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The Effects of External Qì 气 on Growth of Shoots of *Dahlia Brevis in Vitro*

Citlalli Valentina Álvarez Saulés[1], Pablo Isaí Hernández Cortés[2], Diana Patricia Cruz Hernandez[2] and Víctor Manuel Chávez Ávila[2]
[1]The Best of Me-Zhìnéng qigōng Training, and Scientific Research Institution, Email ID: info@thebestofmeusa.com
[2]Plant Tissue Culture Laboratory of the Botanical Garden at the Biology Institute of the National Autonomous University of Mexico, Email ID: victorm.chavez@ib.unam.mx

***Abstract* – The effects of the emission of qì 气 by a Zhìnéng qigōng 智能气功 instructor on the growth of shoots of *Dahlia brevis* in tissue culture was studied. With a total population of eighty shoots, the control group and the experimental group were randomly formed. The experimental group received qì for 30 minutes, 3 times a week for 5 weeks. The length of the shoots was measured; the number of shoots that developed roots was recorded; the number of depressions presented by the culture medium was documented and the data were statistically analyzed. The experimental group did not present statistically significant difference in the length of the shoots in relation to the control group. However, the average length of the shoots of the experimental group was greater than that of the control group. The number of shoots that developed roots of the experimental group was almost double compared to the control group. The shoots treated with qì formed thicker and more abundant roots and presented a better-defined plant shape. The emission of qì also seemed to influence the culture medium, decreasing the number of depressions formed in the experimental group.**

***Keywords* – Dahlia, External qì 气, Plants in danger of extinction, Tissue culture, Zhìnéng qìgōng** 智能气功.

I. Introduction

Qìgōng's 气功 systems are very ancient methods (over five thousand years), that have been used by Chinese doctors and teachers to heal illnesses, maintain good health, and extend life expectancy. The term Qì 气 refers to the smallest particle that forms everything in the universe and Gōng 功 means work. From the Qìgōng's perspective, a disorder appears when the person does not have enough qì, and the qì does not flow freely through the body [1], [2].

Zhìnéng qìgōng 智能气功 is a type of Qìgōng and consists of a series of very soft but very deep movements involving the body and the mind. The practice of these methods promotes that the qì becomes more abundant and flows freely strengthening body and mind's functions [1]-[3].

There are two main Qìgōng's forms practice: internal and external. The internal Qìgōng is the self-directed practice of the techniques used to increase and promote the qì's flow in the practitioner's body; these practices include meditations, movements and sounds. The external Qìgōng is an interpersonal healing practice in which a practitioner projects qì to another person to promote the qì's circulation, and to increase his or her health. The practice of external Qìgōng is not only applied to patients, it is also common to be applied to different inorganic materials, animals, plants, cells, or organisms in culture media. In China, diverse hospitals use both forms of Qìgōng (internal and external) as part of their comprehensive care approach [2], [4]-[5].

A. Experimental Research

Most experimental research refers to the practice of internal Qìgōng (self-healing practice); however, research with the external Qìgōng (the qì projection from a person to a receiver) are becoming more common [2], [4]-[5].

Related to the external Qìgōng with plants, [6] worked with wheat and peas seeds analyzing how the emission of qì induced germination. They reported that the emission of qì increased the rate of growth and cell division hundreds of times. [7], In his compilation of scientific researchers, mentions a series of studies related to the germination and growth of seeds including rice, wheat, peas, beans and peanuts, among others, where qì emission stimulated germination and accelerated growth. [8] Conducted a study of the effect of external qì on the germination of bean seeds for seven days and they report that the length of the roots of the experimental group was on average 6.8% greater than the length of the roots of the control group.

B. Dahlia Brevis

Dahlia brevis is a Mexican herbaceous plant whose natural populations in Mexico have completely disappeared [9]. It is for this reason, that the Plant Tissue Culture Laboratory of the Botanical Garden at the Biology Institute of the National Autonomous University of Mexico, has been working with the culture of tissues of this species for more than ten years.

Tissue culture is a science that studies the growth of cells, tissues or plant organs isolated from the mother plant in an artificial medium rich in nutrients, whose objectives include regenerating, proliferating whole plants and eventually reintroducing them into the environment, among others [10].

II. Methodology

In forty glass jars, eighty shoots (two per jar) of a length of 10 mm were seeded in the culture medium of Murashige and Skoog (1962) (MS), semi-solid, pH 5.7. Randomly, the forty jars were divided into two groups, twenty jars with forty shoots for the control group and twenty jars with forty shoots for the experimental group.

The cultures were kept in the incubation room, at a temperature of 25 + 2ºC, with a photoperiod of 16 hours of light, at an intensity of 1200 lux. All the jars were placed on the same shelf and at the same height to homogenize the conditions. None of the jars presented contamination.

Three times a week the Zhìnéng qìgōng instructor sent qì to the experimental group for 30 minutes for 5 weeks (Fig.

1). The experimental group jars were separated from the control group while receiving the treatment. Later they were placed in the same place next to the control group.

Fig. 1. The experimental group receiving the qì treatment.

Five weeks after starting the cultures and the treatments, and due to the administrative vacations of the University, it was decided to conclude the research protocol. Observations were made in both groups, counting the number of shoots that developed roots and the number of depressions in the culture medium (Fig. 2) (Table 1).

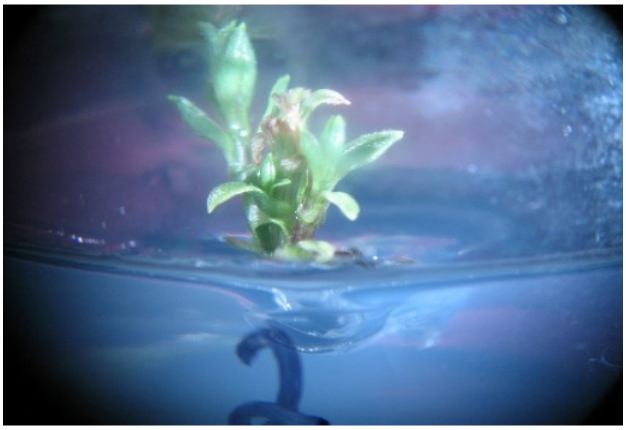

Fig. 2. Shoot with depression in the culture medium.

Table 1. Data from the control and experimental group.

	Control group	**Experimental group**
Number of shoots that formed roots	**6** (15%)	**11** (27.5%)
Number of shoots without roots	**34** (85%)	**29** (72.5%)
Number of depressions in the culture medium	**18**	**4**
Average height (mm) of the shoots	**22.113**	**26.4955**

Subsequently, the lengths of the shoots were measured with the help of a stereoscopic microscope, and photos were taken of the shoots that developed roots before being transplanted to a mixture of substrate (Fig. 3).

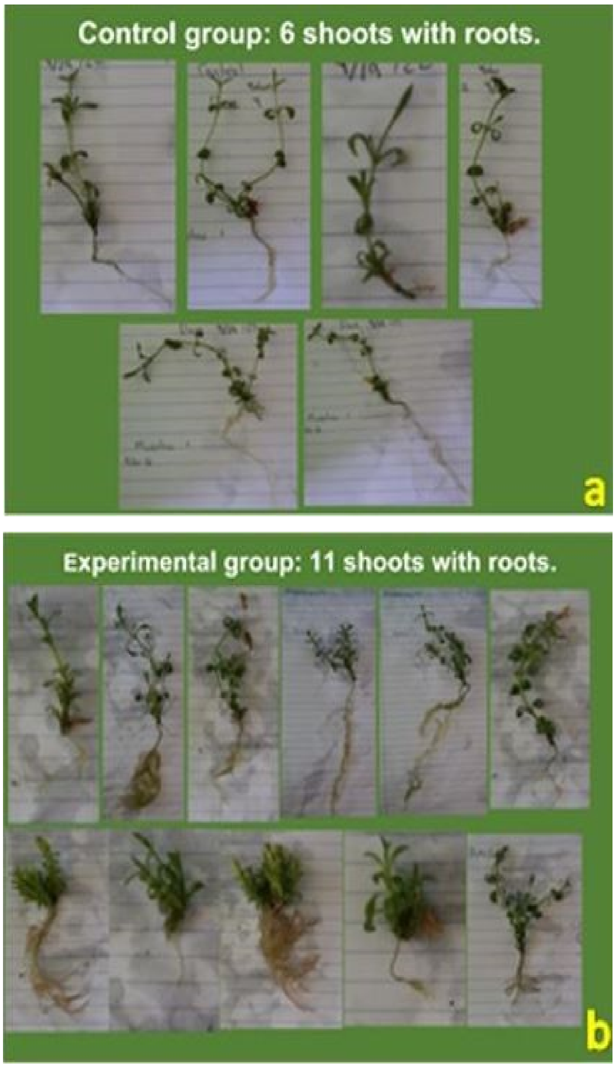

Fig. 3. Images of the shoots that developed roots of the control group (a), and the experimental group (b).

III. Data Analysis

The first stage was to study the observations of both groups, noting the following differences:

1. The number of shoots that developed roots of the group that received the treatment of qì was almost double (27.5%) compared to the control group (15%).
2. The shoots of the experimental group formed thicker and more roots, observed as better shaped little plants.
3. The average length of the shoots of the experimental group was higher than that of the control group (26, 495 mm vs 22, 113 mm).
4. The control group presented eighteen shoots with depression in the culture medium and the experimental group presented four depressions.

The second stage consisted in analyzing the data of both groups with the Shapiro-Wilk test to determine normality, and it was observed that they do not follow a normal distribution for stem elongation (Treatment, $p<0.00001$, Control, $p = 0.00008$). However, due to the central limit theorem, normality was assumed for the rest of the tests, studies have showed non-significant differences when assuming normality in samples greater than $n = 30$ [11].

Subsequently, a Student t-test was carried out for two independent samples with the same variance and sample size assumption, and a Welch's t-test in the Excel 2013 statistical package. For both cases, a single-tailed test was considered, where the null hypothesis was: if the treatment does not influence the growth, there will be no significant differences between the groups. Student's t-test was performed since it is more robust to the break of the normality assumption but shows problems with non-identical variances and Welch's t-test is more robust in cases with dissimilar variances [11].

IV. Discussion

According to both tests "t of student" (t = 1, 15, p = 0, 12) and "Welch's t-test" (t = 1, 15, p = 0, 12) no significant differences were observed. Because of the congruence between the two tests, the result can be accepted despite the non-parametric distribution of the data. However, considering the distributions of the populations and the hypothesis, the negative result can be doubted for the following reasons:

1. The distribution observed in the experimental group (Fig. 4) is traversed towards the left tail due to a high number of individuals of smaller size. In other words, some of the shoots of the experimental group showed a larger size compared to those of the control group. However, since most of the shoots did not grow, these data affected the differences observed.
2. The probability that the results are not due to chance approaches 88%, although violating the convention of 95% probability, should not be considered as impossible.
3. Non-parametric distribution for shoot length in both groups can due to the eighty shoots were not enough to be representative of the species. On the other hand, tissue culture produces clones, mainly. Clones are derived from a reduced number of phenotypes, which in great numbers can act like different populations though they are not.
4. Regarding the development of roots, the fact that most of the shoots did not generate roots coincides with the studies of [12], and Morel and Martin as cited in [13] where, in the first study with apical meristems, only 18% of the shoots produced roots, and in the second study, no shoots generated roots. Besides [13], in her preliminary tests, also reported that isolated shoots (without knots) did not show growth.
5. Finally, when one genotype is used to regenerate many plants, the tissue response can change and even lose the ability to regenerate through clone generations, especially if compared to tissue from a non-clone plant. For this experiment, the tissue came from clones, which have been cloned for several generations. This differential tissue response could affect the qi's effect on shoot length.

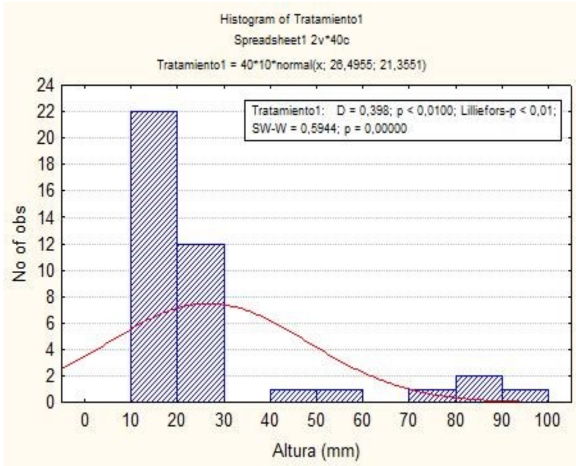

Fig. 8. The distribution of the population with the treatment is observed. If we compare against a normal distribution this distribution is traversed towards the left tail of the distribution, this is due to a high number of smaller individuals.

V. Conclusions

Even though the emission of qì in cultivated shoots of *D. brevis* of 10 mm of initial size, did not present a statistically significant difference in the length of the shoots in relation to the control group, there were differences between the two groups.

It is suggested to repeat the experiment with shoots with an initial length of 30 mm that include a node and with a larger population. To the extent that efforts are made to study and know the species, especially those in danger of extinction, it will be possible to take effective actions in conservation and sustainable use.

Acknowledgment

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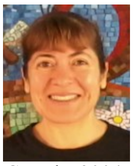
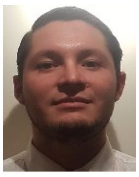
AUTHORS' PROFILES



First Author, M.Sc. Alvarez
Place of Birth: Mexico City, 1967. Bachelor's degree in biology by the Faculty of Science at the National Autonomous University of Mexico, Mexico City, 1990. Master of Science in marine management by the Marine Affairs Program at Dalhousie University, Nova Scotia, Canada, 2004. Zhìnéng qìgōng instructor certified by the Beijing Wisdom Healing Center, China, 2015. She is the Academic Director of The Best of Me-Zhìnéng Gìgōng Training and Scientific Research Institution in Mexico City. info@thebestofmeusa.com. She started to work in science communication. She was in charge of the Ecology Hall at the "Science Museum" at the National Autonomous University of Mexico. She was also head of the Science Communication Department of the Science and Technology Institute of Mexico City, where she was responsible for the "Science on the Streets" program. She has published 21 articles. After her younger sister passed away because of acute lymphoblastic leukemia, she looked for different ways of treating cancer finding Zhìnéng Gìgōng. Currently, she teaches and does research with Zhìnéng Gìgōng.



Second Author, U. Hernandez
Place of Birth: Mexico City, 1995. Undergraduate student in biology in the Faculty of Science at the National Autonomous University of Mexico, Mexico City, since 2014. He has been doing his internship in the Plant Tissue Culture Laboratory of the Botanical Garden at the Biology Institute of the National Autonomous University of Mexico since March 2017.

Third Author, U. Cruz
Place of Birth: Mexico City, 1993. Undergraduate student in biology in the Faculty of Science at the National Autonomous University of Mexico, Mexico City, since 2012. She studies and does her thesis at the Plant Tissue Culture Laboratory of the Botanical Garden at the Biology Institute of the National Autonomous University of Mexico. Since 2016 she has been taking care of the *Dahlia brevis* stock.

Fourth Author, PhD. Chavez
Bachelor's degree in biology by the Faculty of Science at the National Autonomous University of Mexico, Mexico City. Master of Science in Vegetal Biology by the Faculty of Science at the National Autonomous University of Mexico, Mexico City. Doctorate of Science in Biology by the Faculty of Science at the National Autonomous University of Mexico, Mexico City. Research stay at the University of Florida, Homestead, Florida. He is senior researcher in the Plant Tissue Culture Laboratory at the National Autonomous University of Mexico. He is a member of the National System of Researchers SNI-CONACYT. Research field: botanic; plant tissue culture; somatic embryogenesis induction, *in vitro* regeneration and rescue of Mexican endangered species. Groups of study: Orchidaceae, Cactaceae, Zamiaceae (Cícadas), Agavaceae, Asteraceae, Pinaceae.