Innovative Technologies of Ecological Nutrition for the Cultivated Fruits and Berries

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A long-term experience of truck gardening, fruit and berry cultivation in Belarus points to the fact that the principal factors of stress negatively affecting the development and productivity of the cultivated cultures are as follows: drastic temperature drops; air and soil humidity; inadequate or excessive nutrients; sunscalds. Unfortunately, plants are under the effect of the concurrent stress-factors leading to a considerable decline in efficiency of the agricultural technologies used. For the intensified technologies, there is an additional problem associated with degradation of the ecological situation due to the increased area of agricultural farming and to the necessity for the extensively used pesticides and other protecting chemicals.

Within the scope of the realized State Program «Innovative Biotechnologies», the science-production enterprise «Unitechprom of BSU» in association with the Fruit Growing Institute, Plant Protection Institute, local foundation of the Scientific-Technological Park, and Belarusian State University, has obtained the results demonstrating that these problems may be easily solved by means of the foliar nutrition of plants used together with the conventional agricultural techniques.

During realization of the Program, the new balanced water-soluble compounds of the complex regenerative action which are based on humic, citric, and succinic acids; chelates of copper, iron, zinc, and manganese have been developed. These compounds are highly effective in regeneration and reinforcement of the protective and growth stimulating biochemical processes in the plants at the critical vegetation stages. Also, the innovative technologies have been developed to produce these compounds and to use them at the agricultural enterprises.

As demonstrated by the data of ICP-AES (inductively-coupled plasma atomic-emission spectroscopy) and spectrophotometry, the balanced composition of the complex-effect compound «Volat-6» includes the active functional groups and stable chemical structures with active bonds, offering the photoprotective, genoprotective, and sorption capacities for a long period of time.

The complex-effect compounds «Volat-8» and «Volat-9» represent an open nonstationary system of a great number of monocrystalline particles in the state of thermodynamic equilibrium, characterized by active autohesion, well-developed specific surface, and good solubility.

As shown by the agricultural tests carrier out in Belarus, owing to the well-balanced composition of the substances adopted to the metabolic processes in the cultivated fruits and berries, the cases of intolerance, sunscald and allergic complications are excluded. There is no cumulation of the components within a plant; their dose is determined by the systematic effect on the vital activities of cell structures in the plant both in normal and exreme conditions. In total the components are more effective than used separately.

The efficiency of the proposed means is supported by numerous laboratory, field, and operating tests performed by the accredited organizations. To illustrate, an increase in the harvested crop of black-currants was 23-25%, a size of the berries increased by a factor of 1.7, increase of shoots was up to 40%; compared to the control lots, the crop capacity of apple trees increased by 18-20%; the yield of standard products was 83-90%.

Considering such properties of the developed compounds as complete solubility in a process solution; good absorbability by the leaf organs of plants; formation of rich leafage; low consumption and small dosage; ecological safety (no adverse effects for microflora, no toxicity, safe use for people, animals, birds, and bees); wholesome influence on the plants; multipurpose usage; compatibility with other prophylactic-treatment means; simplicity of use; good dispersibility with the use of commercial equipment, the developed innovative technologies and compounds look very promising for implementation at the intensive-production agricultural enterprises in different regions of Belarus and in other countries.