

The Effect of Ultra-Weak Radiation on Biological Objects

Batyanov A. P*

Institute of General Pathology and Pathophysiology 8 Baltiyskaya st. Moscow 125315 Russia

***Corresponding Author**

Batyanov A. P. Institute of General Pathology and Pathophysiology 8 Baltiyskaya st. Moscow 125315 Russia.

Submitted: 2025, Mar 10; Accepted: 2025, Apr 28; Published: 2025, May 08

Citation: Batyanov, A.P. (2025). The Effect of Ultra-Weak Radiation on Biological Objects. *J Electrical Electron Eng*, 4(3), 01-07.

Abstract

The data on the influence of ultra-weak radiation on the development of *Crassula* shoots are presented. The issue of the similarity of the mechanism of energy generation and transmission in bio and inorganic systems is discussed. The assumption is made about the transmission of ultra-weak radiation outside the optical range, due to the electromagnetic field of electron vacancies - the field of "holes".

Keywords: Mitochondria, Transition Metals, Hybrid Orbitals, Quenching Effect, Ultra-Weak Radiation from Pt, The Development of *Crassula* Shoots

Abbreviations

PMT: Photomultiplier

MX: mitochondria

ADF: Adenosine Diphosphoric Acid

DNF: Dinitrophenol

1. Introduction

In previous works, an assumption was made about a possible analogy of the physical processes of generation of ultra-weak radiation of biological and inorganic systems. The main evidence of such an analogy is the similarity of the quenching effect of radiation of biological objects (phosphorylating mitochondria, synchronized culture of *Torula Utilis* Figure No. 2, No.4) and radiation of transition metals (W, Pt, Mo), with photoexcitation or electrification in a hollow resonator [1,2]. The similarity in intensity and action suggests a similarity in the processes of radiation generation. It is omitted that with violations of the electron equilibrium in the surface electron layers of transition metals, in particular Pt, super-weak coherent radiation occurs, associated with the formation of hybrid orbitals. From this point of view, experiments on recording the effect of radiation of transition metals, in particular Pt, on biological objects are of particular interest. The presented work presents data on observations of the growth of the *Crassula* plant under the influence of super-weak radiation of Pt.

2. Materials and Methods

The block diagram of the plant irradiation setup is shown in Figure 1. A light-hermetic hollow plastic resonator containing Pt, placed in a light-tight chamber, was used as a direct emitter. Irradiation was carried out at a distance-optical contact with the irradiated plant at a distance of ~15 mm for 1.5 hours, once a day for 16

days, from 04.01. to 19.01.2025 {Figure 1}. In the experiments, to observe the development, 6 freshly planted *Crassulae* shoots were used, shoots of the same size and color (6 leaves on each, two leaves in successive segments), planted in flower soil 1 hour after cutting from the main branch of the money tree. The observation duration was 3 months, the leaf area, color and height of the plant were determined 3 times a month. All plants were divided into two groups: 3 intact control plants, 3 experimental plants. In the experimental group, each plant was exposed to radiation from a hollow resonator with Pt, but in 3 different modifications corresponding to phases 2, 3, 4 of the model experiments {Figure 7- 11, Figure 14}.

- **Plant No. 1:** irradiation for 1.5 hours in a light-proof room chamber, in a dark room from a hollow plastic cylinder of an emitter with Pt inside, without excitation (without connecting Pt to the negative pole (-) of the battery, when distant-optical contact at a distance of 15 mm, corresponds to phase 2 of the model experiment with Pt, total irradiation time 24 hours 35 minutes. Average T 18.5 0 C.
- **Plant No. 2:** irradiation for 1.5 hours in a light-proof room chamber, in a dark room from a hollow plastic cylinder of the emitter with Pt. connected to the negative (-) pole of an 8 V battery, with remote optical contact at a distance of 15 mm, corresponds to phase-3 of the model experiment with Pt, the total irradiation time is 24 hours 48 minutes. Average T 18.2 0 C.
- **Plant No. 3:** irradiation for 1.5 hours in a light-proof room chamber, in a dark room from a hollow plastic cylinder of the emitter with Pt, without contact with the negative (-) pole of the battery, after disconnections, when remote optical contact at a distance of 15 mm, corresponds to phase-4 of the model experiment with Pt, total irradiation time 25 hours 12 minutes. Average T 18.1 0 C.

All experimental (irradiated) plants (No. 1, No. 2, No. 3) were introduced into a light-tight chamber sequentially after 1.5 hours, plants of the control group (No. 4, No. 5, No. 6) at the time of

irradiation were in a dark room ~ 0.5 meters from the light-tight chamber, the rest of the time the entire group of 6 plants was outside the dark room, at the same temperature and illumination.

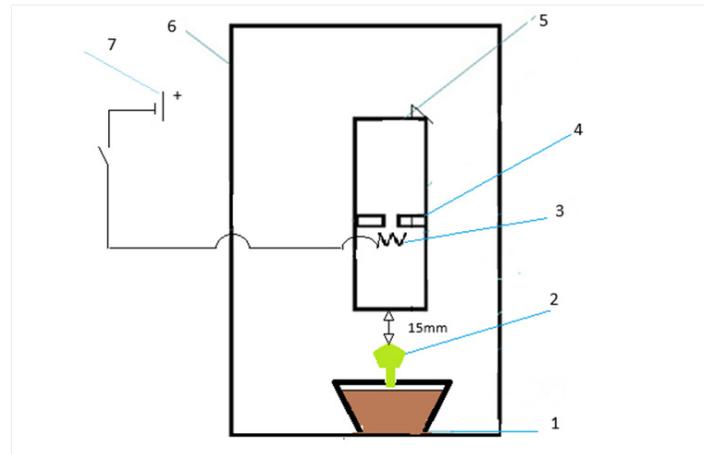


Figure 1: Block Diagram of the Plant Irradiation Installation

1. A glass with flower soil and a planted shoot in a light-tight chamber
2. Crassula seedling
3. Pt -plate a (incorrect hormonal system)
4. Foam plastic diaphragm inside a light-hermetic plastic resonator cylinder.
5. Light-hermetic plastic cylinder resonator (with linearly increasing transmission up to 15% from $\lambda = 8\mu$ to $\lambda = 28\mu$),
6. Lightproof camera
7. supply 8 V.

8, 9, 11, 12}.

Shoot No. 3) Change in color of a pair of lower tier leaves, on the 3rd-4th day of irradiation, from green to yellow-green with a burgundy tint along the edges, color changes last for about 3 months. Slowdown in development and growth - the average area of plant leaves is approximately 60% less than in the control group. Average growth from the ground surface is approximately 34% less than in the control group, while the initial development (3-4 mm) of a new, 4th, upper segment is noted. {Figure 7- 10}.

The leaf area and plant growth 3 months after planting are shown in graphs No. 5 and No. 6

Thus, it is possible to state, with a high degree of probability, the effect of Pt radiation on the experimental group of plants.

3. Results and Discussion

The average growth of shoots from the ground surface for 3 months in the control group is approximately 26% greater than in the experimental group. The average leaf area in the same period in the control group is approximately 18% greater than in the experimental group. {Figure 5, 6}.

Is noteworthy that the diverse nature of the radiation effect, from stimulation to inhibition, correlates with the response of the photomultiplier to Pt radiation in successive phases of the model experiment. {Figure 14}.

Changes in the experimental group of shoots over a 3-month period.

In phase 2, the highest radiation intensity corresponds to the stimulating effect on process No. 1

Shoot No. 1) Acceleration of development - the appearance of a new, 4th, upper segment with a pair of leaves with an area of approximately 50% of the control leaves in the upper 3rd segment.

In phase 3 (moment of electrification Pt) with the greatest fluctuations of the PMT signals corresponds to pronounced abnormal changes in process No. 2 {Figure 13, 14}.

Shoot No. 2) Change in color of a pair of leaves of the lower tier from dark green to yellow-green on the 3-4th day after irradiation, with restoration of the previous color after about 2 months. In the temporary slowing down of leaflet development, approximately 2 months, and normal development; the average area of a pair of leaves of the lower tier is approximately 30% larger than the same pair of the control group, while that of the upper tier is smaller than that of the control group by approximately 18.5%. {Figure

In phase 4-5, the smallest PMT signal corresponds to the greatest inhibitory effect on process No. 3.

The obtained data on the effect of ultra-weak radiation from Pt on the development of Crassulae shoots can be considered as one of the examples of the interaction of biological and non-biological objects due to ultra-weak coherent radiation, similar to the effect of the influence of the material and energy state of incubation cells on the metabolism of isolated mitochondria. And similar effects, but with the opposite direction: quenching the effect of

phosphorylating mitochondria on the photocathode of the PMT, changes IR absorption spectrum of plexiglass and the flash effect of crystal phosphors under the influence of mitochondrial radiation [2,3].

In the presented schemes of registration ultra-weak radiation, the direct radiating element was a hollow plastic cylinder-resonator with the studied sample of metal or semiconductor placed inside, for bio objects - a quartz cylinder with a suspension of mitochondria or yeast culture, which actually imitates a classical laser system, but with a very low "pumping" energy [4]. Nevertheless, some "forced" radiation occurs, acting on the photocathode of the photomultiplier and semiconductors (GaAlN, HgS). It is assumed that non-thermal coherent radiation is capable of creating (or transferring) traps for electrons and accumulating them, in particular, in the photocathode system of a photomultiplier tube during photo contact with emitters containing Pt, W, Mo or biological objects (especially those associated with the phosphorylation process), while the

photomultiplier tube signal decreases (imp./10 sec.), both during one experiment and over 20-30 days of successive experiments (for Pt). It is possible that This same "hypothetical" coherent radiation causes visual changes in cinnabar (HgS) applied to paper during prolonged optical contact with the ultra-weak radiation emitters (14-21 days). However, the obviously low energy level of the ultra-weak radiation in the optical range is insufficient to create the described effects of distant-optical interaction [5]. It is more appropriate to consider another mechanism for transmitting information and energy between spatially separated electronically excited levels. It is possible that the interaction of biological and non-biological objects is based on the interaction of the field of "holes", i.e. electron vacancies with their quantum characteristics, but with the opposite charge sign. It can be assumed that it is the "hole emission" that, in one form or another, provides the quenching effect of mitochondria and other described effects. Further model experiments are needed to confirm this point of view.

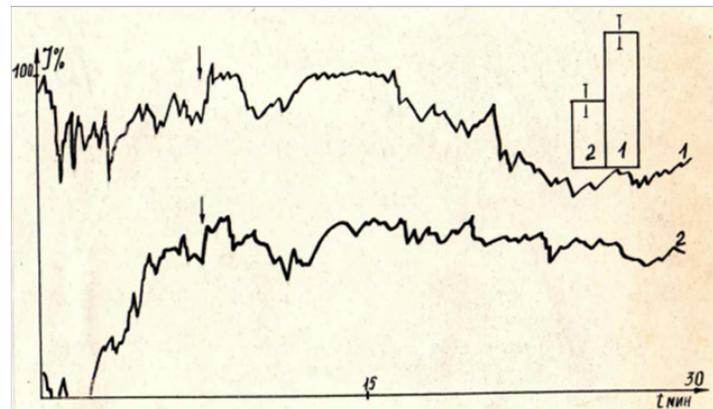


Figure 2: Dynamics of chemiluminescence of "shock" mitochondria in the phase of phosphorylation and substrate respiration. The ordinate axis: chemiluminescence intensity in % of the background. The abscissa axis: time in min. 1. - Chemiluminescence in the phase of substrate respiration. 2. - Chemiluminescence in the phosphorylation phase. Curves 1-2 were obtained by averaging 14 individual half-hour measurements (6 for curve 1 and 8 for curve 2). In the upper right corner is the average number of signal pulses per 100 background pulses (1 - substrate respiration, 2 - phosphorylation, Confidence interval $p < 0.05$. | Beginning of the anaerobic phase.

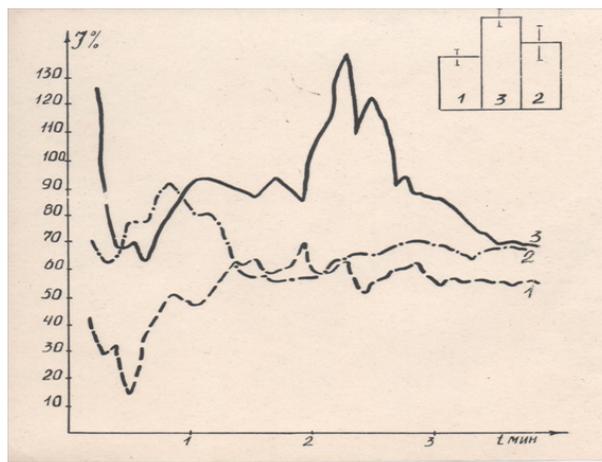


Figure 3: Dynamics of chemiluminescence of isolated (intact) mitochondria in the aerobic phase. 1- phosphorylation phase (0.2 μM ADP), 2- substrate respiration phase (5 mM succinate), 3- uncoupled respiration phase (5 mM succinate + 0.1 μM DNP). Along the ordinate axis: chemiluminescence intensity (% of background). Along the abscissa axis: time. In the upper right corner is the average number of signal pulses. Confidence interval $P < 0.05$ [2]

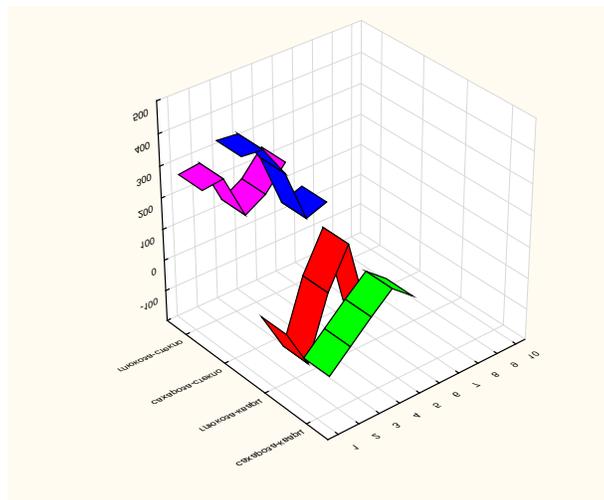


Figure 4: Quenching effect of radiation of a synchronized *Torula utilis* culture incubated in quartz cylindrical cells and its dependence on the cell material. Along the Z axis is the average radiation intensity (% of the PMT background) for 5 consecutive 10-minute stages of each experiment (~60 min.) Along the Y axis is the composition of the medium and the material of the incubation cells: green - sucrose, quartz; red - glucose, quartz; blue - sucrose, glass; pink - glucose, glass. Along the X axis is the time after introducing the culture into the saturated medium (consecutive 10-minute stages ~60 min.)

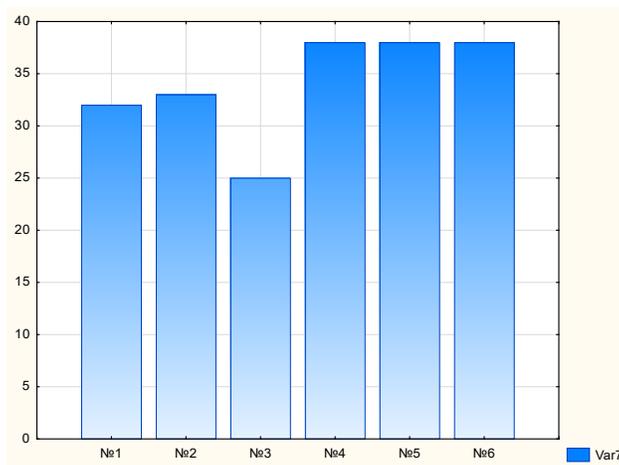


Figure 5: Diagram of growth of *Crassulae* shoots 3 months after planting 1-3 experiment, 4-6 control. Along the ordinate axis: shoot growth from ground level in mm. Along the abscissa axis: shoot numbers

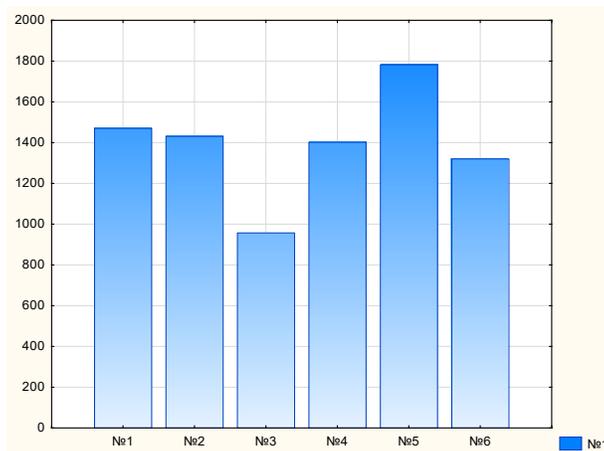


Figure 6: Diagram of the leaf area of *Crassulae* 3 months after planting. 1-3 experiments, 4-6 controls. Along the ordinate axis: leaf area in mm². Along the abscissa axis: shoot numbers



05.01



05.03.2025.



05.04.2025.

Figure 7: Photographs of planted Crassulae shoots during observation for 3 months, from 01/05 to 05/04, 2025; experimental series No. 1, No. 2, No. 3, control series No. 4, No. 5, No. 6



Figure 8: 11.01.2025. experimental group



Figure 9: 09.01.2025. Control group





Figure 10: 05.03.2025. Photographs of Crassulae shoots 2 months after planting No. 1, No. 2, No. 3 - experiment, No. 4, No. 5, No. 6 - control.



Figure 11: 09.01.2025. Change in the color of Crassula leaves 4 days after the start of irradiation - shoot No. 2



Figure 12: 05.04.2025. Change in the color of Crassula leaves 76 days after the end of irradiation - shoot No. 2.

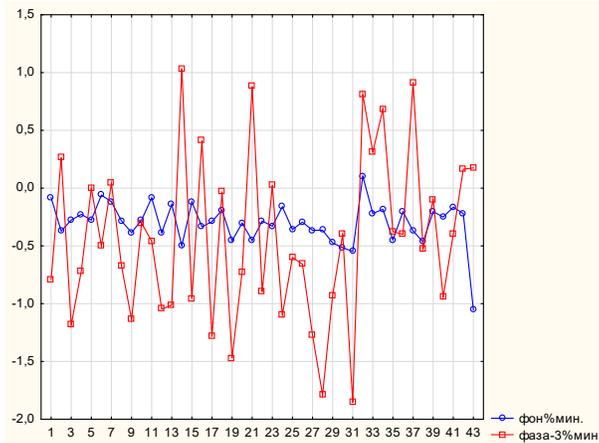


Figure 13: Changes in the PMT signal - %min. when recording radiation from a plastic hollow resonator with Pt inside, for 43 separate, consecutive experiments. Blue curve - background, red curve - phase-3, Pt plate is electrified (contact with one pole of a battery - 5 V~ 15 min. Along the ordinate axis: %min. Along the abscissa axis: number of experiments.

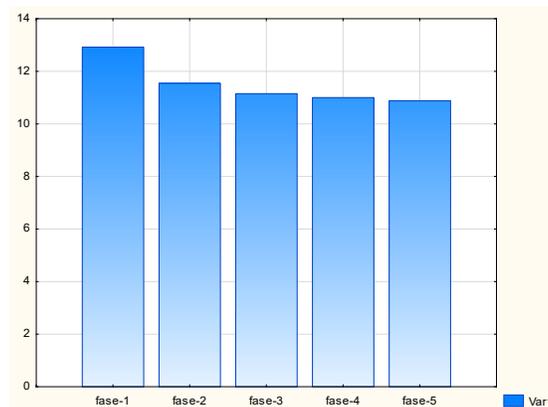


Figure 14: Average changes in the PMT signal - pulses/10 sec. during one experiment ~ 60 min., when recording radiation from a plastic resonator with Pt inside for 30 separate model experiments. In phase 3, the Pt plate is connected to one pole of a 5-V battery ~ 15 min. Along the ordinate axis: pulses/10 sec. on the PMT. Along the abscissa axis: phase of the experiment.

Declarations

Competing Interests

Ethical Approval

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Author Contributions

Institutional Review Board Statement: The study was conducted according to the guidelines of the (DIRECTIVE 2010/63/ EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the protection of animals used for scientific purposes of 22.09.2010.), and approved by the Institutional Ethics Committee of the Institute of General Pathology and Pathophysiology (final protocol # 1 of 01.02.2023.)

Funding

This research received no external funding.

References

1. Batyanov, A. P. (2024). A Model Recording Ultra-Weak

Electromagnetic Radiation from Metals and Semiconductors. *Journal Electrical Electron. Eng.* 3(5)1-16.

2. Batyanov, A. P. (2024). Ultra-Weak Electromagnetic Radiation of Mitochondria and Inorganic Systems Science Set. *Journal of Physics* (3)6 01-09.

3. Batyanov, A.P. (1988). Correlation of mitochondrial metabolism and spontaneous luminescence of incubation cells. *Biophysics* 6 33: 1029 -1034.

4. Young, M. (2000). *Optics and Lasers including Fibers and Optical Waveguides*. Springer-Verlag, Berlin Heidelberg.

5. Nathan S. Babcock. (2024). Open quantum systems theory of ultraweak ultraviolet photon emissions: Revisiting Gurwitsch's onion experiment as a prototype for quantum biology. *Computational and Structural Biotechnology Journal* 26, 78-91.

Copyright: ©2025 Batyanov A. P. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.