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Taras Kavetskyy, Aziz Eftekhari, Rovshan Khalilov

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This research work belongs to a group of authors, contains an in-depth study of the health preservation problem and the use of nanobiotechnology for this purpose, fixes the scientific priority, provides society with the primary scientific information on health promotion, the formation of environmental responsibility.

The monograph is intended primarily for scientists and meets by its content and form of publication, but will be interesting for a wide range of public. The clarity of the wording and presentation of the material, the logic of coverage for the basic ideas and concepts in it are of particular importance. Requirements to the essence of the presentation of the material in the sections of the monograph, similar to the requirements of other scientific publications with certain features of their purpose. Moreover, the issues raised in this monograph are still the subject of lively discussion among contemporary domestic and foreign scholars.

We will be glad if the monograph will not leave you indifferent and you will want to share your impressions of it.

CONTENTS

Chapter 13. KIRLIANOGRAPHY OF BIOELECTRIC PROPERTIES IN PLANTS

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Abstract. *In recent years, due to the accumulation of a large number of essentially new fundamental knowledge, system biology and system medicine have been developed. According to scientists, these areas can allow generalizing the principles of cells, tissues and the body functioning as a whole, including plants. The development and practical application of highly sensitive methods for assessing and predicting the bioactivity of a plant object, based on the study of plant electrophysiology, are promising. Such studies were first carried out by the Kirlian spouses in the last century, patenting the method and device. The method is based on photographing an object of nature in a high-frequency field with the formation of a gas discharge. The method, known in the world as the Kirlian effect, is widely used in various modifications to solve diverse applied problems.*

Kirlian photography on an X-ray film allows visualizing the electrophysiological damage of plants at a biochemical standard level of research and their visible manifestations. The electrophysiological features of bioenergy at different parts of plants have been identified. The use of Kirlian photos of plants is advisable for assessing the ecological state of the environment, assessing the state of plant metabolism to predict their vital functions.

Keywords: *system biology, system medicine, bioactivity of a plant object, plant electrophysiology, Kirlian photography, Kirlian effect.*

Introduction

Plants play an important role in the life support of mankind, and above all, in maintaining the necessary gas composition of the atmosphere. Under the conditions of modern technocratization in the world and technological pollution of the environment, it is also relevant to study the biological state of plants as an ecological situation indicator in the region [15; 16].

Existing global trends in the introduction of an artificial element in all spheres of human activity, including agriculture, the food industry, prompt to develop methods for monitoring the state of biological energy in plant objects, as sources of human and animal nutrition.

Existing GOSTs for the content of certain substances in plants and their fruits suitable for consumption are not able to predict their invariability in time and identify the risks of early unsuitability, including for germination.

In recent years, due to the accumulation of a large number of essentially new fundamental knowledge, system biology and system medicine have been developed. According to scientists, these areas can allow generalizing the principles of cells, tissues and the body functioning as a whole, including plants.

Vernadsky V. I. stated that there are no new energy forms in the structure of living matter. Only numerous energy flows are realized there, which are integrated by the state of the living substance itself, its totality of the biosphere and individual representatives of this substance [2].

Based on the V. I. Vernadsky, A. L. Chizhevsky school, assumptions of K. E. Tsiolkovsky, experimental data, academician V. P. Kaznacheev concluded that “living matter is associated at all levels of evolution with field planetary-cosmic flows, which nature is still not well known. It is possible that these flows are beyond the statements made by physicists, which we know from the scientific point of view of the last century in our natural world. This is only 5-7% of the knowledge about the cosmos planetary infinite matter. The phenomena that other are trying to explain using well-known electromagnetic and other processes of atomic-quantum nature are hidden in this obscurity. The Universe may turn out to be a giant hologram” [6].

The earth is known to be surrounded by an air envelope, which density varies as it moves away from the earth’s surface. In the upper, attenuated layers of the atmosphere, continuous ionization processes occur under the influence of cosmic and solar radiation and other factors. This region of the air envelope is called the ionosphere.

The ionosphere is a positive ions generator forming an electric field directed toward the earth, which, in turn, carries a negative charge.

Earth and the ionosphere – these, figuratively speaking, electrodes are separated by a dielectric – atmosphere, forming a kind of an electric capacitor of a spherical shape.

In a dielectric, in other words, in an atmosphere which lower layers have high dielectric properties, electrical phenomena and processes in the form of, for example, lightning discharges occur. In an electric field at atmospheric pressure, gas particles are in different molecular states, with different potential values interacting with each other.

Since the formation of the atmosphere on earth for many millions of years, the “life” of the electric field between the earth and the ionosphere has been going on in the cycle of ionization and recombination of gas particles.

In an electric field, every object of animate and inanimate nature is polarized to one degree or another. When the electric field is sufficient for intense ionization of the air, then coronation is sometimes observed in the dark, that is, the electric glow of some objects, known as the “St. Elmo’s fire”. In this reservoir of electrical energy, biological life on earth was born and continues to develop.

Unlike the animal kingdom, plants, by virtue of their anatomical structure, have a damp bed for the root system in moist areas of the earth, and therefore they are grounded for life.

When the atmosphere is saturated with water vapor, and its dielectric constant changes, and the capacitive characteristic of the atmospheric condenser reaches large values, then, as it is known, they are “pumped” intensely from the ground to the atmosphere or from the atmosphere to the ground with electric charges, through the roots, trunk, branches and leaves of plants. In other words, an electric current flows through the plant, sometimes of large magnitude. Thus, a plant, like a lightning rod, is a constant mediator of electrical exchange between the earth and the atmosphere.

It is likely that the atmospheric electric field affects to a certain extent the vital activity of the plant organism under these conditions. Today, the state of the natural electric field is largely distorted by the rapid development of electronic technologies.

Hence, the development and practical application of highly sensitive methods for assessing and predicting the bioactivity of a plant object, based on the study of plant electrophysiology, are promising.

Such studies were first carried out by the Kirlian spouses in the last century, patenting the method and device [7]. The method is based on photographing an object of nature in a high-frequency field with the formation of a gas discharge. The method, known in the world as the Kirlian effect, is widely used in various modifications to solve diverse applied problems [9; 21].

Spouses Kirlian established previously unknown patterns of their interaction with the environment in numerous studies carried out at various plants. Namely:

1. Plants are in constant electrical exchange with the atmosphere and the earth.

2. The anatomy and geometry of the leaf blade margin is the organ of the plant, performing electrophysiological functions in the plant's life.

3. Ionizing the near-canopy layer of air, this organ of the plant activates gas nutrition products, which are transported under the dynamic action of the electrostatic field of the leaf plate and penetrate into the plant cells by ion diffusion, where the biochemical processes of carbon assimilation continue.

4. It is proved and experimentally fixed that plants conduct electric current through special channels isolated from wood, selectively located in the cambial layer of the plant.

5. As a result of the recombination of gas nutrition products (carbonic acid air ions) with a polarized leaf crown, electric charges move from the soil to the crown through the plants to compensate for the potential of the crown, i.e. a direct current electric current flows through the plants.

6. This phenomenon is accompanied by electrolytic processes not only in the channels of the electroconductive system of plants, but also in soil bordering the root (hair) system (electrolytic dissociation).

7. The corona discharge coming from the leaf blade of plants forms luminous clusters of spherical shape, wandering in space [8].

The aim of the work was to study the possibility of classical Kirlian photography of various parts of plants to visualize the state of their bioenergy.

Materials and methods. Kirlian photography of plant samples was carried out on an x-ray film under standard conditions for its development. Freshly sampled for 2 hours parts of plants (twigs with buds, flowers, leaves, fruits) were used. The studies were carried out on an experimental device "REC 1" developed by the Ukrainian Research Institute of Engineering Technologies [16]. An X-ray film rests on the device's desktop, objects for photographing were placed on it, an operator touched to each of them with an electrode, the film was shot and developed. It is possible to study human fingers using a stencil (*Fig. 1*).

Fig. 1. Kirlian photography device

Results and discussion

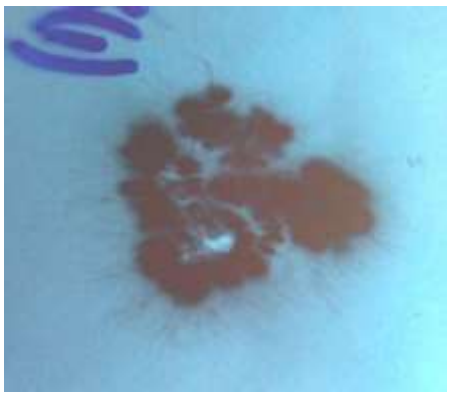
The figures below show our own research: photographs of parts of plants and their Kirlian (*Ki*) images (*Fig. 2; Fig. 3*).

Photo of cherry sprig with leaf-buds

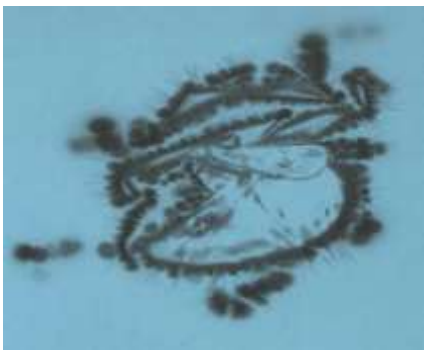
Ki-photo of cherry sprig with leaf-buds

Photo of apricot leaf-buds and flower

Ki-photo of apricot flower



Ki-photo of apricot leaf-bud



Ki-photo of a rose flower

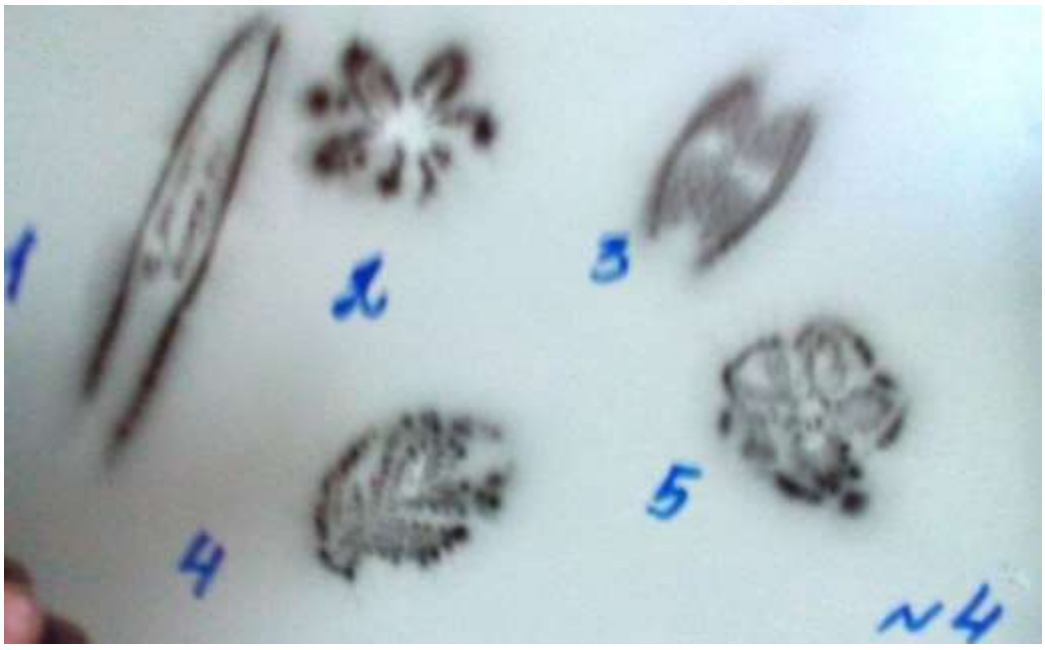
Ki-photos: 1 – poppy leaf, 2 – sorrel, 3 – currant, 4– strawberry

Photo of a decorative poppy leaf

Photo of sorrel leaf

Photo of currant leaf

Photo of a wild strawberry



1 - a snowdrop leaf, 2 - a snowdrop flower, 3 - a periwinkle leaf, 5 - a periwinkle flower, 4 - a rose leaf

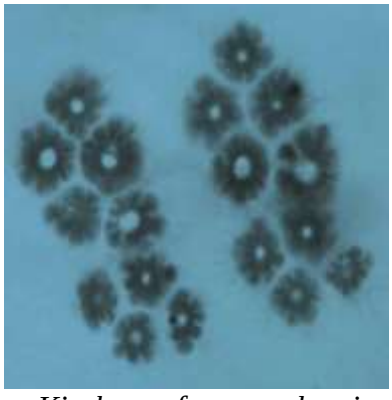
Photo of a snowdrop leaf and flower

Photo of a periwinkle flower

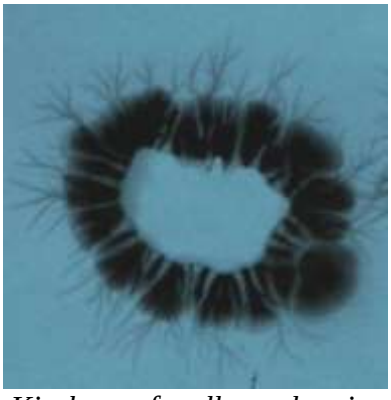
Photo of periwinkle leaf

Photo of a rose leaf

Fig. 2. Photos of plant parts and their Kirlian images



Ki-photo of currant berries



Ki-photo of mulberry berries

Ki-photo of an apricot fruit

Fig. 3. Ki-images of the plant fruits

The following differences of the Kirlian glow around different parts of the presented plants are noteworthy. Namely:

1. There is a more intense glow of the crown around the leaf-buds and flowers, compared with branches and leaves, regardless of the plant species. That is, the bioenergy of the potential growth of the leaf-bud, flower for the subsequent development and formation of the fruit is more

concentrated. The function of leaflets and leafage, in comparison with them, is less active in gas exchange with the environment.

2. The Kirlian-photographic picture of the leaf-bud from which they were born is preserved in the flower and fruit. There are various types of gas discharge glow of the center of the leaf-buds and its surrounding substance. The center has a high brightness, the surrounding substance is low. This indicates various types of chemical reactions and redox processes in the corcule itself and in the material ensuring its subsequent development.

3. In addition, given the research of V. L. Voeikov, high brightness, indicating the minimal known ionization of air, means not only the known molecular-atomic interactions with the photon emission, but other mechanisms with their absorption are also possible. The former is characteristic for catalytic processes in biological systems, and the latter is characteristic for synthetic processes in cellular metabolism [1]. This is logical for the function of plant growth from the "grain" of the leaf-bud. Earlier, we experimentally revealed a correspondence between the brightness of a biological fluid and its biochemical composition (protein content, their breakdown products, lipids, microelements) [18]. Given this, it is advisable to differentiate the growth or germination potential of a plant by the type of luminescence intensity of its grains (leaf-buds, tubers, etc.) at the stage prior to active vegetation.

4. When comparing with our results of kirlianographic studies for water, it was found that a high brightness is typical for highly structured waters with high bioactivity (coherent water) [11; 19; 20]. “The role of water, which is part of biological fluids (blood, lymph, cerebrospinal fluid, etc.), is still poorly covered in modern literature, but its importance as an information factor is extremely great and requires further reflection. Moreover, according to scientists, any effects on water and solutions – electrical, magnetic, electromagnetic, ultrasonic, electrochemical - can be explained on the basis of energization of a virtual pair of elementary particles of electron-positron” [13].

“Some aspects of the cellular redox processes biochemistry can be interpreted only as protons and electrons flows. The transition from nonliving to living is usually understood as the appearance, on the basis of *quantitative* accumulation, of a series of *new qualities* of developing matter, organized in a certain way. Embraced by a holistic system of a higher order, atoms and molecules cease to exhibit *some* of their properties, but other properties arise from their interaction, which no longer belong to the components. On the other hand, the combination of components in a structure can lead to the use of *some* qualities that are not manifested when the components are in an isolated position or in unsuitable substances. The biological structure could be a material structure allowing manifesting – at the macroscopic level – a number of properties inherent in the quantum-mechanical level of matter” [3]. Myakin S. V considers "the presence of the smallest energy bodies, called biophotons or somatids in water, especially contained in living organisms. Dr. Enderlein (Germany) and Gaston Naessens (Canada) reported the observation of such particles with negative electric charge in blood and other living fluids” [14].

“Between the faces of the cluster elements, there are distant Coulomb forces of gravity, which allows us to consider the structured state of water in the form of a special information matrix. S.V. Zenin in his works showed that water molecules in such formations can interact with each other according to the principle of charge complementarity, known to science in DNA research, due to which the construction of the structural elements of water into cells (clathrates) is carried out, which is observed using a contrast-phase microscope. It is assumed that the water was the main matrix for the first DNA synthesis, which is the information basis for all biochemical processes and life” [5].

Obviously, the progenitor water had a certain structure, allowing it to perceive the cosmoplanetary conditions of the origin of certain biochemical processes characteristic of living. According to today's ideas, “natural water is characterized by fractality or ordering and dissymmetry or optical activity” [12], characteristic of biological life.

“Currently, many facts have accumulated about the special state of water in a living organism, where water is in contact with macromolecules of protein substances. The effect of the properties of water in maintaining the globular structure of enzymes has been proved, the structure and function of their active center depends on the conformational changes (M. V. Marguni, 1969). Some authors

(Z. A. Sorokina, 1978) draw attention to the reduced, in comparison with bulk water, dissolving ability of a liquid in a cell: cellular water behaves as a phase with respect to the surrounding aqueous solution. The very fact that it differs from the properties of water in large volumes can be considered established. One of the main functions of protoplasm, apparently, is the creation of specific structures in the aquatic environment. The latter contribute to the appearance of such forms of charge transfer that would be impossible outside these structures” [10].

This feature of the living is determined by the pattern of its biofield, along which force lines the Kirlian radiation is directed, which explains the difference in the inhomogeneity of the glow on the leaf itself, as was also indicated by Kirlian studies.

“Plants attract attention by the variety of leaf shapes and the variety of their edges contours. The shape of the leaf blade and the pattern of its margin is a stable phenomenon, and each type of plant has its own leaf pattern. In plant physiology, they are of great importance for life. In particular, the notches at the edges of the blade, given the fact that the vital activity of plants proceeds in an atmosphere of an atmospheric electric field and that the plants are constantly electrically grounded by the root system.

The edge of the leaf blade of plants bears a function, expressed by the constant ionization of the air in the atmosphere; polarized surfaces of plant leaves transport and ion diffuse gas nutrition products; the recombination of aeroions from the plant leaf blade (in the gas supply process) is accompanied by the movement of charges from the ground to the canopy (electric current), which causes electrical processes (electrical dissociation) in the whole plant and in the near-root layer of the soil; the root system, trunk and canopy of plants in the process of electrical exchange (earth-atmosphere) conduct electric current through themselves not over the entire cross section, but through isolated channels; streamers sometimes generate a special type of a spherical shape discharge during the pruning of a leaf blade” [8].

As it can be seen from the presented Kirlian photographs, all the studied objects have a matrix structure. The properties of objects with a matrix structure are determined not only by the properties of the elements, their ratio (the transition of quantity to quality), but also the sizes of the structural elements of the object of *P* and *L* (*P* is the fraction of occupied elements on the lattice; *L* is the lattice dimension) .(*Fig. 4* – percolation).

$$P = P_C^{\,L} = P_c^{\,l/a},$$

where:
P – is the probability of a geometric phase transition;
$\boldsymbol{P_c}$ – is the bulk particle of the heterophase;
L – is the dimension of the percolation lattice;
a – is the particle size of the heterophase.

For Kirlian images of leaves, structural elements form a connecting cluster such structures are characterized by a synergy of properties (Fig. 4. L = 8; P = 0.4; P = 0.6).

The bioenergy properties of the leaf-buds and flowers increase significantly due to the features of geometric phase morphology (Fig. 4. L = 2; P = 0.2). The larger the size of the structural elements, the stronger they appear in the system (power dependence.

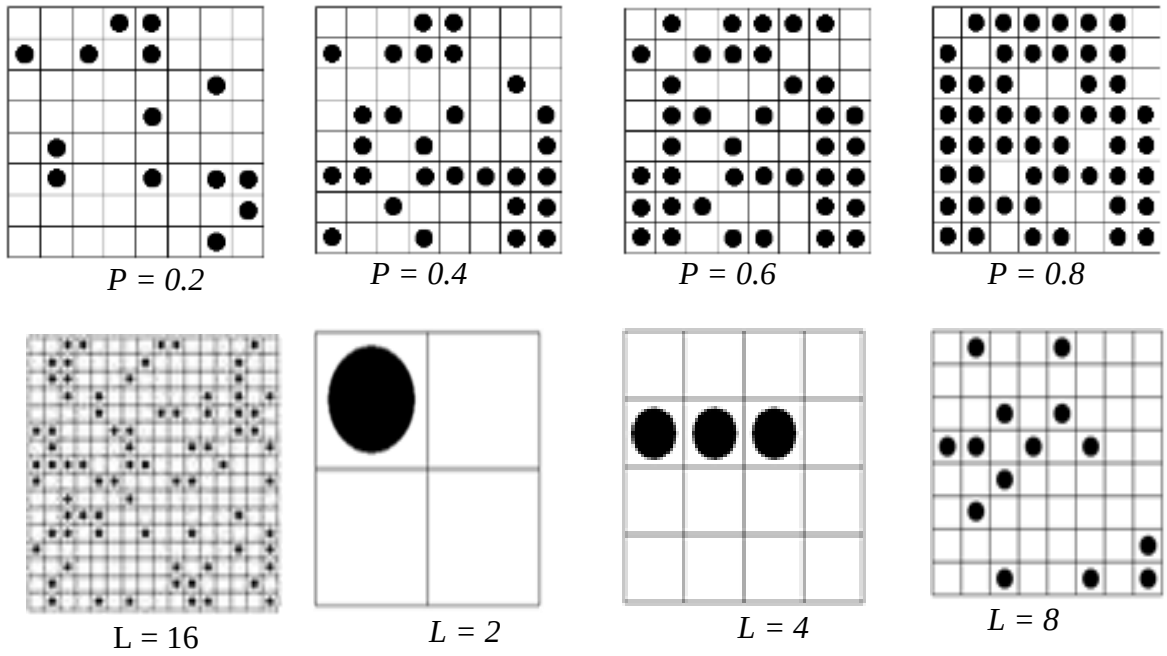


Fig. 4. Examples of percolation configurations on a square lattice for the different values

We obtained a Kirlian photograph of a freshly sampled leaf of chlorophytus without visible external changes. But a picture of the glow crown showed its damage, which will inevitably lead to leaf death (Fig. 5). That is, Kirlian photography revealed electrophysiological disorders of the plant at a subtle level of matter, which is predictive for biological life.

Fig. 5. Kirlian photograph of electrophysiological damage to the leaf of chlorophytus without visible external signs

Figure 6 shows more significant electrophysiological damage to the leaf of a chestnut compared to apparently not damage.

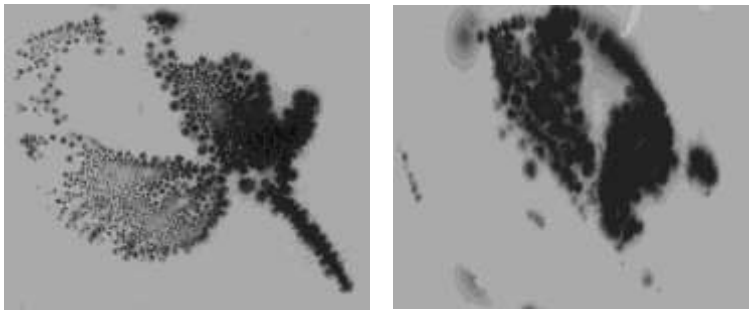


Fig. 6. Kirlian photo of not damaged (left) and damaged (right) chestnut leaves

Living objects are nonequilibrium formations; they cannot maintain the unique dynamic stability of their organization only due to the energy influx. A single ordering factor of the system is also needed. A. G. Gurvich called this factor the biological field [4; 17]. “A. Saint-Dieri (1960) suggested that diverse interactions can occur without material contact. They are possible through either energy bonds or an electromagnetic field, which, thus, together with water and its structures is represented as a matrix of biological reactions... Biological functions can actually consist in the formation and disruption of water structures” [10].

Today, the fact of photon emission without external stimulation by all living cells, including plants, has been established. The phenomenon was given the term Ultra-Weak Photon Emission (UPE). Its radiation is explained by the formation of a bioelectromagnetic field of tissues during metabolic processes. Today, the spectrum and intensity of a person’s UPE are considered recognized, and the main source, statistical distribution, and fractality are partially understood. The discovery that forces one to change the view on the formation and energy transport in the human body is the discovery of a new anatomical formation is called the Primo Vascular System (PVS). It is a morphological substrate providing the formation and transport of biophotons [22]. Obviously, these laws are universal for all living organisms, on the basis of which their interaction occurs, including between plants and the environment, plants and the human body.

The only express method allowing to visualize and analyze the electrophysiological state of a living object, in this case plants and their fruits, associated with its electromagnetic component, is classical Kirlian photography and its modifications.

Conclusions

1. Kirlian photography on an X-ray film allows visualizing the electrophysiological damage of plants at a biochemical standard level of research and their visible manifestations.

2. The electrophysiological features of bioenergy at different parts of plants have been identified.

3. The use of Kirlian photos of plants is advisable for assessing the ecological state of the environment, assessing the state of plant metabolism to predict their vital functions.

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