Physiological role of bioliths in plants life

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Examining conditions of forming biominerals in plants it is necessary take into account that in their tissues take place the restoration conditions – the biogenic restoration barriers in ways of biogeochemical migration of elements from environments in plants and inside plants. During decomposition of plants their bioliths, transformed or not transformed by oxidation processes, are entered in the small biological and in the great geologic rotation. Because of this bioliths are presented always in soils, bottom sediments of water drains, lakes, seas, oceans, and of course in sediments. Bioliths are known for 34 chemical elements.

Three physiological functions of bioliths in plants may be discussed. 1) The participation in the mechanisms of nonbarrier-barrier accumulation of chemical elements in various plant organs, tissues, sells and subsell structures. 2) The storing of some chemical elements in winter period of the relative physiological immobility for the intensive consumption in the summer period of intensive vegetation. 3) The active participation of corresponding chemical elements after dissolution of the accumulated bioliths in physiological processes in summer and autumn phases of intensive growth, development and fruit bearing.

The first function of bioliths is characteristic for "old", died, low-active and inactive tissues. It is connected with the transferring of the excessive quantities of chemical elements in the physiologically inactive forms of solid phase – bioliths. This function is established and investigated by us in suberized covering tissues (bark) of trees trunk and in their fruits, – in suberized cones of coniferous trees for example.

The storing of chemical elements is well illustrated by forming of the calcium oxalate Ca (COO)2 crystals significant quantities in physiologically active sprouts and leaves of trees. It is described in thousands of publications. There are foundations to suppose that oxalatization are accompanied by the forming of some other chemical elements bioliths, the native gold for example. The dissolving in summer of bioliths accumulated in winter period of relative physiological immobility is one of the testimony that the most active ionic forms of the corresponding chemical elements arised from the bioliths take place in the determined physiological processes of the vital-functioned plant tissues.

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BIOGENIC MINERALS IN PLANTS

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Our investigations of I970-2000 show that the most diversity of biogenic mineral – bioliths are observed in old suberized tissues of plants. It was established also that very convenient for their investigations are phytoshlichs (Kovalevskii, Kovalevskaya, 1992). It is probable that phytoshlichs may be excreted from other parts of plants and animals. The yellowed and dry defoliated leafs of trees and past years remains of grasses may be suitable also. By the scintillation emission spectral analyses (SESA) in them were revealed mineral particles of elements which were absent in green tissues. Gold is the example. It is presented in green leaves in water soluble forms of sell protoplasm (Kovalevskii, 1976) when absent even in small particles <0.2-2 mkm size. It is important that because of SESA high sensitivity, small weights of samples 0.1-0.2 g are suitable for investigations. The interesting peculiarity of bioliths is they ephemerity – the changing of one mineral into another. It is established specifically for silicon oxides and phosphates in plants.

For the present time it may be stated that in plants may present bioliths of 34 chemical elements: Cu, Ag, Au, Be, Ca, Mg, Zn, Cd, Hg, Al, _, Si, Ti, Zr, Pb, P, As, W, O, S, Se, __, Mn, F, Cl, Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, Pt. It is no doubt that their number would be increased. SESA may assist in revealing and investigations of these and other chemical elements in great degree. Samples of various bioobjects whith probable presence of the largest bioliths, suitable for mineral investigations, may be revealed by SESA.

Our long time (1977-1996) experience of exotic gold microbioliths investigations and recently beginning investigations of platinoids (1992-1999) made possible to state that the main peculiarities of forming and distribution of platinoids bioliths in plants are similar to the well investigated gold. It was established specifically that the largest (2-20 mkm) bioliths of gold and platinoids are formed in old parts of plants and also in roots. The most suitable for SESA among above ground parts of plants are outer suberized layers of the tree trunks bark, suberized cones and "old", including rotten, stumps of coniferous trees. Small (<0.2-2 mkm) bioliths of gold, platinum and iridium were revealed by high sensitive SESA in twigs, sprouts and bast of trees trunk. The absence of gold microbioliths in green parts of plants corresponds with data that gold is presented in the sell protoplasm in ionic forms which are leached by distillated water (Kovalevskii, 1976, Kyuregyan, Burnutyan, 1972). It may be expected that similar phenomenon would be established for platinoids still not determined in saps of plants.