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THE MORPHOFUNCTIONAL PRINCIPLES OF DEVELOPMENT AND EVOLUTION OF FRUIT STRUCTURE AND ULTRASTRUCTURE

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Résumé: De manière synthétique l'auteur presente des idées, des conceptions, des hŷpothèses et des principes originaux importants pour la théorie d'évolution, élaborés à la base des vastes investigations d'ordre structural et ultrastructural, concentrées sur la développement des fruits charnus.

Les données obtenues aux niveau tissulaire et cellulaire sont interpretées par la prisme du leur sense biologique, pendant que le fruit est considéré comme un carpobionte avec les attributs de la stabilité et aussi de la flexibilité adaptative phylogénétique et ontogénétique.

The trend in contemporary Plant science regarding structure, ultrastructure, evolution and functionality of fruits represents a modern direction in reproductive plant biology.

Considerable progress in investigations on fruit structure and ultrastructure has been made over the past 35 years by the coworkers of our Laboratory of Plant structure and ultrastructure, especially on the succulent fruits. As far as we now the succulent fruits constitute a special carpoecological and carpobiological group with its organspecific evolution and functionality.

The knowledge of the structure and ultrastructure of fruit during ripening and maturation is important for understanding fruit ontomorphogenesis and phylomorphogenesis, autonomization phenomenon in plant organ development, which including the immobilization of secondary metabolites and putative reserve of transcriptes (informosomes, olygosomes) and may add to our overall understanding of how developmental fruit structural processes are involved in general principles and modes of plant evolution transformation.

Moreover, it is very important to understanding the analogous features of fruit development "in vivo" and "in vitro" culture, necessary for the gene expression and regulation of cell proliferation in biotechnological goal interest.

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Therefore, the information on structure and ultrastructure organization has been value for the both aspects: structural and biological, every structure and ultrastructure meaning obligatory the biological and/or evolution sense. In our publications we underlined the function and the biological sense of different structure and ultrastructure and its assemblage, as well as, the anatomical organization, by the modes, character and orientation of its transformation. The main position was always the conceptual paradigm of conservative general status of anatomical and ultrastructural organization as rule and particular flexibility of cell ultrastructural feature during the adaptation, growth and development in organ - ontomorphogenesis and phylomorphogenesis.

On the base of our results on structural research we have noticed a few principles in structure and submicroscopic organization of fruit and proposed the following completive hypothesis, conceptions, visions and notions. Among them:

* hypothesis of parallel development of structures independent of organ - specific or species - specific belonging;
* conception of existence of carpohistological types with adequate histo-anatomical zonation among the diversity of pericarp structure;
* conception of the idioadaptive character of the histo-anatomical zonation of fruits, which reflects frecquently the dispersal modes of seeds and fruits;
* four new principles or rules of structural and ultrastructural changes and transformations in cell, tissue and pericarp organization:(i) similarity in histo-anatomical zonation of pericarp to the species of the same genera, (ii) proportionality in development of epi- and endostructures, (iii) coadaptability (coadaptogenesis) of different structure and ultrastructure complexes during the organ (fruit) development, (iv) partition in cell organization integrity (apoptose) under the stress influence and senescence to provide the prolongation and survival of cell metabolism form of apoptotic "islands", as well as, the tissue and organ longevity and viability (for exemple, in frozen preserved fruits):
* initial carpellar model for the ulterior histogenesis, growth and development of fruits;
* concept of the structural "memory" which is supported and exemplified by the presence in the pericarp of rudimental and ancestral structures and ultrastructures (vestigial sclereid's concretions into mezocarp parenchyma);
* notion of the existence of "imobilization reserve" of secondary metabolites and nontranslated transcriptes (informosomes, olygosomes) in the parenchyma cell of the fruit is a strategy of its vitality and longevity;
* similarity between protective sistem of plants and animals;
* notion of "organ - specific biontity" and its product -carpobiont - based on the ambiguity of the nature of fruit which reflect the belonging to reproductive organ, as well as to organismal level (embryo - seed - pericarp complex);

* structural basis of development the large fruits which express the hyperthelia phenomenon, one of the ways of the hypergenesis;
* revision of the monofunctional status of sferosomes after established their polyfunctionality (triglyceride and protein synthesis);
* new term "carotenoidoplasts" instead of the old commonly term "chromoplasts" which is incorrect in this case , because in my opinion the latest includes all colored plastids (green and yellow - orange - red) and no confined by only orange or red plastids. Moreover, we proposed and documented the reversion of the carotenoidoplasts to chloroplasts against the Frey Wyssling's formula of monotrope metamorphosis.

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At the present and for the future all investigations of our Laboratory will be transfere to resolve a new problem "Modulation of proliferative processes and carpogene callus for obtain cellular fruit - biomass". If the researches of structure and ultrastructure of fruit "in vivo" are based on the morphogenesis phenomenon (carpogenesis), the investigations "in vitro" conditions will be include in nonmorphogenesis conception. The new direction which include complex investigations such as explantation, inoculation, subcultivation, amplification of carpogene - callusogenesis to obtaining fruit cellular biomass we named "carpoculture in vitro". The term "carpoculture" does not confine by biomass biotechnology but expands also in microcloning area (embryoidogenesis).

The result on structure and ultrastructure researches of succulent fruits were publicated in different modes (abstracts, articles, reviews, monographs, etc.). The main publicatins overcame the follow monographs: ***Plant ultrastructure*** (in romanian, Kishinev, 1965), ***Ultrastructure of carotenoidoplasts*** (in russian, Kishinev, 1973), ***Principles of structural transformations*** (in russian, Kishinev, 1988), ***Soybean spherosomes*** (in russian, Kishinev, 1993), ***Structure and functionality of fruits*** (in russian, Kishinev, 1995). In total, more than 600 articles, reviews and 22 books and monographs with the english summary have been publicated.

In our Laboratory there are two experimental units - Electron microscopy unit and Fruit experimental complex "Carpotron".