# Cytological And Ultrastructural Studies On Callus Of *Fagonia Arabica*

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**Abstract:** Cytological study on callus of *Fagonia arabica* leaf explants (initiated on solid MS medium supplemented with 5mg/l Kinetin, 1 mg/l 2,4-D and 30 g/l sucrose after 6 weeks and maintained on solid MS medium supplemented with 6 mg/l kinetin , 2 mg /l NAA and 40 g/l sucrose after 4 weeks) revealed that, most cells of the callus were in telophase. Ultra structural study on the callus showed large cells with normal structure. Cell organelles such as vacuoles, cell wall, dense cytoplasm, nuclei, endoplasmic reticuli, mitochondrion, golgi apparatus appeared after using Transmission Electron Microscope (TEM).
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**Keywords:** *Fagonia- Fagonia arabica* -Callus-Cytology- Transmission Electron Microscope.

## 1. Introduction

Plant tissue culture is a model system which allow one to investigate physiological, genetic and structural problems related to plants (Biondi and Thorpe, 1981). Electron microscopy is an important tool for studies of plant structure (Gamborg and Phillips, 1995). Ultrastructural studies on callus cells of different plants such as *Phaseolus vulgaris* were done using Transmission Electron Microscope (Raafat and Zaki,1999).

## 2. Materials and Methods

**Plant materials:**

Samples of *Fagonia arabica* L. var. *viscidissima* Maire. were collected from Quatamia- Suez desert road (150 Km away from Suez City). All the samples were authenticated by comparison with voucher specimens in the herbarium of Botany Department, Faculty of Science, Ain Shams University, Cairo, Egypt, where voucher specimens were deposited.

**Methods:**

**i) Tissue culture study:**

callus of *Fagonia arabica* leaf explants initiated on solid MS medium supplemented with 5mg/l Kinetin, 1 mg/l 2,4-D and 30 g/l sucrose after 6 weeks and maintained on solid MS medium supplemented with 6 mg/l kinetin , 2 mg /l NAA and 40 g/l sucrose after 4 weeks (Eman *et al.*, 2010).

**ii) Cytological study of mitotic division in callus cells :**

The semithin sections of callus of *Fagonia arabica* leaf explants were examined under light microscope and the mitotic indices (M.I.) and mitotic stage indices (M.S.I.) were determined using the following formula (Haiba, 2001):

$$\text{Mitotic index (M.I.)} = \frac{\text{No. of deviding cells}}{\text{Total cells examined}} \times 100$$

$$\text{Mitotic stage index (M.S.I.)} = \frac{\text{No of cells in a particular stage}}{\text{Total cells examined}} \times 100$$

**iii ) Ultrastructural study of callus cells using Transmission Electron Microscope (TEM):**

- Internal cellular structure of callus of *Fagonia arabica* leaf explants was carried out using Transmission Electron Microscope (Zeiss-West Germany) in Central Lab Unit, National Research Centre.

- Fixation, dehydration,infiltration and embedding sectioning and staining of callus cells were done according to the methods adopted by Gamborg and Phillips, (1995).

## Results and Discussion

### I ) Cytological study of mitotic division in callus cells:

The semithin sections of callus of *Fagonia arabica* leaf explants were examined under light microscope and the mitotic indices (M.I.) and mitotic stage indices (M.S.I.) were determined in Table (1). Photos (1-8) show mitotic division in callus cells.

Data in Table (1) and Photos (1-8) show that, the most cells of callus were in telophase.

**Table (1): Cytological study of mitotic division in callus cells.**

| Total number of cells | Mitotically dividing cells | M.I. | Cells in prophase | M.S.I. | Cells in metaphase | M.S.I. | Cells in anaphase | M.S.I. | Cells in telophase | M.S.I. |
|---|---|---|---|---|---|---|---|---|---|---|
| 490 | 64 | 13.06 | 20 | 4.08 | 7 | 1.43 | 5 | 1.02 | 32 | 6.53 |

Photo : 1 ( X= 40)

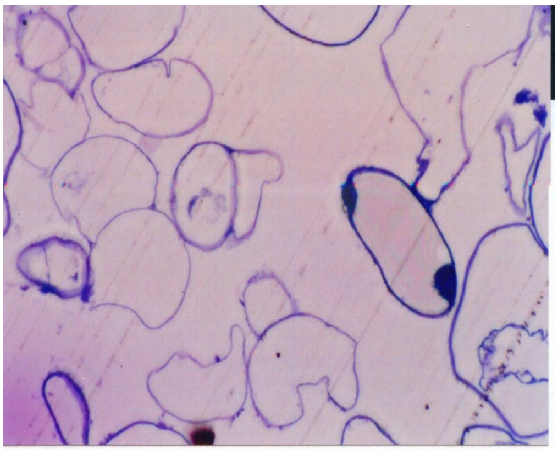
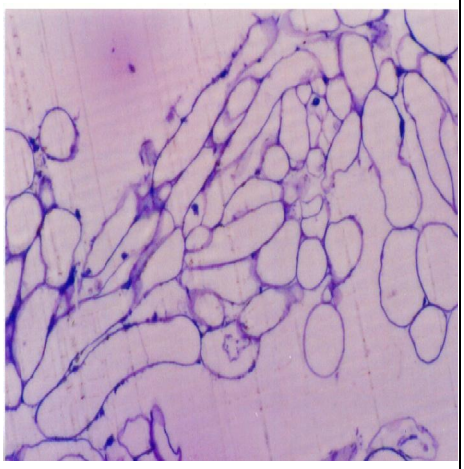


Photo : 2 ( X= 40)



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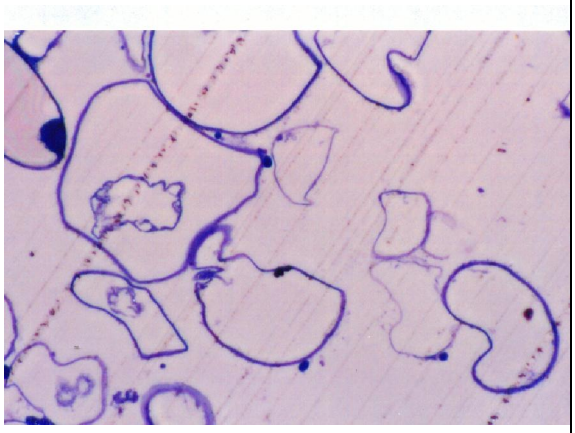

Photo : 3 ( X= 40)

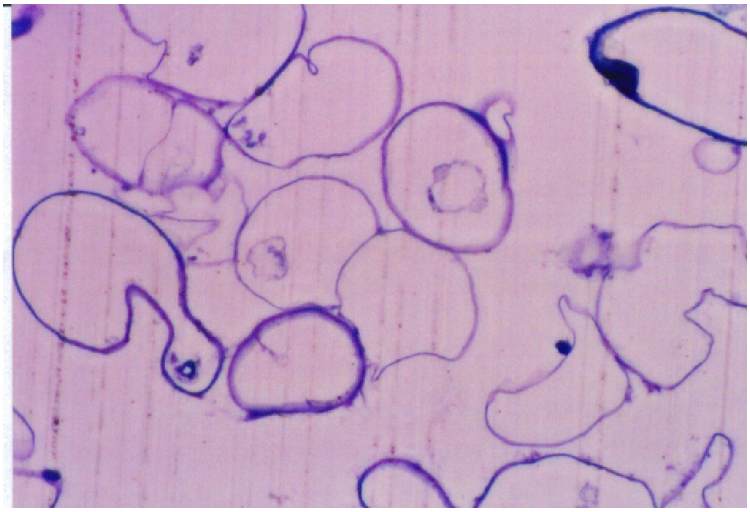

Photo : 4 ( X= 40)

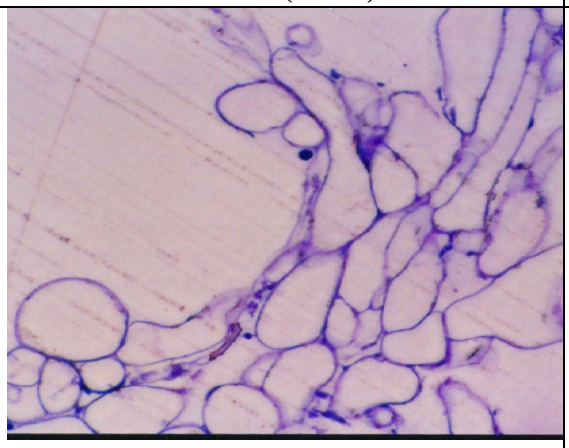

Photo : 5 ( X= 40)

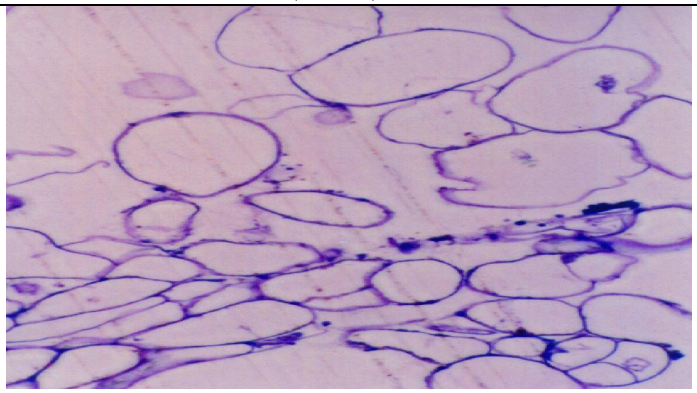

Photo : 6 ( X= 40)

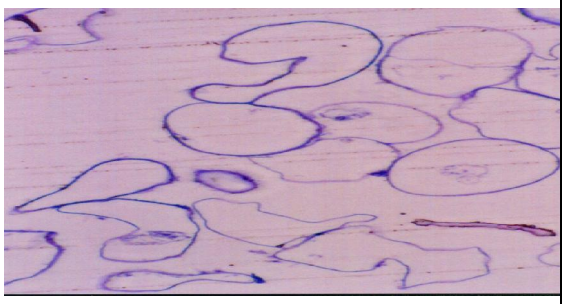

Photo : 7 ( X= 40)

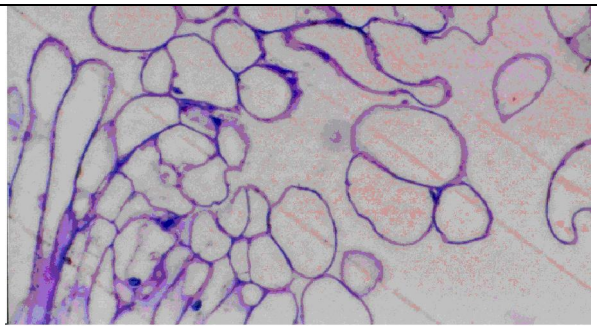

Photo : 8 ( X= 40)

**II ) Ultrastructural study of callus cells using Transmission Electron Microscope (TEM).**

Photos (9-11) show the internal cellular structure of callus. Ultrastructural study on the callus showed large cells with normal structure. Cell organelles such as vacuoles, dense cytoplasm, nuclei, endoplasmic reticuli, mitochondrion, golgi apparatus enveloped by cell wall appeared after using Transmission Electron Microscope (TEM).

Photo: 9 (X = 6.3 X $10^3$)

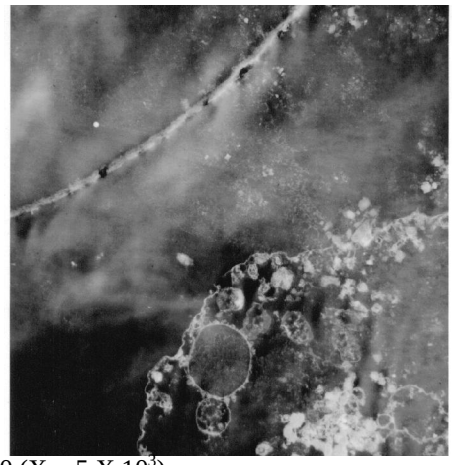

Photo: 10 (X = 5 X $10^3$)

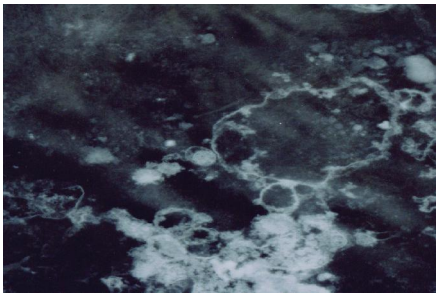

Photo: 11 (X = 6.3 X $10^3$)

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