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Research Article

## Cultural and Biological Aspects of Production and Uptake of Camote De Cerro (*Dioscorea* spp.) In South of Strand of Lake Chapala

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**Abstract:** Camote de cerro (*Dioscorea* spp.) is obtained through traditional gathering in wild environments in south of strand of Lake Chapala (in Jalisco and Michoacán states), local gatherers recognized varieties and preserved populations because of their knowledge (3). We conducted interviews to camote de cerro gatherers, consumers and merchants, and field visits in order to document their knowledge and management techniques of camote de cerro. For *in vitro* establishment were used MS (4). culture medium, it contains 30 g/L saccharose without PGRs 14 sterile seeds were maintained in a growth room at room temperature for a 16L: 18D photoperiod,. After germination 4 subcultures were performed under the same conditions. Camote de cerro gatherers identified two plants varieties, seven local medicinal uses for camote de cerro. Results of *in vitro* culture were: 11 seeds were contaminated and 3 were able to germinate. After 4 subcultures performed 103 plants were obtained. Was stablished a culture line for further analysis and microtuberization, thus could be material available for camote de cerro production without affecting natural populations.

**Key words:** *Dioscorea* spp., uptake, micropropagation, traditional, gathering

## INTRODUCTION

In the southern banks of Lake Chapala in the Mexican states of Jalisco and Michoacán people continue to benefit from the use of wild plants. The most common practices focus on the exploitation of tree species and consumption of fruits, flowers or edible seeds, among the most common are: maguey (*Agave inaequidens*), pitayo (*Stenocereus queretaroensis*), guamúchil (*Pithecellobium dulce*), nopal (*Opuntia* spp.) and camote de cerro (*Dioscorea* spp.). The latter species are highly consumed in many locations and provide meaningful employment for people with limited financial resources<sup>1</sup>. Tubers of camote de cerro plants are harvested in western Mexico, the main gathering zone is in the Tapalpa Mountains and the hills surrounding Lake Chapala between the states of Jalisco and Michoacán<sup>2</sup>. Camote de cerro is sold as food, which benefits peasant families and local merchants. In addition, these plants have been used for medical purposes for many years; furthermore, their nutritional value is important because it contains a large amount of starch which provides a vast source of energy. The high fiber and protein content in the plant's stem suggest its use as fodder for cattle and poultry<sup>3</sup>.

The collecting of camote de cerro is traditionally performed, and it has been transmitted as a craft from generation to generation in the west of the country, along with various food and medicinal uses. Although genus *Dioscorea* is widely distributed in the world, the exploitation of its different species is carried out at different scales, from being used as food as well as being used as a precursor to synthetic hormones in pharmaceuticals. In the southern strand of Lake Chapala, camote de cerro has not been exploited successfully as a crop; therefore, consumption and knowledge of its properties has been restricted to a few regions due to short seasons and insufficient yields during its gather. Camote de cerro tubers are extracted in large quantities; therefore, strategies are needed for their sustainable exploitation<sup>4</sup>.

The objective of this study was to document and spread traditional knowledge about camote de cerro and its cultural and nutritional values; furthermore, to generate an alternative conservation through its *in vitro* propagation of camote de cerro plant.

## METHODS

For the documentation of traditional knowledge on the use, consumption and extraction of camote de cerro, interviews were conducted with gatherers, merchants and consumers of “camote de cerro”. The interviews were conducted in the following municipalities of Southern strand of Lake Chapala, Cojumatlán de Regules in the state of Michoacán and Tuxcueca and Tizapán El Alto in the state of Jalisco. Qualitative interviews were conducted in order to document knowledge and management of crop harvesting, field guided visits were conducted with camote de cerro experienced gatherers.

For the establishment of *in vitro* culture 14 seeds were used, which were disinfected with the following protocol the disinfection was performed in a laminar flow cabinet: all the seeds were disinfected in a 40% Sodium Hypochlorite (commercial) solution for 20 min, then they were dipped in a 20% ethyl alcohol solution for 20 min. Once the completed the disinfection process in sterile condition, the seeds' wings were removed discovering embryos. Then they were seeded in vials containing about 30 ml of MS<sup>3</sup> with 30 g/L of saccarose without PGR's. The vials were placed in the incubation area where they were naturally lit, with a photoperiod of 16 h light/ 18 h dark at ambient temperature (average of 23° C). From day 17 to day 388, subcultures were made by segmenting shoots including rhizomes of plants grown on germination, under conditions described above<sup>5</sup>

## RESULTS

From interviews and guided field visits, testimonials regarding traditional gathering methods were recorded. The gathering was performed in the neighboring hills that surround Lake Chapala, there the plants grow in small populations which gatherers called “manchas”, harvest season is from September to March, and gatherers use certain kinds of tools: casanga (scythe), machete (machete) and barra (digging bar) to dig and find the tubers, excavations to obtain camote de cerro can reach 1 m per plant. After obtaining the tubers, a crucial practice is to replace the (ombligo) corm which allows the plant to produce camote de cerro in the coming seasons. In addition, gatherers identified two 2 varieties of plants that produce tubers of different textures as revealed in the testimony by Rafael Domínguez, January 27 2013: “There are two kinds of plants, “sonaja” plant and “gusano” plant, sonaja plant produces “camote cristalino” (with higher water content) it is thin and gusano plant produces “camote masudo” (starchlike consistency) it is thick. Sonaja (rattle) plants are named this way because when the plants are moved by either the wind of passersby they produce a rattle sound, and gusano (worm) plants were given this name because of their tangled stems (**Fig. 1**).



**Fig.1** Harvest of camote de cerro: A. Ombligo (Corm). B. Tools using in harvest. C. Camote masudo variety. D. Camote cristalino variety. E. Gusano plant variety. F. Sonaja plant variety.

An important practice during collection is to replant the “ombligo” (corm) after one obtains the tuber, as it was mentioned in Rafael Domínguez's testimony registered on January 27, 2013: “Some people go and pull out and do not replant the ombligo; therefore, the plant dry out and does not produce camote for the next season”. By replanting the corm, new camote can grow and the plant can reproduce again. As a consequence of not replanting the corm, the number of plants decreases; therefore, the quantity and quality of camote is affected negatively. For the last 3 to 5 years, gatherers have noticed this decline and they attributed to deforestation, cattle ranching, agriculture and the lack of rain. Besides food usage of camote de cerro, seven traditional medical usages were recorded during the interviews. The two most commonly mentioned were traditional remedies to mitigate hormonal problems and diabetes (**Table. 1**).

**Table 1:** Medicinal uses of camote de cerro.

Ailments	Kind of consumption
Acne	Water used during cooking
Intestinal parasites	Raw tuber
Diabetes	Liquefied raw tuber/ Raw tuber
Cancer	Liquefied raw tuber
Prostate ailments	Raw or cooked tuber
Menopause ailments	Raw or cooked tuber
Infertility	Raw tuber

Regarding the *in vitro* culture: of the 14 planted seeds, 11 got contaminated, 3 germinated and formed roots and stems 10 days after they were planted. At day 17 they developed vines of approximately 5 cm in height (**Fig. 2**). From the 4 subcultures reproduced, 103 plants were obtained of which 3 were contaminated. These results have shown that it is viable to reproduce wild species *in vitro* starting with seeds even though only 21% germinated. The development of the plants was optimal and only with 3 specimens, the goal of micropropagation was achieved.

**Fig.2:** Mother plant obtained from *in vitro* germination.**Table 2:** Results for *in vitro* culture of seeds and micropropagation.

Day	Date	Response	Number of plants
1	25/04/13	...	14/14
5	30/04/13	Germination	3/14
10	8/05/13	Formation of root and stem	3/3
17	10/05/13	Subculture 1	6
99	16/08/13	Subculture 2	10
336	10/04/14	Subculture 3	41
388	6/05/14	Subculture 4	103

## CONCLUSIONS

Local knowledge about camote de cerro is abundant and persist in the studied area, population experience has allowed the appreciation of the vegetable resources, and using this and sustainable methods as the corm replant and to maintain the plants and protect species of camote de cerro can preserve traditional knowledge about consumption, collection and medicinal uses. *Ex situ* conservation and reproduction by *in vitro* culture is an alternative that could give rise to the implementation of camote de cerro crop whose production is not greatly affected by climatic changes, the above work established a culture line for further analysis and microtuberization; thus, it could be material available for camote de cerro production without affecting natural populations.

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