

## SCANNING ELECTRON MICROSCOPY OF CHLOROPLASTS FROM DUCKWEED CELLS

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**Abstract:** *Lemna paucicostata* was fixed by FPA, critical-point dried, coated with gold-carbon, and examined under the SEM. The fractured chlorenchymatous cells showed an aggregate of egg-shaped chloroplasts with rough surface. Smaller granules were attached to some of the plastids.

### INTRODUCTION

The rapid advance in the development of the scanning electron microscopy (SEM) during the past decade has made it an important tool for the examination of surface. Heslop-Harrison (1970), Richard *et al.* (1971) have reported that the SEM can provide excellent quality micrographs. Because of the depth of field or three-dimensional quality of the image obtained, electron micrographs produced by this instrument can be easily interpreted in terms of what the microspace really looks like. Here we present the image of chloroplasts from *Lemna paucicostata* cells.

### MATERIALS AND METHODS

The mature fronds of *L. paucicostata* were collected from a water tank in the green house. They were dissected from the healthy plant and fixed in aqueous FPA (30% formalin: propionic acid: 50% ethanol=5:5:90) for 2 hours under reduced pressure. The submerged fronds were removed and placed in the fresh fixative overnight. The specimen were slowly dehydrated by passage through a graded series of ethanol solutions to absolute ethanol (30%, 50%, 70%, 85%, 95%, 100%, 100% ethanol, each step 15 minutes). Finally, the absolute ethanol was exchanged for dry isoamyl acetate overnight. The specimens were then critical-point dried for 1 hour by means of a CO<sub>2</sub>-apparatus (Cohen, 1974).

All specimens were coated with a few hundred angstroms of gold-carbon to insure electrical conductivity. All scanning electron micrographs were taken on a JEOL JSM-15 scanning electron microscope operating at 15 KV.

### OBSERVATION AND DISCUSSION

In the course of critical-point drying, chlorenchymatous cells became fractured, thus exposing their inclusions, notably plastids. Fig. 1, 2 and 3 show the 1000 $\times$ , 3000 $\times$ , and 5000 $\times$ , respectively, of the broken cells of *Lemna* chlorenchyma. These cells, with massive chloroplasts sitting on torn cell wall, look very much like bird nests (Fig. 1 and 2). It was estimated that each cell contained approximately 10 to 20 plastids. The chloroplast appeared egg-shaped; its diameter was 2.5 to 3 microns, and had rough surface (Fig. 3). At 5000 magnifications, the picture also shows the smaller granules associated with chloroplasts. Panessa and Gennaro (1974) combined the observation of the SEM and the TEM and suggested that their uncoated

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Fig. 1. A SEM view of fractured chlorenchymatous cells from *Lemna paucicostata*, showing cell wall and chloroplasts (1000 $\times$ ).

Fig. 2. The enlarged view of a "bird nest" or chloroplasts wrapped in a wall (3000 $\times$ ).



Fig. 3. Further magnification of chloroplasts showing rough surface and smaller granules attached to plastids (5000 $\times$ ).

specimen yielded information on mitochondrial-chloroplast association. The physiological significance of this association is not clear. The size of the smaller granules we saw measured 0.3-0.4 micron, which is about the size of mitochondria. It is thus probable that we have found the same organelle association here.

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