentage of cultivated "*Majk py*" (*T. erecta* and *T. patula*) in tomb offerings was very similar in both communities, around 25%, cultivation of "*Majk py*" in Yacochi is less frequent than in Tepuxtepec, probably due to socio-economic.

Cultivation of "*Majk py*" (*T. erecta* and *T. patula*) involves preparing the soil for seedling during the early rainy season, from the end of May to the middle of June. Seedlings are planted in corn fields Tepuxtepec and in home gardens in Yacochi. The seedling area can cover from 1 to 9 square meters, but commonly it has 1 m<sup>2</sup>. Seeds are sown spreading them by hand, then covering them with soil using a sweeping brush. After sowing, in Yacochi at least, soil is covered with straw at the end of May to protect the seed from birds. If seedling is not required, then direct sowing is done planting seed in the row trough digging holes in small plots beside corn, beans and pumpkin plants. This practice is done at middle May or starting June. To plant flowers with double inflorescences, three to five flowers are used to obtain the required seed. Two months after sowing, plants are ready for transplanting to the

field. Only vigorous plants are transplanted.

Weeding, including wild species of *Tagetes* ("*Tsi'm py*", for example), is done by hand. Mixe are able to differentiate wild from cultivated forms because wild species have smaller leaves than cultivated ones.

For the seedling plot fertile soils are selected, therefore chemical fertilizers are never used. For transplanting, row distances between 30 to 50 cm are used, while plants within the row are separated by 15 to 20 cm. These practices are followed for all the crops; corn, beans, pumpkins and "flor de muerto".

Normally there are neither pests nor diseases of importance. However, climate phenomena, such as too much rain, hails, and frosts can damage the plants.

The flowering period is at 95 to 105 days after planting. For harvest, floral stems of 30 to 40 cm long, with big inflorescences are selected. Harvesting is carried out in October 30 and 31. The bigger and double inflorescences are always selected for home altars. In the case of *T. erecta*, seeds are selected for the following season by harvesting mature plants with double inflorescences from the field. Seeds of *T. erecta* are also extracted from the home altar offerings once the "Dias de Muertos" holiday has finished. In the case of *T. patula*, on the other hand, selection is done unwittingly, since seed from single inflorescences types fall to the soil during harvesting, leading to their spontaneous germination the following year, during the onset of the rains. Because of the process of domestication, the double inflorescences type would probably disappear if it were not cultivated. To preserve the planting seed in good conditions, dried inflorescences are kept in rustic containers.

In Yacochi, all tools used in cultivation of "flor de muerto" are made of wood. Tepuxtepec people learned to plant directly the seeds of "flor de muerto" from their ancient relatives. However, this practice has changed recently to seedling because direct sowing would spread seeds everywhere, with plants germinating, growing, and flowering without any pattern.

Old people of Yacochi indicated that long ago the "flor de muerto" was not cultivated, and therefore the "*Tsi'm py*" wild type was the only one

available. According to them, plants were never consciously selected by morphological characteristics; therefore, the changes observed could probably have occurred by open pollinations among different types, promoted by the wind.

Celebration of the "Dias de Muertos" festivity has been inherited from mixe ancestors. Long ago, this holiday was celebrated in special places by the mountain, because at that time there was no cemetery available. In ancient times, people used to commemorate baby births offering racemes of flowers to Cong Hoy (Good King), God of Cempoaltepec (Twenty picks) mountain.

Flowers of "flor de muerto" are now used as offerings in home altars and in cemeteries in Tuxtepec. The holiday begins in October 31 preparing the welcome to the souls, visiting the cemetery each person or in groups, and organizing a massive procession through the whole town. In this day, all people take racemes of "flor de muerto" to the cemetery. The wild types are the more frequently used. After this activity, people begin to enjoy November 1<sup>st</sup> and 2<sup>nd</sup> festivities.

In the Yacochi community, home altars are arranged on a table or on a "petate" (sleeping mat) on the ground, an arc of flowers is made and sometimes flowers are placed in floral vases too. Offerings are composed by plant products, such as pumpkins, corn, beans, oranges, bananas, peanuts, and nuts; prepared dishes are also offered, such as "pan de muerto" (bread for dead), "tamale", chocolate, "pulque", water, "tepache", "mezcal", cigarettes, and liqueur. These products are surrounded by wakes, religious images, and incense is burned. Each component of the offering has an important meaning: the wake shining serves to guide the returning souls back home, water to refresh the thirsty and tired souls, flowers both to decorate the place where souls are returning to and to proportionate aromatic essence of "flor de muerto" to make sure the souls will arrive to the indicated place (home altars).

In cemeteries, offerings made of "flor de muerto" are arranged in racemes and are carried out to be put on the tombs. The offerings are collocated following a specific order: first to close relatives tombs, and secondly on the tombs of far relatives or friends. Flowers on the tombs can be arranged in a cross shape, forming an arc or put-

ted in flower vases.

Although several cultural aspects around the use of "flor de muerto" by mixe communities were very similar to other indigenous groups in

Mexico, this study is the first one that tried to combine both cultural, biological, and traditional management aspects surrounding this plant resource among mixe people.

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