Subcellular Processes in Plants and Animal Cells

LS.7.P186
Ultrastructural analysis of sink-source relations between green and white areas of variegated plant chimera *Ficus benjamina* var. Starlight

E. Labunskaya[1], V. Choob[1]

[1]Moscow State University, biology, Moscow, Russian Federation

styxelenalab@gmail.com
Keywords: variegated plants, plant chimera, sink-source relations, mesophyll ultrastructure

Ficus benjamina var. Starlight is the green-white periclinal chimera with green edge and white center of leaves. Arrangement of areas in the leaf is constant whereas proportion of green and white zones may vary from leaf to leaf. It has been investigated that proportion of white area depends on the order of branching but not on the distribution of future white and green cells in meristem [1]. In mosaic chimeras the sink-source status appears to be dependent on leaf position in the axial system, and products of photosynthesis may act as metabolic signal for leaf primordium [1]. Mesophyll cells in white area of young leaves have few photosynthetically active chloroplasts: the quantum yield of photosystem II averages 0,5 (quantum yield of PSII for green mesophyll averages 0, 54). Mature leaves have no chloroplasts in white cells. Some leaves have 95% of white area per leaf but (однако) they grow and develop. Therefore white zone appears to be the sink, and green areas act as source region. In an effort to estimate ultrastructural changes in white and green areas of young and mature leaves owing to sink-source relations we investigated the ultrastructure of green and white areas of chimera's leaves. We have found that young leaves possess few agranal chloroplasts with huge starch grains. Presumably starch accumulation is connected with sink status of the entire leaf. When leaf becomes mature and switch its sink status to source [2] the condition of white mesophyll declines, and cells degrade. Supposedly the reason of degradation is the carbohydrate starvation.

Ultrastructural traits of white mesophyll resemble to the auphagy [3] that can be summoned by the carbohydrate starvation [4]. Nevertheless there are two different types of white mesophyll cells. The first type includes cells that are far from vascular strands (Figure 1). They obtain numerous extensive lythic vacuoles with degrading organelle, electron-dense droplets and myelinic bodies [5] (Figure 2). The second type incorporates cells that are situated near vascular strands (Figure 3). The cytoplasm in these cells is near cell walls only, there are no organelle and rare electron-dense bodies are exposed. The condition of white mesophyll in mature leaves suggests that the direct transfer of photosynthetic products from the source (green zone) to the sink (white zone) lacks. However the difference between cells that are located near and are situated far from a vascular bundle leads to the conclusion that some carbohydrates from green areas enter to the white zone and slow down the degradation in it.

1. Labunskaya E.A., Zhigalova T.V., Choob V.V.Russian Journal of Developmental Biology. V. 38 (2007), p. 397-405
2. Walter A., Rascher U., Osmond B. Plant Biol. V. 6 (2004),. p. 184 – 191
3. Aubert S., Gout E., Bligny R., Marty-Mazars D., Barrieu F., Alabouvette J., Marty F., Douce R. JCB. V. 133 (1996), p. 1251 – 1263
4. Toyooka, K., Okamoto T., Minamikawa T. JCB. V. 154 (2001), p. 973 – 982
5. Douce R., Joyard J. Annu. Rev. Cell Biol. (1980).V 6, p. 173 – 216
5. The work is performed at User Facilities Center of M.V. Lomonosov Moscow State University under financial support of Ministry of Education and Science of Russian Federation

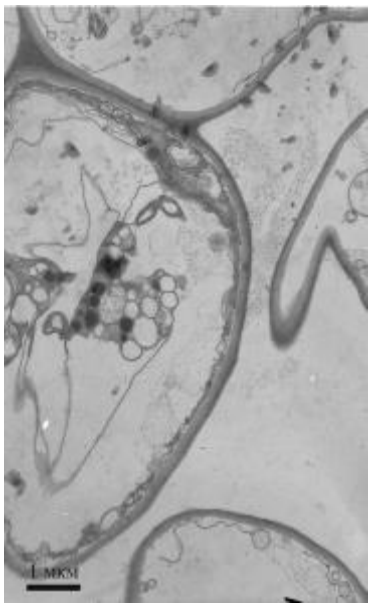

Figure 1. White mesophyll cell that is far from any vascular bundle. Electron-dense bodies and thin cytoplasmic layer are presented.

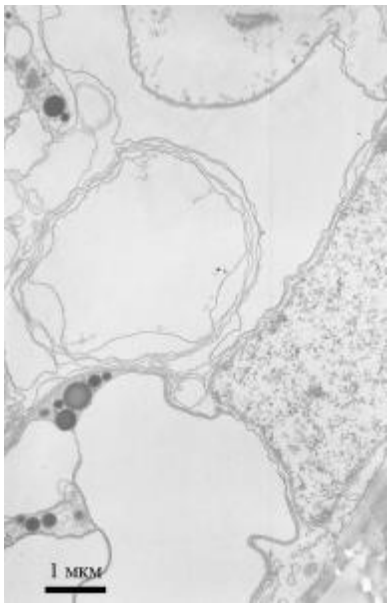

Figure 2. Myelinic bodies in a degrading cell of white mesophyll.

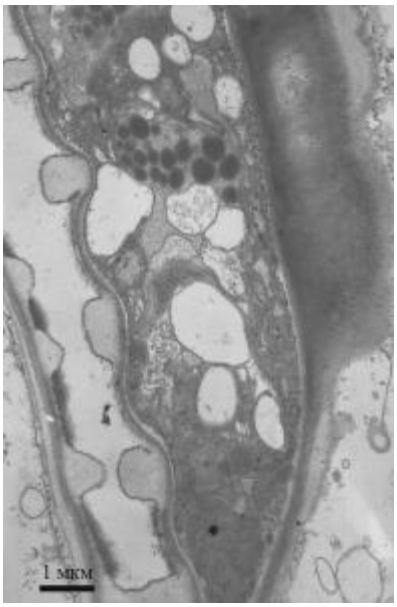

Figure 3. White mesophyll cell near the vascular bundle. There are numerous lipid oils, electron-dense bodies and lythic vacuoles. The cytoplasm is not degraded.