Anther and Pollen: from Biology to Biotechnology

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Oleosin Genes are Expressed in Both Gametophytic and Sporophytic Tissues of Olive (Olea europaea L.) Anther

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Both the pollen grain and seeds of oleaginous plant species share ultrastructural characteristics such as the presence of reserve lipids in the form of subcellular structures called oil bodies. These structures have been extensively studied in seed (Huang 1996). Oil bodies from seeds possess a matrix of triacylglycerol/diglycerides surrounded by a monolayer of phospholipids. They are stabilized by a layer of low molecular weight proteins (16 to 20 kDa) called oleosins which prevent these structures from coalescing or aggregating. Oleosins are amphilic proteins displaying several isofoms. Three distinct domains have been identified in these proteins, the most significant of which is a conserved central hydrophobic region. In olive, oleosins have been reported to be present in the long-term storage oil bodies form the embryo and endosperm tissues of the seed while they are absent from oil bodies of the meioecarp (Ross et al., 1993).

Oleosins in both the pollen grain and the tapetum have been described only in Brassica and Arabidopsis (da Oliva et al., 1993; Robert et al., 1994). A characteristic C-terminal domain appears to be present in all oleosins expressed in pollen, but not in oleosins from other tissues (Roberts et al., 1995). In olive, the negative cytoplastm of mature pollen grain inside the anther is very rich in lipid bodies. After anther dehiscence and pollen germination its number noticeably decreases because of lipid multiplication. However, no information about the presence of oleosins in the reproductive tissues of the tissues of the olive is yet available to our knowledge. The purpose of this work is to determine whether these proteins arc expressed in olive anther during ist development.

We report here the use of a clone (ca. 200 bp long) corresponding to the central hydrophobic domain from a Brassica napus oleosin anther cDNA kindly donated by Dr. Joanne Ross (John Innes Centre, Norwich, UK). In situ hybridization to wax sections (7 μm thick) of olive anthers using dig-labelled PCR generated probes from this clone showed intense labelling in both the tapetum and microsporocytes at several developmental stages. Early floral buds (pre-meiotic) did not show labelling in any of the tissues and were used as a negative control. Further RNA dot blot experiments also confirm the pattern of expression observed after in situ hybridization. Southern blot analyses using genomic DNA obtained from olive leaves cut with several restriction enzymes and probed for the same sequence showed a number of bands with sizes ranging 3.5 to 7.0 Kbp. Therefore, these results clearly indicate the presence of several copies of oleosin genes in the olive, perhaps in the form of a multigene family. Oleosin transcripts are on the other hand present in both the sporophytic and gametophytic tissues of the olive anther.

References


Ross JHE, Sanchez J, Millen F and Murphy DJ (1992). Differential presence of oleosins in oleaginous seed and mesocarp tissues in olive (Olea europaea) and avocado (Persea americana). Plant Sci. 93, 203-210

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