

REVIEW

by

Prof. Dr. Paraskeva Vl. Michailova - Ivanova, Professor at the Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences /retired/ – member of the Scientific Jury, appointed by Order No. 24 /07.05.2026/ of the Director of IBER

In the competition for "Associate Professor", announced in the State Gazette, issue 25/10.03.2026. and Decision of the Scientific Council of IBER- BAS - Protocol No. 54/17.04.2026, item 9/, the candidate is Senior Assistant Dr. Tsvetelina Gerasimova from IBER, BAS, Section "Biomonitoring and Ecological Risk" at the Department "Ecosystem Research, Ecological Risk and Conservation Biology"

GENERAL DATA ABOUT THE CANDIDATE'S CAREER AND THEMATIC DEVELOPMENT

Dr. Tsv. Gerasimova graduated from secondary education in 1974 in the city of Vratsa, and in 1997 from the Medical College in the same city with a degree in Nursing. The candidate received her higher education in 2002 at Sofia University "Kl. Ohridski", Faculty of Biology, subject in "Ecology and Environmental Protection" with a Master's degree. Her thesis is on the topic: "Adaptations at the metabolic levels of the rock mouse (*Apodemus mystacinus* Danford & Alston, 1877) from the northern limit of its range". For one year she worked as a specialist biologist at the Institute of Botany at the Bulgarian Academy of Sciences, and since 2005 she has been working at the Institute of Zoology, Bulgarian Academy of Sciences. In 2012, she successfully defended her doctor thesis on the topic "Comparative study on the sensitivity of the karyotype of monitor species of small mammals to the action of chemical mutagens from the environment" and received the scientific degree of PhD. Her PhD is on the karyotype and cytogenetic features of small mammal species, the basis for her successful participation in a number of scientific research projects related to the study of environmental pollution on a number of groups of small mammals. Even as a PhD, she learned a number of cytogenetic methods that she subsequently successfully applied in scientific research activity. In 2009, a poster on her dissertation was awarded at the "XI Anniversary Scientific Conference with International Participation: Biology - Traditions and Challenges".

During the period 2010-2013 she was an Assistant at the IBER and from 2013 until now she has been a Senior Assistant at the same Institute. The candidate speaks fluent English and uses Russian.

Her main research interests are genetic screening; cytotoxic and genotoxic effects of biologically active substances; mammalian karyology; she is very proficient in cytogenetic methods with analysis of various chromosomal aberrations; their detection and determination, as well as the micronucleus test. To determine the significance of the results, she successfully uses statistical methods. All this ensures successful scientific research, tracking the influence of extracts from *Rosa* species from the family Rosaceae - cytotoxic and genotoxic activity of hydrosols, oils, and wastewater from these plants. Her contributions are significant in the cytogenetic screening of newly synthesized aminophosphonates and their derivatives, industrial chemical agents and organic solvents, as well as the assessment of genetic risk from exposure to heavy metals in wild and laboratory small mammals.

SUBMITTED MATERIALS FOR THE COMPETITION

The candidate participated in the competition with 25 scientific papers. Three of her scientific papers are related to obtaining the educational and scientific degree "Doctor".

The remaining 21 are articles published in renowned international journals, such as Life, Molecules, International Journal of Ecosystems and Ecology Science, European Journal of Medicinal Chemistry, Research Journal of Chemistry and Environment, Acta Zool. Bulgarica, etc. She is also a co-author of a chapter in the book "A Cytogenetic Overview of Bulgarian *Rosa alba* L. Essential Oil, Hydrosol and Wastewater – Generated by Water-Steam Distillation on in vivo and in vitro Test-Systems", published in the journal "Novel Aspects on Chemistry and Biochemistry", 2023, Vol. 4. From the submitted report of Dr. Tsv. Gerasimova on the compliance of the points of her scientific-metric indicators, it is seen that they not only meet, but also exceed the state requirements, the requirements of the Bulgarian Academy of Sciences and those of the National Council of the IBER. The presented indicators by groups A, V, G and D are distributed as follows: indicator A - 50 points; indicator V - 130 points /with 100 points required/; indicator G - 265 points /with 200 points required/; indicator D - 200 points /with 50 points required/. In total, all points are 645, which is a very good certificate for the candidate.

MAIN DIRECTIONS OF THE CANDIDATE'S RESEARCH WORK AND IMPORTANT SCIENTIFIC CONTRIBUTIONS

The directions of the candidate's research activity are in five main directions:

- (1). Cytogenetic screening and genoprotective potential of natural products and plant extracts of species of the family Rosaceae;
- (2). Cytogenetic screening of newly synthesized aminophosphonates and their derivatives;
- (3). Cytogenetic screening of industrial chemical agents and organic solvents;
- (4). Ecotoxicological studies and assessment of genetic risk in case of exposure to heavy metals in wild and laboratory small mammals;
- (5). Karyological and comparative cytogenetic studies;

I. Cytogenetic screening and genoprotective potential of natural products and plant extracts of species from the family Rosaceae.

The cytogenetic, genotoxic activity and genoprotective potential of essential oils, hydrosols, wastewaters obtained by water distillation of species of the family Rosaceae, with the species: *Rosa damascena* Mill., *Rosa alba* L., *Rosa centifolia* L. and *Rosa gallica* L., were monitored.

Acute effects were performed under controlled environmental conditions, with special attention paid to mitotic activity and the presence of chromosomal aberrations. Various test systems were used: human lymphocytes, laboratory mice and a plant test system.

The hydrosols of the two species of the family Rosaceae: *Rosa damascena* Mill. and *Rosa alba* L., obtained by steam distillation, did not exhibit significant cytotoxic and genotoxic activity in the test systems used. The detected chromosomal aberrations and micronuclei were close to the control values, and at higher concentrations there was a tendency towards a slight increase in the effects, accompanied by a moderate decrease in mitotic activity. But it should be noted the different sensitivity of individual test systems. Human lymphocytes have higher sensitivity, while the in vivo test system, laboratory mice /B4-publication 1/ exhibits very weak activity. The action of hydrosols from the species *Rosa centifolia* L. and *Rosa gallica* L. is interesting, as they do not exhibit cytotoxicity and induce very weak genotoxicity in a plant test system and human lymphocytes. However, in both species of the family Rosaceae there is a different reaction, more strongly manifested in *Rosa centifolia* L., expressed by an increase in the frequency of chromosomal aberrations and micronuclei (B4-publication 3). However, a

concentration-dependent effect has been established, an effect also observed with the action of *Rosa damascena* Mill essential oil using in vitro test systems (B4-publication 4).

The studies conducted on the aromatic products of *Rosa alba* L. in the three different test systems are of a beneficial nature, with human lymphocytes again distinguished by the highest sensitivity (G8–publication 16). Dr. Gerasimova logically and very correctly concludes that the different reaction of the individual test systems depends on the level of biological organization, with the in vivo model - laboratory lines of mice complementing the data from the in vitro and plant test systems, showing lower genotoxicity of the products used.

The analysis of wastewater from *Rosa* production shows that they are not harmless and they can induce a certain geno - and cytotoxic effect, which necessitates their careful use (G8 - publication 16). A significant contribution is also the study of the genoprotective effect of various products from the family Rosaceae against the action of mutagenic N-Methyl-N'-Nitro-N-Nitrosoguanidine (MNNG), in which the level of induced chromosomal aberrations and micronuclei was reduced. /B4 - publications 2, 3, 6; G8 - publication 16/. The results obtained from the effects of various products from species of the family Rosacea are important for their use in medicine, the food and cosmetic industries.

II. Cytogenetic screening of newly synthesized aminophosphonates and their derivatives

The cytogenetic screening of newly synthesized aminophosphonates and their derivatives is of significant contribution. These compounds have an extremely broad spectrum of application in pharmacology and have a particularly pronounced antitumor potential. This determines the importance and necessity of conducting screening of these compounds to establish their action. The clastogenic and antiproliferative activity of a wide range of aminophosphonate derivatives, such as α -aminophosphonic acids and a number of other compounds (G7 – publications 1, 2, 5, 7, 8, 9, 10, 11) administered at defined doses, has been studied. For some of them, in vivo assessments of their genotoxicity have been carried out for the first time, a contribution of important medical importance (G7 – publications 1, 2). But it should be emphasized that she establishes the different effects of individual compounds, some of which also have a dose dependence (G7- publications 9, 10).

III. Cytogenetic screening of industrial chemical agents and organic solvents

The candidate's analysis of various chromosomal aberrations and the mitotic index in bone marrow cells from five species of small rodents - laboratory mice (ICR line) and rodents widely distributed in Bulgaria (*Apodemus flavicollis* (Melchior, 1834), *Mus spicilegus* (Petényi, 1882), *Clethrionomys glareolus* (Schreber, 1780) and *Microtus arvalis* Pallas, 1778)) and allows to assess the genotoxic potential of the organic solvent tetrahydrofuran (THF) (G7 - publication 14). A species-specific response and the presence of various types of chromosomal aberrations were observed, proving the genotoxic effect of the solvent (G7 - publication 14). High sensitivity of species of the genus *Mus* was noted, making them suitable bioindicator species in agroecosystems.

IV. Ecotoxicological studies and genetic risk assessment of heavy metal exposure in wild and laboratory small mammals

Dr. Gerasimova's research on monitoring the impact of environmental pollutants, mainly lead ions, is of great practical interest. Numerous damages to the chromosomal apparatus and chromosomal aberrations have been identified (G7-publication 12). Together with colleagues from Slovakia, lead ions accumulation in the bone tissue of the snow vole */Chionomys nivalis* (Martins, 1842)/ was monitored. This research gives her reason to suggest that the snow vole should be used as a highly sensitive bioindicator species. Significant regional differences in lead ions concentration in bone tissue have been found. Those from populations in the Tatra have three times more lead ions than those in populations in the Bulgarian mountains, Rila and Vitosha. For the first time, the importance of this species for establishing regional differences in exposure and bioaccumulation of heavy metals in this species under natural conditions is shown (G7- publication 12).

V. Karyological and comparative cytogenetic studies

The candidate's results regarding the karyological studies of the Bulgarian autochthonous breed Karakachan dog (*Canis familiaris* L. 1758) are original. The diploid chromosome set ($2n = 78$) and the sex chromosomes XX/XY were determined /G7- publications 3, 4/. Karyotype analysis showed the presence of chromosome fragments and polyploidy, which is probably the result of the influence of environmental factors (G7- publication 3).

From all the presented results it is clear that Dr. Gerasimova is a well-established specialist who thoroughly, precisely and faithfully conducts all cytogenetic and genotoxicological analyses. Here I would like to emphasize the important and significant role of Dr. M. Topashka in her growth as a specialist. Dr. Topashka is the supervisor of her

dissertation work, her co-author, and was trained her in numerous methods and analyses in the field of cytogenetics.

REFLECTION OF SCIENTIFIC PRODUCTION IN SPECIALIZED LITERATURE

The candidate's scientific output finds a wide response among specialists in our country and abroad, as evidenced by 100 citations of the candidate's scientific publications, all of which are in journals with IF, such as Current Organic Chemistry, Synthesis, Organic Letters, Journal of Molecular Catalysis, etc.

SIGNIFICANCE OF THE CANDIDATE'S SCIENTIFIC AND APPLIED ACHIEVEMENTS, OUTLINED BY THEIR PUBLIC SIGNIFICANCE

The research of Dr. Tsv. Gerasimova is of great importance for our society. The candidate works on an extremely relevant problem for our time - environmental pollution and its impact on biota. The scientific publications presented by Dr. Gerasimova are collective, which allows for a comprehensive consideration of the problem. She is a very good researcher, with a clearly outlined profile in the field of Genetics and with numerous original scientific and applied results in this field. Her research finds wide resonance among the scientific community and is of great importance for environmental protection and medicine. With her knowledge and skills, Dr. Gerasimova contributes to the development and establishment of the Genetics at IBER, a subject important for modern study the biodiversity and environmental changes in the Institute.

The candidate also has a significant scientific and organizational activity. She participates in various projects: in the implementation of 10 national, 2 international projects with Mexico and Slovakia; projects under the European Union, funded by the Ministry of Education, Youth and Science and another project funded by NATO with a base organization. Institute of Cryobiology.

Dr. Gerasimova has participated with reports in 21 national conferences, where she is co-author. The reports reflecting her achievements in the field of geno- and cytotoxicology. Together with our and foreign scientists, she has participated with reports and posters in 46 international conferences in Bulgaria, Montenegro, Switzerland, Serbia, Turkey, etc.

CRITICAL NOTES AND RECOMMENDATIONS

In publications B4 - 1, 2; D7 - publication 3; G8- publication 16, the micropictures do not indicate the magnifications at which the photos were taken. In publication D7 - 3 the micropictures are at low magnification, which makes their analysis difficult, and there is no karyogram with the designation of the autosomes and sex chromosomes.

I wish Dr. Tsv. Gerasimova to attract and train young specialists and jointly promote the specialty "Genetics", so important for IBER. I recommend that in her future research she applies modern molecular - cytogenetic and molecular approaches. In this way she will be able to study changes in the cellular apparatus in more detail. I would like to recommend that she turns attention to the impact of the pollutants on the behavior and morphological changes of mammalian species exposed to these pollutants.

CONCLUSION

From the materials presented above, it is clear that Senior Assistant Dr. Tsvetelina Gerasimova is a well-established specialist, successfully applying a number of important methodological approaches in the field of Genetics, as well as their in-depth and detailed analysis. Her research finds a wide response both among our and foreign scientific communities. She meets the national criteria for holding the academic position of "Associate Professor", determined by the Law the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for its implementation, as well as from the Regulations on the conditions and procedure for acquiring scientific degrees and for occupying academic positions at the Bulgarian Academy of Sciences as well as the Regulations on the conditions and procedure for acquiring scientific degrees and for holding academic positions at IBER-BAS. I am fully convinced to give my high positive assessment and recommend to the esteemed Scientific Jury to vote on a proposal to the Scientific Council of IBER, BAS to elect Senior Assistant Dr. Tsvetelina Gerasimova as "Associate Professor" in the scientific specialty "Genetics" for the needs of the Section "Biomonitoring and Ecological Risk" at the Department "Ecosystem Research, Ecological Risk and Conservation Biology" by IBER, BAS.

Sofia, 19.06. 2026

Reviewer

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