Programmed cell death in cut flowers

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Abstract

In animal cells three main types of programmed cell death (PCD) are presently distinguished, based on the morphology and ultrastructure of the dying cell: apoptosis, autophagy-related death, and necrosis. During apoptosis the cell shows blebs and fragments into pieces. These blebs or pieces are taken in by other living cells, where they are digested. In autophagy-related death the cell dies from within, which is associated with an increase in autophagic (self-eating) bodies in the cytoplasm. Necrosis does not show either of these morphologies, but is often accompanied by swelling of the cell and mitochondria. Plants do not show apoptotic PCD. In plants two types of PCD can be distinguished. One is due to breakage of the vacuolar membrane, which releases hydrolases into the cytoplasm. These hydrolases degrade the cytoplasm and often the cell walls. This process has been called autolytic PCD. The second type of plant PCD is not due to vacuole permeabilization and release of massive amounts of hydrolases, thus has been called non-autolytic PCD. The first type of plant PCD occurs mainly during normal development and during abiotic stress, the second type mainly after pathogen attack. In petals, either on flowers on the plant and in cut flowers, PCD is normal part of terminal organ development. PCD is the phenomenon that underlies the visible senescence symptoms. Examples given are *Iris* and *Ipomoea* (morning glory). PCD in both species starts in the mesophyll cells in between vascular bundles. The flowers are visibly senescent only by the time the epidermis cells die. In *Ipomoea* we found fragmentation of the nucleus which also occurs during apoptotic PCD in animal cells. In both species cell death is accompanied by increased expression of many genes.