Chromoplast morphogenesis during development of pansy petals

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In flowers pigmented with carotenoid pigments, the latter may be deposited either as crystals or inside several types of lipoprotein chromoplast structures (Camara et al. 1995). Of the latter, the simplest are spherical bodies, plastoglobules. Inspite of the fact that chromoplasts containing plastoglobules are most common, they are so far investigated in a relatively small number of species. Here we ultrastructurally characterized the development of globulous type chromoplasts in yellow pansy (*Viola* × *wittrockiana* Gams.).

Samples for ultrastructural analyses were taken from freshly collected petals at several developmental stages. Small pieces of tissue were fixed for 30 minutes in 2% glutaraldehyde in 0.05 M cacodylate buffer and postfixed for 1h with 1% osmium tetroxide in the same buffer. After dehydration in a graded series of ethanol, the tissue was embedded in Spurr's resin. Ultrathin sections were stained with uranyl acetate and lead citrate and examined using a Zeiss EM10A electron microscope.

The adaxial epidermis of young petals showed plastids containing several small plastoglobules and a small number of membranes (some of them resembling single thylakoids)(Fig. 1A). As the flower buds developed, these plastids gradually differentiated into chromoplasts. In fully developed flowers, the chromoplasts were amoeboid in shape and most of their volumes were occupied by lightly stained plastoglobules (Fig. 1B). The latter were rather large (up to 0.8 μm in size) and often appeared to be enclosed by one or two membrane layers.

The abaxial epidermis of young petals contained chloroplasts, which in the later stages of petal development turned into chromoplasts (Figs.1C, D). The chromoplasts were considerably less abundant than in the adaxial epidermis and also appeared to contain fewer plastoglobules. In these chromoplasts, remnants of the thylakoid system were commonly observed.

In the mesophyll, the proplastids differentiated into chloroplasts with a well-developed thylakoid system. The chloroplasts remained in the mesophyll cells during most of the petal development, and disintegration of the thylakoid system, which was characterized by dilatation of thylakoids and accumulation of plastoglobules, was not observed until the petals turned yellow.

Ultrastructural studies indicated that, during development of pansy petals, chromoplasts morphogenesis occurred predominantly in the epidermal cells. In the abaxial epidermis, chromoplast development started from chloroplasts, while, in the adaxial epidermis, chromoplasts differentiated from simple plastids which contained small number of membranes. Also, in the adaxial epidermis the chromoplasts were more abundant and appeared to contain more plastoglobules.

Reference:

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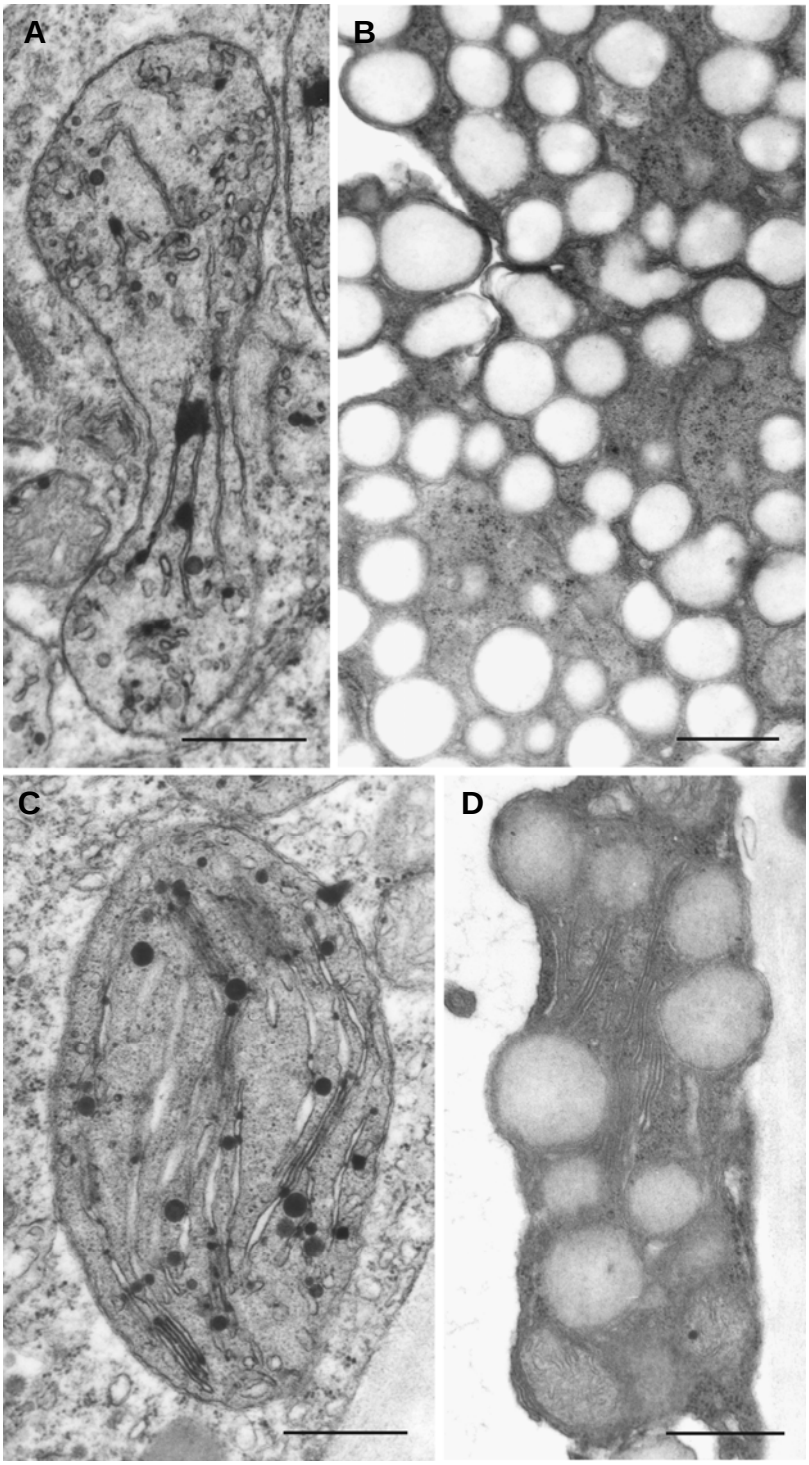

Figure 1. Plastids from petal epidermis of pansy flowers. (A) Plastid from the adaxial epidermis of 19 mm long flower bud. (B) Chromoplasts from the adaxial epidermis of the open flower. (C) Chloroplast from the abaxial epidermis of 19 mm long flower bud. (D) Chromoplast from the abaxial epidermis of the open flower. Bars = 0.5 μm.

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