

Ultrastructural Cytochemistry of Equisetum Spore Mother Cells
in the Bouquet Stage I. Oxidative reaction of DAB in
mitochondria

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The chromosome syndesis is a characteristic feature in meiosis. It is realized by the bouquet formation during the syndetic stage. In this stage, a peculiar unilateral cell polarity is established. A cytochemical study of Equisetum spore mother cell was carried out to examine this polarity. This material was chosen, because they were synchronized in meiotic process.

A preliminary examination under a microscope showed that the nucleus of the spore mother cell in the syndetic stage was found displaced from the central position to take an eccentric one. In the broader region of cytoplasm, many faint yellow-green colored plastids were found to form a tight mass ---the formation of plastid centre (PC). When the mother cells in this stage were treated with DAB reagent, the mitochondria turned deeply brown. A number of mitochondria was found in the cytoplasmic region of bouquet-base (BB) side close to the nuclear membrane and in the cytoplasmic region of PC side near the nuclear membrane. The density of mitochondria in the former region was higher than that in the latter one. These two regions took an opposite spatial relationship across the nucleus. As cyanide and azide completely inhibited the DAB oxidation, we may say that this reaction was caused by cytochrome oxidase.

In the pre-syndetic stage, as well as in the post-syndetic one, mitochondria were found to distribute evenly in the cytoplasm. Therefore, the formation of the regions denser in mitochondrial distribution may be regarded as an indication of the cell polarity peculiar to the syndetic stage. Electron microscopical examination revealed that in the spore mother cells treated with DAB reagent, a majority of mitochondria increased in electron density. While, in some mitochondria no increase in density took place. Sometimes, even in a single mitochondrion, the intensity of DAB oxidation in cristae differed in different cristae. In higher magnification, mitochondria positive in DAB reaction exhibited electron dense deposits in the inner membrane of mitochondrial cristae. These deposits were 60-70 Å in diameter and formed a row along the cristae at the intervals of 100 Å.

From the results obtained, we may draw a tentative conclusion that the formation of two regions denser in mitochondrial distribution on BB and PC sides across the nucleus indicates the establishment of the cell polarity peculiar to the syndetic stage.