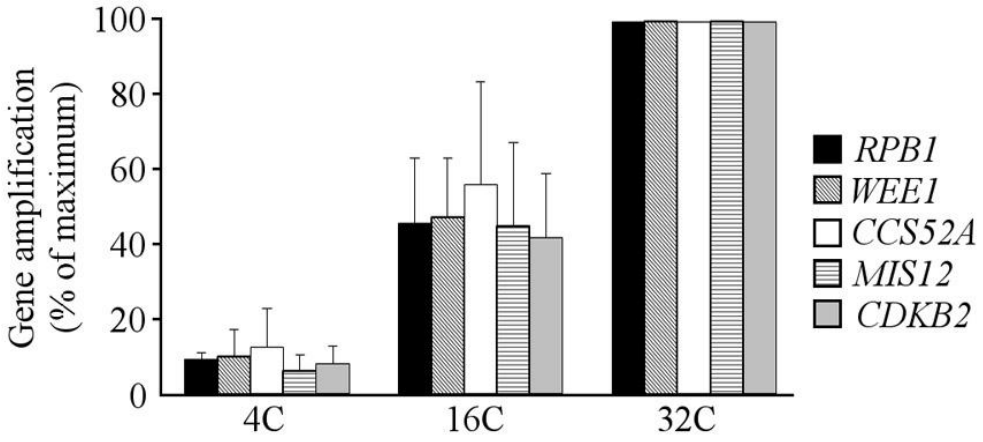

Fig. S1. Quantification of *RPB1*, *WEE1*, *CCS52A*, *MIS12* and *CDKB2* gene amplification according to ploidy levels. The gene amplification of *RPB1*, *WEE1*, *CCS52A*, *MIS12* and *CDKB2* was assessed by qPCR using 100 nuclei sorted at different ploidy levels (4C, 16C and 32C). Data are the mean of three biological repetitions.

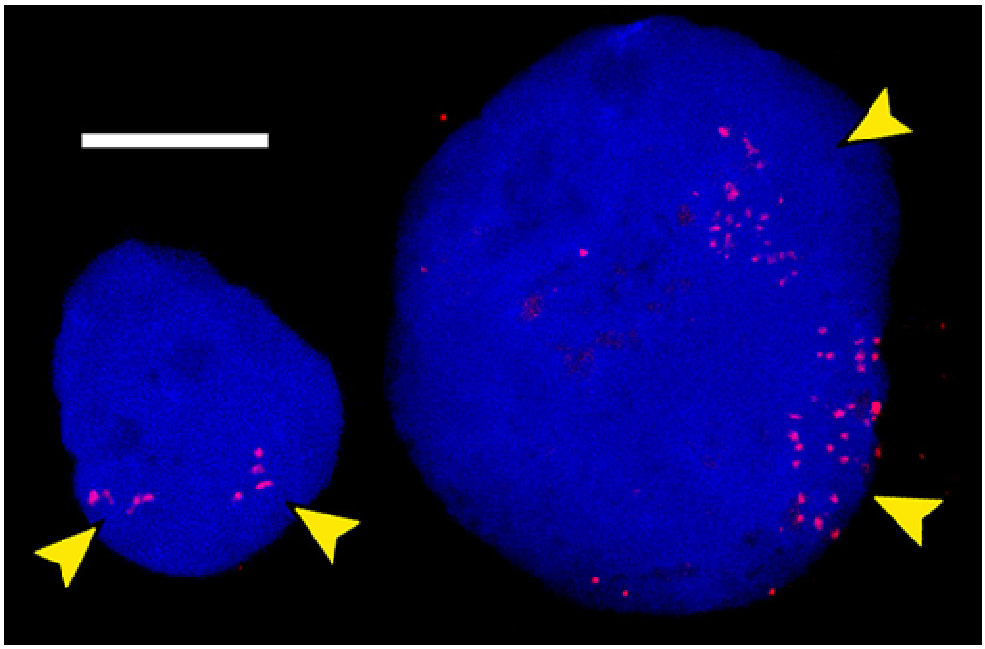

Fig. S2. DNA FISH on isolated nuclei using the *Arabidopsis* 5S rDNA probe. Two pericarp nuclei of different size are represented. Images are maximal projections of confocal *z*-series. The hybridisation signal is clustered in two groups of red dots (yellow arrows) and the difference in dot number indicates contrasting ploidy levels for the two nuclei. Chromatin is stained with DAPI (blue). Scale bar: 10 µm.

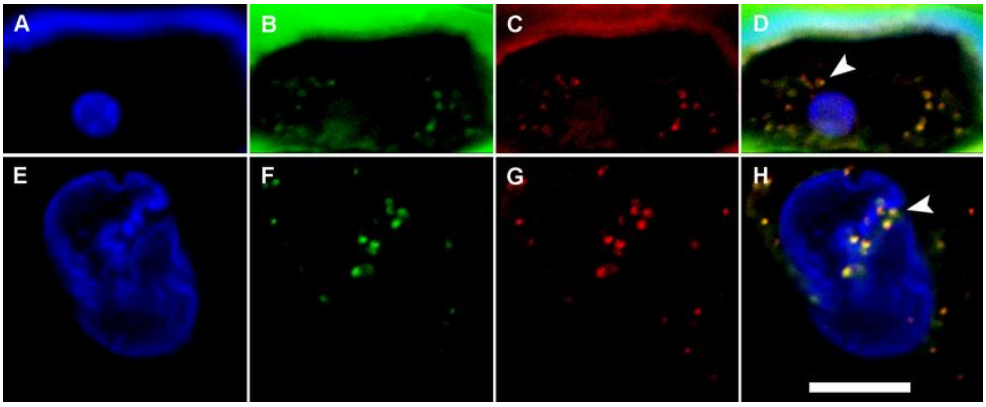

Fig. S3. Viability analysis of mitochondria surrounding endoreduplicated nuclei. (**A-H**) Confocal images (single planes) of DAPI-stained nuclei (blue) and JC-1-stained mitochondria from pericarp areas displaying contrasting ploidy levels: (A-D) outer epidermis (2C-4C levels) and (E-H) mid-mesocarp (32C-128C levels). (A,E) DAPI staining; (B,F) detection of JC-1 monomers (green, 520 nm); (C,G) detection of JC-1 aggregates (red, 585 nm), revealing the maintenance of membrane mitochondrial potential; (D,H) overlay. Pericarp pieces were stained for 7 minutes at room temperature in the presence of DAPI (5 µg/ml) and JC-1 (3.8 µM) in PBS, then briefly washed in PBS and observed under a confocal microscope. The excitation (Ex) and emission (Em) wavelengths were: for detection of JC-1 monomers, Ex 488 nm and Em 515-540 nm; for detection of JC-1 aggregates, Ex 543 nm and Em 580-615 nm. Arrowheads in D,H point to mitochondria. Scale bar: 10 µm.

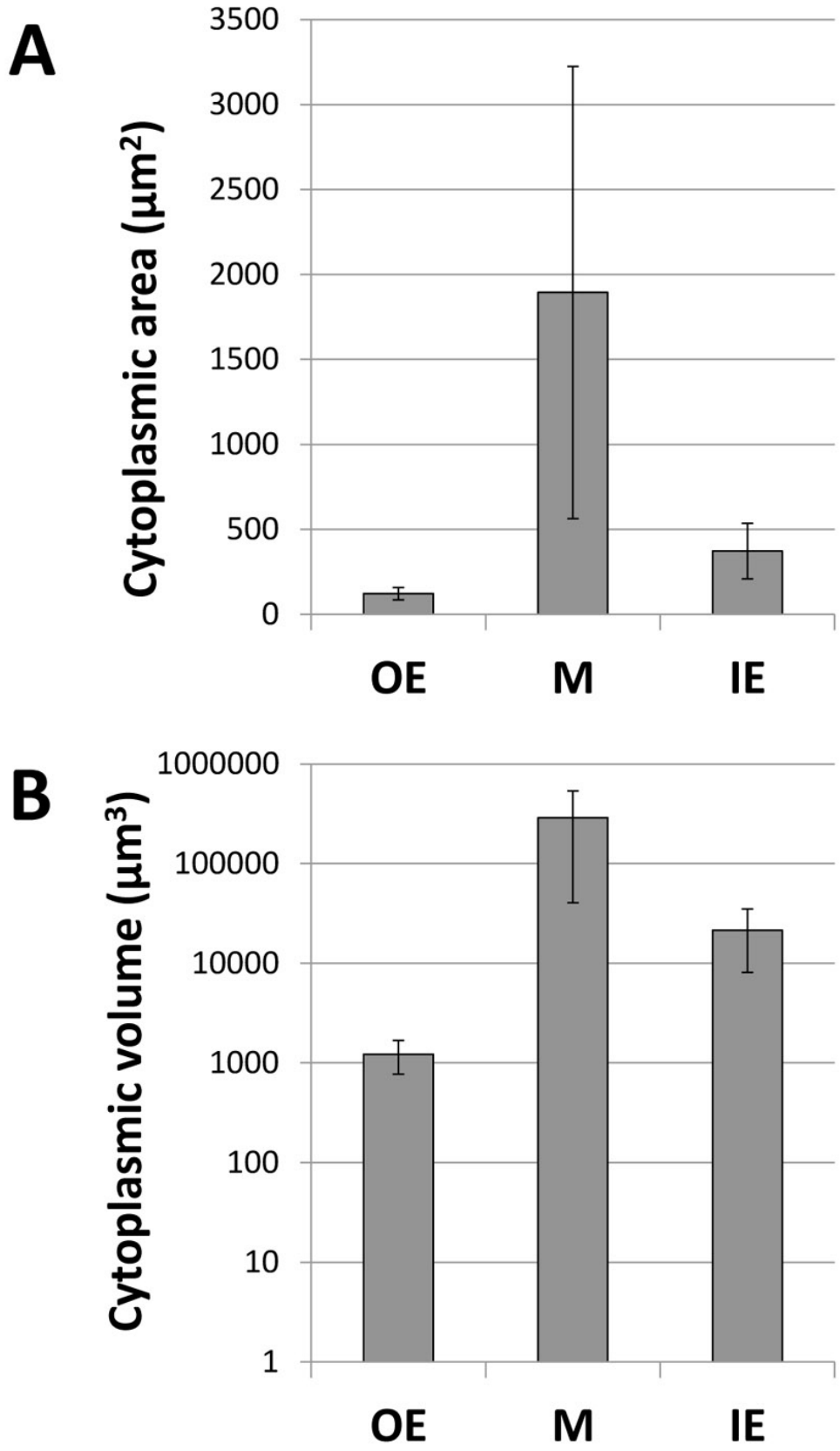

Fig. S4. Cytoplasmic area and volume are adjusted relative to cell position within the three most contrasting pericarp zones in terms of ploidy level. (**A**) Cytoplasmic area according to cell position across pericarp (OE, M and IE) was assessed on photon microscopy images of 1 µm Epon-embedded fruit pericarp sections stained with Toluidine Blue, by excluding the nuclear and vacuolar compartments, using Image-Pro Plus software. The most common nuclear classes in these tissues are, respectively, 2C, 64C and 16C (Bourdon et al., 2011). (**B**) Cytoplasmic volume was estimated from measurements of cytoplasmic area, cell perimeter and cell diameter from (A) as follows. First, cell volume (V_1) was calculated from

maximal (a) and minimal (b) radii measured on sections, assuming that cells have the shape of a revolution ellipsoid [$V_1=(4/3)*\pi*a*b^2$]. Second, mean cytoplasmic thickness (t) was estimated by dividing cytoplasmic area by cell perimeter; this approximation can be made because the cytoplasm only represents a very thin layer close to the cell periphery. Third, we calculated the óvacuolarô volume (V_2) of an ellipsoid with maximal and minimal radii of (a-t) and (b-t), respectively. Finally, the cytoplasmic volume was deduced as the difference: V_1ï V_2. Note that a logarithmic scale is used for the *y*-axis. OE, outer epidermis (*n*=18); M, mesocarp (*n*=23); IE, inner epidermis (*n*=15).