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Colza cell autophagy induced of high dose of industrial sewage sludge

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This preliminary study is to evaluate the effects on colza of land application of industrial sludge containing heavy metals especially lead and chromium. We are interested in high doses spreading 100t/ha to better observe the phenomena of induced transformations on colza by the absorption of heavy metals. We used the technique for ultrastructural observation in a transmission electron microscope.
The colza cells show a compaction and marginalization of nuclear chromatin, nuclear membrane and cytoplasmic convolution and condensation of cytoplasm. The kernel then fragments, each fragment are surrounded by a jacket. Some cytoplasmic and nuclear elements are released and are phagocytized by neighboring cells. We observed vacuolation of the cytoplasm and the formation of autophagic vesicles.
The two main ways to cell death are apoptosis and autophagy. Apoptosis was not seen in plant yet. At the nucleus level cell death main characteristics are the nuclear blebbing and fragmentation. At the molecular level, caspases activity (VPE for plants, or metacaspases I and II), chromatin condensation, degradation of DNA detected by TUNEL assay and DNA laddering detected by comet test are the main events. Autophagy is the major degradation and recycling process in cells. Its aim is to address part of the cytoplasm or organelles to the proteasome. In macro-Autophagy a specific feature is the double membrane structure that we can see in electron microscopy. This membrane is known to fusion with the lysosome/vacuole where this is in process. As a rule, the vacuole grows more and more until no organelles remains. Small lytic vacuoles appear in increasing quantity also. Autophagosomes tend to be pushed against the membrane and wall of the cell. Sometime in the literature it was describe a permeabilization or a tonoplast disruption; this is the last stage called mega-autophagy.
The stress generated by heavy metals in industrial sludge spreading, produces in colza cells programmed death. Several authors (Gilchrist, 1998; Larsen, 1994 White, 1996; Wyllie et al. 1980) observed this type of behavior in tobacco and mammals. They attribute this to the case of autophagy or apoptosis programmed cell death. Cryns and Yuan (1998) have shown that autophagy is characterized by a decrease in mitochondrial membrane potential, intracellular acidification, massive proteolysis and DNA damage.
We must complete these observations in a larger study in cell biology and biochemistry to better understand the phenomenon of colza cell autophagy and its relations with the spreading of industrial sludge rich in heavy metals. These transformations will have a significant impact on the colza oil produced by this type of culture and therefore an impact on the human body.