

## **Project Update: August 2021**

**July 01-August 31**

### **Evaluation of plants established in the field**

Apart from production activities, we have had the opportunity to participate in events and activities, thanks to which we have had contact with important producers of the beverages obtained from these plants, as well as institutions dedicated to conservation, thanks to which plants of different species that grew from our nursery, or in the private nurseries that we advise.



Adaptation and growth tests of Agave seedlings. © Lourdes Delgado

### **Participation in conferences for the dissemination of results**

During the project we received the invitation to participate in the International Virtual Workshop, where specialists from the USA, United Kingdom, Australia, Germany, Spain and Mexico were present and where alternatives, techniques, projects and exchange of ideas were presented that allowed updating for the conservation of species exceptional, among the talks, our project and its progress were made known, as well as the support of The Rufford Foundation in this work.



**Virtual Global Symposium and Workshop**  
**Conserving Exceptional Plants**  
**Cryobiotechnology and the Model of Oaks**  
**October 19-21, 2021**



**OCTOBER 19-21, 2021**

10:00 a.m. to 2:00 p.m. U.S. Eastern Time.

8:00 – 10:00 p.m. U.S. Eastern Time, Oct 21, to connect with those in Asia, Australia, New Zealand, and the Pacific (Oct 22 in some areas)

Plan to join this free, three-part Virtual Symposium/Workshop. Hear from leading experts in exceptional plant conservation and cryopreservation. Oaks will be used as a model to illustrate and demonstrate the potential of cryobiotechnologies and how they can be applied to a wider range of exceptional species.

Registration for this event is now closed.

<https://cincinnatizoo.org/conservation/crew/virtual-symposium/>

[https://cincinnatizoo.org/system/assets/uploads/2021/10/Lourdes-Delgado\\_Abstract.pdf](https://cincinnatizoo.org/system/assets/uploads/2021/10/Lourdes-Delgado_Abstract.pdf)

The presentation at the international symposium was highly accepted, since establishing relationships at a global level allows us to carry out more complete and impactful studies.



UNIVERSIDAD DE GUADALAJARA  
Centro Universitario de Ciencias Biológicas y Agropecuarias



Virtual Global Symposium and Workshop  
**Conserving Exceptional Plants**  
Cryobiotechnology and the Model of Oaks  
October 19-21, 2021



## Conserving Agave: somatic Embryos by V-cryoplate Method



INTRODUCE

PhD. María De Lourdes Delgado-Aceves

## Acknowledgment



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Thanks to:

Liberato Portillo, Ph.D.

Raquel Folgado, Ph.D.

Dra. María Teresa González Arnao, Ph.D.



**¡Gracias por su atención!**



## Submission of scientific article

The second article generated from this project has been accepted in the journal in Plant Cell Tissue and Organ Culture with 2.711 impact factor (2020), this moment is in the editing process.

Most recommended in the last month

### New Approaches for Micropropagation and Cryopreservation of *Agave Peacockii*, An Endangered Species

Preprint File available October 2021

Lourdes Delgado-Aceves · Liberato Portillo · Raquel Folgado · [...] · María Teresa González-Arno

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1 New approaches for micropropagation and cryopreservation of *Agave peacockii*, an endangered species

2

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19

20 **Abstract**

21

22 More than 50% of *Agave* species are endemic to Mexico. Among them, *Agave peacockii* is listed within the list

23 of threatened species that require special protection. In this work, we aimed at developing new supplementary

24 strategies to achieve micropropagation and perform cryopreservation of *in vitro*-grown shoot-tips of *A.*

25 *peacockii*. For multiplication, the addition of two cytokinins, 6-benzylaminopurine (26.6 µM) and kinetin

26 (27.84 µM) to MS semisolid medium significantly favoured the morphogenetic response and produced the

27 highest shoot generation (87.00±17.18) after 60 d of culture. This interaction was more effective than using the

28 same growth regulators separately. Propagated and rooted plantlets were successfully acclimated with 100%

29 survival and a normal morphological development during greenhouse performance. For cryopreservation, an

30 optimized protocol following droplet-vitrification approach allowed obtaining 98% and 96% regrowth before

31 and after cryopreservation, respectively. Shoot-tips were excised of *in vitro*-propagated plants, subjected to

32 preculture on MS semisolid medium with 0.3 M sucrose for 1d, loaded in solution with 0.4 M sucrose and 1.6

33 M glycerol for 20 min, exposed to vitrification solution PVS2 for 15 min, and then, immersed in liquid nitrogen

34 in droplets of PVS2 placed on aluminium foil strips. The vegetative growth of cryo-derived plants and of the *in*

35 *vitro* propagated plants was compared under greenhouse culture conditions. No significant differences were

36 detected in most assessed characteristics after 120 d of acclimatization. The results presented here constitute

37 new viable biotechnological approaches for the *in vitro* propagation and long-term conservation of endangered

38 *Agave* germplasm.

39

40 **Keywords:** Agavoideae, *in vitro* propagation, droplet-vitrification, vegetative growth

41

## Acknowledgment

This work was funded by The Rufford Foundation (Grant 31255-2) and Consejo Nacional de Ciencia y Tecnología (Grant scholarship No. 291236).

# Indirect Somatic Embryogenesis and Cryopreservation of Agave tequilana Weber Cultivar 'Chato'

Article Full-text available January 2021 · Plants

Lourdes Delgado-Aceves · Maria Teresa González-Armas · Fernando Santacruz-Ruvalcaba · [...] · Liberato Portillo



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Article

## Indirect Somatic Embryogenesis and Cryopreservation of *Agave tequilana* Weber Cultivar 'Chato'

Lourdes Delgado-Aceves <sup>1</sup>, María Teresa González-Armas <sup>2</sup>, Fernando Santacruz-Ruvalcaba <sup>1</sup>, Raquel Folgado <sup>3</sup> and Liberato Portillo <sup>1,\*</sup>

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**Abstract:** *Agave tequilana* Weber cultivar 'Chato' represents an important genetic supply of wild severely in decline populations of 'Chato' for breeding and transformation programs. In this work, the indirect somatic embryogenesis and cryopreservation of Somatic Embryos (SEs) were investigated using the 'Chato' cultivar as a study case. **Methods:** Embryogenic calli were induced by the cultivation of 1 cm of young leaves from in vitro plants on MS semisolid medium supplemented with 24.84, 33.13, 41.41, 49.69, and 57.98 µM 4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid (picloram) in combination with 2.21, 3.32, and 4.43 µM 6-benzylaminopurine (BAP). The origin and structure of formed SEs were verified by histological analysis. Cryopreservation studies of SEs were performed following the V-cryoplate technique and using for dehydration two vitrification solutions (PVS2 and PVS3). **Results:** The highest average ( $52.43 \pm 3.74$ ) of produced SEs and the Embryo Forming Capacity (estimated index 52.43) were obtained using 49.69 µM picloram and 3.32 µM BAP in the culture medium. The highest post-cryopreservation regrowth (83%) and plant conversion rate (around 70%) were achieved with PVS2 at 0 °C for 15 min. **Conclusions:** Our work provides new advances about somatic embryogenesis in *Agave* and reports the first results on cryopreservation of SEs of this species.

**Keywords:** re-generation; picloram; cryoplate; vitrification solutions; long-term preservation



**Citation:** Delgado-Aceves, L.; González-Armas, M.T.; Santacruz-Ruvalcaba, F.; Folgado, R.; Portillo, L. Indirect Somatic Embryogenesis and Cryopreservation of *Agave tequilana* Weber Cultivar 'Chato'. *Plants* 2021, 10, 248. <https://doi.org/10.3390/plants10020248>

**Academic Editors:** Miroslav Ueda and Shuang-Peng

**Received:** 5 December 2020

**Accepted:** 21 January 2021

**Published:** 28 January 2021

**Publisher's Note:** MDPI stays neutral

### 1. Introduction

*Agave* plants are distributed in several wild and cultivated areas of different Mexican states, as well as preserved by many local human populations [1]. There are various culti-

Participation in academic seminars that allow new generations to be involved in the conservation of various species.

The image is a composite of two parts. The top part is a certificate of participation from the Universidad de Guadalajara, Centro Universitario de Ciencias Biológicas y Agropecuarias. It is titled 'CONSTANCIA' and is issued to M.C. MARÍA DE LOURDES DELGADO ACEVES for her participation as a MODERADORA in the LGAC: BIOTECNOLOGÍA VEGETAL. The certificate is dated July 15, 2021, and mentions the IV SIMPOSIO 'La investigación en la Maestría en Ciencias en Biosistemática y Manejo de Recursos Naturales y Agrícolas' held in Las Agujas, Zapopan, Jalisco. The bottom part is a screenshot of a Zoom meeting interface. It shows a grid of participants: ALBERTO ROSAS LOPEZ, Rosaura Avila Coria, Mayra Isidro Granados, CUCBA BIMARENA POSGRADO, LINO DE LA CRUZ, FERNANDO SANTACRUZ RUVALCABA, MARIA DE LOURDES DELGADO ACEVES, and a 'Tú' (You) icon. The meeting is titled 'dtw-iqgo-gdy' and has 55 participants.

IV SIMPOSIO

UNIVERSIDAD DE GUADALAJARA  
CENTRO UNIVERSITARIO DE CIENCIAS BIOLÓGICAS Y AGROPECUARIAS  
MAESTRÍA EN CIENCIAS EN BIOSISTEMÁTICA Y MANEJO DE RECURSOS NATURALES Y AGRÍCOLAS

Otorga la presente

# CONSTANCIA

a la: **M.C. MARÍA DE LOURDES DELGADO ACEVES**

Por su participación como MODERADORA en la LGAC:

**BIOTECNOLOGÍA VEGETAL**

Dentro del marco del IV SIMPOSIO "La investigación en la Maestría en Ciencias en Biosistemática y Manejo de Recursos Naturales y Agrícolas", celebrado en Modalidad virtual los días 13 y 14 de julio de 2021

Las Agujas, Zapopan, Jalisco, 15 de julio de 2021

Dra. Patricia Zarazúa Villaseñor  
Coordinadora de la Maestría  
BIMARENA

Maestría en Ciencias en Biosistemática y Manejo de Recursos Naturales y Agrícolas  
Centro Universitario de Ciencias Biológicas y Agropecuarias

Dr. Ramón Rodríguez Macías  
Secretario Académico  
C.U.C.B.A

GRABANDO

ALBERTO ROSAS LOPEZ

Rosaura Avila Coria

Mayra Isidro Granados

CUCBA BIMARENA POSGRADO

LINO DE LA CRUZ

FERNANDO SANTACRUZ RUVALCABA

MARIA DE LOURDES DELGADO ACEVES

47 más

Tú

dtw-iqgo-gdy

Meeting with students and specialists in biological sciences.

The dissemination of our results has shown interest to local and national media. Interviews have been conducted to inform and emphasise the importance of conserving and properly managing endemic agaves.



<https://www.udg.mx/es/noticia/congelan-agave-para-preservar-su-legado-celular>



<https://www.mexicoambiental.com/en-la-udeg-congelan-agave-para-preservar-su-legado-celular-y-genetico/>

Desarrollan investigadores de la UdeG método de crioconservación

# Congelarán agave décadas

Usando nitrógeno líquido preservan temperaturas para mantener la planta

MARIANA QUINTERO

Para preservar y tratar de frenar la sobreexplotación del agave, Lourdes Delgado Aceves, bióloga conservacionista de la UdeG, congeló con nitrógeno líquido fragmentos de esta planta, lo que permitiría conservarla hasta por 100 años.

Este proceso lleva por nombre crioconservación y consiste, en este caso, en preservar a temperaturas ultracongelantes partes diminutas del agave –desde un milímetro hasta un centímetro–, para que a partir de sus células se pueda regenerar la planta completa.

“Esta técnica hace que en pequeños espacios podamos replicar lo que pasa en la naturaleza produciendo miles o millones de plantas si fuera necesario, la base para hacer viveros y que éstos doten de plantas al campo”, comentó sobre el proceso Liberato Portillo Martínez, especialista en biotecnología de la UdeG y quien trabaja en conjunto con Delgado Aceves.

“Después de estar en el laboratorio, llevamos (las plantas) a invernadero, se hace la aclimatación y una vez que vemos que su crecimiento y su supervivencia está intacta pasa a campo, y en campo ya se puede redirigir ese material a zonas en las que ya se degradaron”, complementó la académica.

Los investigadores actualmente trabajan con tres



Investigadores de la UdeG desarrollaron un proceso de crioconservación.

especies de agave que se encuentran amenazadas: cv. ‘chato’, lurida –en peligro de extinción– y peacockii –de protección especial–.

También analizan otra triada de especies comerciales: cupreata, karwinskii y conwallis.

“Como humano, explota-

mos y no regresamos al medio ambiente lo que estamos tomando, no hay un manejo sustentable. Lo que queremos es devolver al medio

ambiente y que se vuelvan a reforestar”, añadió Delgado Aceves.

Ambos académicos esperan que esta técnica pueda ser replicada para la conservación de otras especies. Por ahora trabajan también con tomatillo silvestre y cactus.

Portillo Martínez dijo que también se trabajará en impulsar la creación del Laboratorio de Criobiotecnología en el que no solo académicos de la UdeG, si no de universidades de todo el País puedan sumar esfuerzos en la materia.

“Estos estudios están dirigidos a un fin noble y lo que buscamos es impactar positivamente en la sociedad, concientizar sobre ese valor básico en la vida, esa relación estrecha con los recursos naturales”, concluyó la académica.

INICIO

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## Congelan agave para preservar su legado celular

Publicado hace 4 meses en agosto 9, 2021  
Por Informe Fracto

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