[newsletter] Number 43
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Message from the General Secretary

One positive side effect of the Chernobyl accident has been to promote a strong stimulation of the radioecological studies and research, a scientific area which therefore took some advantage from abundant and somehow easier funding through the various international agencies and institutions involved, especially the European Commission. Without doubt, this boost has allowed in-depth understanding of radioctivity transport and impact on human health based on advanced descriptions of radionuclides transfer through the environment to the human target.

Quite naturally, this boost effect proved to be temporary and started to vanish out some years ago, with tougher competition for appropriation of international funding, and the concomitant dis-aggregation of non-critical mass research groups, a feature which led some observers to question the future of Radioecology, either as a scientific discipline (its «last gasp») or as a unique expertise to parallel atomic energy activities. Meanwhile, a vigorous political debate has evolved almost worldwide questioning the public acceptance and usefulness of considering further atomic energy developments to face the growing planetary energetic needs. This debate has first led some countries to promote the abandon of nuclear energy technology, especially in Europe, due to emphasis placed on its danger. However, concerns over requirements for sustainable development, and greater awareness of climatic disruption promoted by fossil fuel burning, are now leading other countries to plan, sometimes to engage on (Finland, China, …), further developments in nuclear energy production. This is not even mentioning the economic trends that currently affect the fuel barrel cost…
This particular context fully demonstrates the pertinence of Radioecology in the near future, as well as indicates the evolution necessary to meet its new challenges. The mastering of risks to humans needs to be extended in two

Message from the General Secretary

News from the President

News from the Secretariat

Scientific News

Announcements

Book Reviews

WWW.IUR-UIR.ORG

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main directions. First, radioactive wastes are still accumulating without a proven acceptable technical solution, and better assessments are therefore needed in the long to very long term. This puts emphasis on aspects such as chronic exposures, dynamic environmental repartition, long-term environmental speciation and potential local accumulations, etc… Second, whilst transfers through the environment to man have now reached an advanced level of understanding, potential radioactivity effects on ecological systems, from non-human biota to habitats, landscapes and ecosystems, deserve especial attention. This ability to appropriately assess ecological risk linked to radioactive substances is a prerequisite to future acceptance of further developments in nuclear energy technology as well as an anticipated obligation to meet legal requirements that are currently evolving.

The signs of IUR commitments in such a multi-facet evolution are now becoming visible from a variety of last years initiatives that have been undertaken: the creation of the Asian branch of IUR and its pending Task Group on the «Radioecology of rice», a food source for millions of human beings; the progress of a several years reflection on radioactive waste with a Final Report production from its dedicated Task Group expected soon; the contribution of IUR to international agencies initiatives where policies are directed and future programmes seeded (update of TRS-364 and Action Plan for protection of the environment with the IAEA, invited observer at UNSCEAR sessions, support to ICRP); efforts to design a Worldwide International Research Network in Radioecology, particularly encompassing issues of protection of the environment and multi-pollution aspects; significant efforts to share and spread scientific achievements with co-organising the recent Ecorad Conference (Aix-en-Provence) and next International Conference on Radioactivity in the environment, including Arctic and Antarctic regions (Nice); creation of the «IUR Vernadsky Award» to recognise outstanding contributions to the field of Radioecology; and many others not mentioned here.

Thanks to many of you taking various active roles within the Union, it is clear that the worldwide recognition and audience of IUR is growing. I am encouraging even more commitments, at least to respond up to an appropriate level to the renewed influx of new young members who are joining, month after month from many different parts of the world, with expectations and excitement.

François Bréchignac
General Secretary

News from the President

The Second International Conference on Radioactivity in the Environment & the Sixth International Conference on Environmental Radioactivity in the Arctic and the Antarctic.

The major IUR event this year will be the conference held at the NICE-ACROPOLIS CONGRESS CENTER between 2-6 October 2005. It will be arranged by the International Union of Radioecology (IUR) and Norwegian Radiation Protection Authority (NRPA), in association with the Journal of Environmental Radioactivity (JER) and Institut de radioprotection et de sûreté nucléaire (IRSN), and in co-operation with the International Atomic Energy Agency (IAEA).

Other sponsors are U.S. Department of Energy (DOE), Russian Federal Service of Hydrometeorology and Environmental Monitoring (ROSHYDROMET), and Arctic Monitoring Assessment Programme (AMAP).

This conference is an amalgamation of two conference series, namely the International Conference on Environmental Radioactivity (last time held in Monaco 2002), and the International Conference on Environmental Radioactivity in the Arctic and the Antarctic (last time held in St. Petersburg 2002). In view of the overlapping research areas and requirement for good communication within the discipline of

radioecology, it seemed natural to combine these two conferences.

In line with IUR's objectives the conference will cover all the scientific aspects of environmental radioactivity, from its use to trace and time natural processes, to the radiological assessment of human health and effects on the environment, including remediation of contaminated sites. It is now almost 20 years since the Chernobyl accident, and the environmental consequences due to this incident will be highlighted in a separate session.

The discipline of radioecology is clearly still strong and thriving as close to 300 participants from about 45 countries or international organisations from all continents have currently registered for this IUR event. The broad interest shown for the conference and its interdiciplinary character will make this a truly international event.

In keeping with the first conference on Environmental radioactivity, a Young investigators' award will be distributed to encourage a new generation of highly adept scientists. The response has been good with a high quality of submitted material rendering the selection process very competitive. It is encouraging to see that young scientists are engaged and embarked on new careers investigating the behaviour and fate of radioactivity in the environment.

The event will provide a broad scientific view of radioecology, with the Conference on environmental radioactivity in the Arctic and Antarctic as a separate parallell session on Wednesday the 5th. The sessions are:

- The Second International Conference on Radioactivity in the Environment
    - The Chernobyl Accident - 20 Years after
    - (Technologically Enhanced) Naturally Occurring Radioactive Materials
    - Protection of the Environment
    - Monitoring and Measurement
    - Emergency Preparedness - Models and Systems
    - Risk Assessment and Management
    - Environmental Transport and Transfer

- 6th International Conference on Environmental Radioactivity in the Arctic and Antarctic

After the ordinary programme on Wednesday (4/10), the IUR general assembly will take place. During this assembly the first IUR Vernadsky award will be granted.

Prior to the conference (30/9-2/10) the IUR Task group "Speciation of radionuclides", Marine Environment Laboratory of the International Atomic Energy Agency (IAEA-MEL) and Norwegian University of Life Sciences is organising the Third Pre-Conference Workshop on Anvanced techniques and radionuclide speciation within radioecology. The workshop will be held at the offices of the Marine Environment Laboratory International Atomic Energy Agency (IAEA-MEL) in Monaco. (More info is given on http://www.iur-uir.org/conferences.cgi?id=25&page=1&theme=).

For further details please visit http://www.iur-uir.org/news.cgi?id=54 or contact the conference secretary Torun Jølle (torun.jolle@nrpa.no), NRPA, P.O. Box 55, N-1332 Østerås, Norway.

Per Strand
President

IUR GENERAL ASSEMBLY 2005

UNION INTERNATIONALE DE RADIOECOLOGIE
INTERNATIONAL UNION OF RADIOECOLOGY

XXVIII General Assembly
Nice, France,5 October 2005

AGENDA

1. IUR management updates
2. V.I. Vernadsky Award
2. Status of IUR activities and report by the President
3. Financial report and budget
4. Outline of the programme for 2006
5. Any other business

Fees 2005

Most members have been contacted about payment of the fees for 2005. If you have not paid, please could you do so, preferably by providing the treasurer with credit card details. If you want to arrange other methods of payment please contact the membership
secretary: Torun Jølle
e-mail: torun.jolle@nrpa.no
fax no. +47 67147407

Membership grade	CIS, China Cuba	Central Europe (only non-European Community and non-CIS countries)	Other countries	
	USD	USD	Euro	USD
Student	7	10	20	20
Regular	14	20	50	50
Senior	21	30	70	70
Fellow	21	30	70	70
Emeritus	7	10	20	20
Honorary	0	0	0	0
Supporting org	>140	>200	>400	>400

New members (From August 2004)

DEJANIRA DA COSTA, Lauria	Brasil
DIAS, Victor	France
DOI, Masahiro	Japan
EAST, James	USA
GILHEN,Michael J.	UK
GWYNN,Justin	Norway
HOU, Xiaolin	Denmark
KUMAR, Prabhat	India
LACIOK, Ales	Czech Republic
LAGAUZERE, Sandra	France
LEE, Sang-Han	Korea
NEWMAN, Richard T.	South Africa
PANOV, Alexey	Russia
RIGOL, Anna	Spain
SEKOKO, Israel	South Africa
TAGAMI, Keiko	Japan
VARGA, Ester	Yugoslavia
VASSEUR, Christophe	France
WHICKER, Jeffrey J.	USA
WOOD, Michael	UK
ZOTINA, Tatiana A.	Russia

Obituaries

Dr. Nikolay P. Arkhipov died on 8th December 2004, one week before his 72nd birthday. As a radioecologist his career spanned research on the aftermaths of both the 1957 Kyshtym and 1986 Chernobyl accidents.

After graduating the Timiryazev Moscow agricultural academy Nikolay began his long scientific career in North Kazakhstan in 1954. In 1960, his 44 year long association with radioecology began when he move to the (then secret) Experimental Scientific and Research Station (ESRS) at the Chemical Industrial Complex 'Mayak' (South Urals). At the same time he became a post-graduate student of the founding Soviet radioecologist Academician Vsevolod M. Klechkovsky. His subsequent PhD. thesis was based on his research, conducted between 1960 and 1963, on the Eastern-Ural radioactive trace from the Kyshtym accident. This led to the «Klechkovsky index» being proposed as a method of describing the ratio of Sr to Ca in soil-plant systems.

From 1963 to 1986 Nikolay Arkhipov was the head of ESRS's agrochemical laboratory. During this time the ESRS was a leading organisation within Soviet radioecology, and a 'nursery' for professional specialists. His research whilst at Mayak also included the consequences of nuclear weapons tests, the development of agricultural countermeasures, the transfer of radionuclides in different climatic zones and the potential application of nuclear industry by-products in agriculture. In this environment Nikolay Arkhipov was shaped both as a scientist and as a personality. Amongst his many friends and colleagues were many well know radioecologists and radiobiologists such as: Arkadiy Yegorov, Evgeniy Fyodorov, Rudolph Alexakhin, Fyodor Tikhomirov, Dmitriy Osanov, Nikolay Korneev, Boris Prister, Vladimir Shevchenko. The special environment of this small Urals town reflected in his family life. His wife of more than 40 years, Edith Arkhipova, was also a scientist (a radiobiologist). Nikolay and Edith also raised a new generation of scientists, Andrey their son is also a radioecologist, and Valentina their daughter is starting her career in biotechnology.

Early in May 1986 Nikolay Arkhipov led a group of ESRS scientists to Chernobyl for the USSR Government Commission. Under trying conditions, leading by his knowledge, experience and scientific intuition, he began to investigate the

situation in the Chernobyl area. He participated in the assessment of the radiological situation, developed proposals for its improvement, and tested new countermeasures, techniques for decontamination, and restoration of affected soils. His group's results were used by the State in the formulation of decisions on the post-accident management of the Chernobyl zone. Nikolay Arkhipov was rewarded with many Government awards for his work in the Chernobyl zone between 1986 and 1987. As a scientist he would not be compromised, and drawing upon his knowledge and experience, he ensured that many expensive and unjustified measures were stopped (e.g. the burial of 'Red Forest' trees).

In the years following the Chernobyl accident Nikolay created the Department of Radiology and Land Recovery (subsequently the Chernobyl Scientific and Technical Centre) originally based in Pripyat with additional laboratories in Chernobyl town. Despite an increasing administrative and managerial load, he did not cease his research work, collaborating with scientists from many organisations in the former Soviet Union and world-wide. Research included the distribution and migration of radionuclides within the varied ecosystems of the Chernobyl exclusion zone, the effects of radiation on biota within the zone, and measures to rehabilitate the zone with the development of some economical activity. In 1994 Nikolay Arkhipov defended a second doctoral thesis on the 'Role of natural and anthropogenic factors in behaviour of radionuclides in different soil-vegetation zones'. Nikolay Arkhipov was a full member of International Union of Radioecology, an expert contributor to activities of the IAEA, and one of the founders and trustees of Nuclear Society of Ukraine. He had a large authority and was a mentor to many.

Memories of Nikolay will live forever in the hearts of his friends, colleagues and scientific progeny.

Intergovernmental Panel on Climate Change (IPCC) & Arctic Climate Impact Assessment (ACIA)

Mark Dowdall, NRPA, Norway

Two recent comprehensive scientific assessments, conducted by the Intergovernmental Panel on Climate Change (IPCC) and the Arctic Climate Impact Assessment (ACIA), have appraised and presented the situation regarding the changing Arctic climate and the actual and probable impacts on the Arctic regions. Both assessments leave little room for doubt that Arctic climate change is occurring, at a pace faster than previously thought and that it will have extensive, significant and long lasting impacts on the region, its environment and its peoples. The nature of the Arctic enironment and the climatic changes predicted for it mean that almost all facets of Arctic environmental science will be impacted to some extent, not excluding those of most pertinence to Artcic radioecology.

The Arctic has often been characterised as a region of heightened vulnerability in relation to radioactive contamination due to two factors: the presence of a large number of actual or potential sources of radioactive contaminants within the region and aspects of the Arctic environment that predispose its populations and biota to heightened vulnerability to radioactive contaminants relative to temperate regions. The situation regarding the Arctic and the effects of Arctic climate change as presented by both the IPCC and ACIA assessments is of some significance in relation to both these factors. The stability, security and level of risk associated with existing or future nuclear facilities in the Arctic are vulnerable to the changes that will be imposed by a warming Arctic climate such as permafrost melt, severe coastal erosion and an increase in the severity and frequency of storm events within the Arctic region. The ACIA report specifically highlights the Kola peninsula as an area likely to undergo significant infrastructural damage as a result of changes in ground stability and coastal

erosion and it would seem prudent that the assessment of the risk of future contamination from facilities located on the Kola peninsula would take into account the predictions of the relevant climate assessments.
The processes and systems that govern our understanding of how and why Arctic peoples are more vulnerable to radioactive contamination and how we ensure satisfactory radioprotection are largely Arctic specific processes that are among those most likley to change signficantly under new climatic regimes. The implications of Arctic climate change on the radioecology and radioprotection of the Arctic region have not yet perhaps received the attention necessary to fully elucidate the effects of Arctic climate change on these two scientific fields. An AMAP report on the effects of climate change on the transport of radioactive contaminants to the Arctic region concluded that there would be no major changes in transport pathways for such contaminants to the Arctic but the effect of Arctic climate change on the behaviour and fate of radioactive contaminants within the Arctic region was outside the scope of the report. It is worth noting however that the authors point out that warming of the Arctic region may result in significant elevation of the dose received by Arctic peoples from radon daughter isotopes. Considering that this dose change may occur to a large population already undergoing multiple and diverse stresses as a result of Arctic climate change would seem to present significant new challenges for Arctic radioecology and radioprotection.

Recent years have seen significant developments in the fields of Arctic radioecology and radioprotection and this perhaps leaves the fields well placed to take on the potential challenges posed by the effects of Arctic climate change on Arctic radioecology and radioprotection.

International Scientific Workshop «Radioecology of Chernobyl Zone»

September 13 - 14, 2004, Slavutych, Ukraine

Traditional International Scientific Workshop «Radioecology of Chornobyl Zone» was held on September 13 - 14, 2004 in the town of Slavutych, Ukraine. The Workshop was organized by the International Radioecology Laboratory of Chornobyl Center for Nuclear Safety, Radioactive Waste and Radioecology with the support of IAEA, International Union of Radioecology and US DOE. 72 persons attended the Workshop. 59 presentations were submitted by the scientists and experts, presenting research, research-and-production and other institutions from Ukraine (Ukraine, Russia, Belarus and Japan). 32 presentations were submitted as oral messages (plenary and rapporteur), the remaining part as poster ones. The Workshop was organized as consecutive meetings of 3 Sessions: i) «Radiobiological Effects in Environment Components. Radioecological Significance of Exclusion Zone Facilities»; ii) »Distribution and Migration of Radionuclides in Environment Components»; iii) »Rehabilitation of Contaminated Territories. Methods and Instrumentation for Radioecological Research».

The subject of large interest and much discussion was the presentation of R. Alexakhin «Anthropocentric and Ecocentric Principles of Environmental Protection», containing a new relevant conceptual rule of radiation protection of humans and the environment.

At the meeting of the Session «Radiobiological Effects in Environment Components. Radioecological Significance of Exclusion Zone Facilities» much interest in the participants of Workshop was aroused by the fundamental presentations of scientists

from the Russian Institute of Agricultural Radiology and Agroecology (Obninsk, Russia): «Resistance of Forest Biogeocenosis to Ionizing Radiation Effects and Their Postradiational Changes After Acute Radiation Exposure» (Dr S. Spiridonov), «Exposure of Agricultural Plants and Animals to Radiation Within Contaminated Areas After the Chornobyl Accident» (Dr Ye. Spirin) and «Early and Long-term Effects of Exposure to Low Levels of Ionizing Radiation on Plants» (Dr S. Geras'kin).

Interesting results of research into existing and potential effects of the Exclusion Zone Facilities (Object Shelter, New Safety Confinement, Storage Facility for Spent Nuclear Fuel etc.) on the Environment of Exclusion zone were presented by Dr V. Batii with co-authors from Institute for Nuclear Power Plants Safety Problems, (Chornobyl, Ukraine). Very important data about formation and characteristics of radioactive aerosols both into Object «Shelter» and in releases from this one were presented by Dr B. Ogorodnikov (Physical-Chemical Institute named after Karpov, Moscow) with co-authors from Institute for Nuclear Power Plants Safety Problems, (Chornobyl, Ukraine.

A brisk discussion developed after presentation of Prof. V. Shestopalov with co-authors «Seismological Hazards of New Safety Confinement» (Institute of Geological Sciences, Ukraine).

A thematic spectrum of presentations, submitted at the Session «Distribution and Migration of Radionuclides in Environment Components», was rather wide: the outcomes of analysis of equilibrium of radiocesium with related stable elements within the biological cycle of contaminated forests (Dr S. Yoshida -National Institute of Radiological Sciences, Japan with co-authors from Gakushuin University, Japan, ICF Consulting, USA and Forest Institute, Belarus), problems of radioecology of birds in the Exclusion zone (Dr S. Gaschak, International Radioecology Laboratory, Chornobyl Center, Slavutych, Ukraine), estimation of the role of radionuclides immobilization and vertical transfer in soil on long-term dynamics of ^{137}Cs and ^{90}Sr transfer to plants (Dr Yu. Ivanov, International Radioecology Laboratory, Chornobyl Center, Slavutych, Ukraine), radionuclides resuspension and transfer during fires in biocoenoses of the Chornobyl zone (Dr V. Ioschenko with co-authors, Ukrainian Institute of Agricultural Radiology). Results of forecast of radionuclides migration from ChNPP and Object «Shelter» operation site into groundwater (Prof. V. Shestopalov with co-authors from Institute of Geological Sciences and Institute for Nuclear Power Plants Safety Problems, Ukraine), results of model predictions and field observations of ^{90}Sr transport in the aquifer from the waste burial at «Red Forest» site (Dr D. Bugai, Institute of Geological Sciences, Ukraine with co-authors from Ukrainian Institute of Agricultural Radiology and IRSN, France) and others.

The outcomes of research on the rehabilitation of the contaminated territories were discussed at the meeting of the Session «Rehabilitation of Contaminated Territories. Methods and Instrumentation for Radioecological Research.».

First results of the International project on the contaminated territories were reported in the presentation «Chornobyl Forum – Strategy to Plan Countermeasures in Contaminated Areas», submitted by Dr V. Kashparov with co-authors from IAEA, Ministry of Emergencies of Ukraine, Scientific Center of Radiation Medicine, Ukraine and GSF, Germany. Methodological Aspects of Planning of Agriculture Rehabilitation Measures in Long-Term Period after the ChNPP accident (Dr A. Panov with co-authors, Russian Institute of Agricultural Radiology and Agroecology, Russia), problems of assessment of irradiation doses to personnel and general public during rehabilitation of Exclusion zone (Dr O. Bondarenko with co-authors from Ecocentre and Administration of the Exclusion zone and the zone of absolute resettlement, Chernobyl, Ukraine) and problems of rehabilitation of contaminated forest lands (Dr I. Bulavik with co-

author, Institute of Radiology, Belarus) have been considered and discussed at this Sessuon. Large interest was aroused by the information about new methods and instrumentation for radioecological research, including methods and instrumentation for radwaste measurements, for determination of radionuclides specific activity in environment objects, foodstuff and water, person exposure spectrometer for monitoring of radionuclides specific activity in human organism etc., presented in rapporteur presentation of V. Babenko (Research and Industrial Enterprise «AtomComplexPrylad» Ltd, Ukraine).

A lot of scientific information on radiobiological and radioecological problems of the Chernobyl Exclusion zone was presented in poster presentations. Next traditional International Scientific Workshop «Radioecology of Chornobyl Zone» will be held in 2006.

Yu. Ivanov,
International Radioecology Laboratory,
Chornobyl Center for Nuclear Safety,
Radioactive Waste and Radioecology,
Slavutych,
Ukraine.

XXXIII Klechkovsky annual radioecological readings

The XXXIII annual radioecological readings were held in Obninsk, October 21, 2004, and were dedicated to the memory of V.M. Klechkovsky (1900-1972), one of the founders of agricultural radiology. The subject of the Readings was Protection of the environment from ionizing radiation and problem of the rehabilitation of contaminated agricultural land». The Readings were attended by 70 specialists from Russia and CIS countries. The International Union of Radioecology was one of the co-organizers of the meeting.

R.M. Alexakhin in his report On principles of radiation protection of the environment considered evolution of scientific ideas and their practical implementation in the field of radiation protection of humans and the environment.

The second half of the XX century was dominated in the field of radiation protection of the environment by the anthropocentric concept formulated by the ICRP. According to this concept «…if man is protected by radiation standards then the environment is also adequately protected». At the end of the XX century in conditions of increasing technogenesis and, consequently, increasing ionizing radiation background in the area of radiation protection an ecocentric strategy is beginning to emerge where accents are shifted towards protection of biota in their environments. In brief «healthy man needs healthy environment».

When considering anthropo- and ecocentric concepts of radiation protection, it is advisable to compare and then harmonize permissible dose limits for man and biota in a single system of dose coordinates, which is made difficult by the choice of criteria for estimating radiation induced changes in biota. At the present stage of nuclear power engineering development, the efforts of radioecologists dealing with problems of environmental protection from ionizing radiation and medical workers evolved in problems of radiation protection of humans must be directed

to the elaboration of a synthetic position that ensures simultaneous protection of man and all other living things.
A.V. Panov gave a report Methodological aspects of planning of rehabilitation measures in agriculture in the long term after the Chernobyl accident. The report dealt with the methods for optimization of strategy of protective and rehabilitative measures based on: 1) - differential approach to different groups of the population (address approach), 2) - ecologo-economic justification and 3) - control of the effectiveness of measures based on the radiation monitoring data.

The population living in the contaminated areas is divided into two categories: the population that consumes products obtained in the region of their residence and the population that consumes products imported from the contaminated regions. As the main criterion to assess the effectiveness of countermeasures for the first cohort of the population, reduction in the individual dose is considered. For the second cohort it is reduction in the collective dose from consumption of contaminated products. Among the major factors responsible for internal dose formation are contamination levels for agricultural lands and products, soil properties, peculiarities of previously applied countermeasures and contribution of forest products to the diet of the population.

The results of the Readings have shown that in the XXI century preservation of the environmental quality that provides sustainable development of the community remains one of the major challenges in the present world.

Uranium and phosphorus uptake from a field-contaminated soil by bald root mutant and wild type barley plants (*Hordeum vulgare* L.) in association with arbuscular mycorrhizal fungus *Glomus caledonium*

*Baodong Chen[a], Yong-Guan Zhu[a, *], Xuhong Zhang[a] and Iver Jakobsen[b]*

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Abstract

Background. Recent studies indicated that arbuscular mycorrhizal fungi (AMF) play important roles in plant accumulation of uranium (U) from contaminated environments, but the impacts of fertilization practices on functioning of the symbiotic associations, which are crucial factors influencing plant nutrition and growth responses to mycorrhiza, have rarely been considered.

Materials and Methods. In a greenhouse experiment, a bald root barley mutant (*brb*) together with the wild type (*wt*) were used to test the role of root hairs and AMF in uranium (U) uptake by host plant from a U contaminated soil. Nil, 20 and 60 mg KH_2PO_4-P kg^{-1} soil were included to investigate the influences of phosphorus (P) fertilization on plant growth and accumulation of U.

Results. Dry matter yield of barley plants increased with increasing P additions and *wt* produced significantly higher dry weight than *brb*. Mycorrhiza markedly improved dry matter yield of both genotypes grown at nil P whereas only *brb* responded positively to mycorrhiza at 20 mg P kg^{-1}. At the highest P level, mycorrhiza resulted in growth depressions in both genotypes. Plant P concentrations increased markedly with increasing P additions and in response to mycorrhiza.
Mycorrhiza and P additions had no significant effects on shoot U concentrations. However, root U concentrations in both genotypes were significantly increased by mycorrhiza. On the other hand, shoot U contents increased with increasing P levels, while 20 mg P kg^{-1} stimulated and 60 mg P kg^{-1} inhibited U accumulation in roots. Root length specific U uptake was moderately enhanced both by root hairs and strongly enhanced by mycorrhiza. Moreover, non-inoculated plants generally had higher shoot-root ratios of U content than the corresponding inoculated controls.

Conclusion. Our study shows that AMF and root hairs improves not only P acquisition but also the root uptake of U. Hence, mycorrhiza is of potential use in phytostabilization of U contaminated environments. However, the impacts of P on U accumulation by plants were very complex.

Perspectives. The complex impacts of P on U accumulation by barley plants suggested that U behavior in mycorrhizosphere and translocation along soil-fungi-plant continuum as affected by fertilization practices deserve extensive following studies for optimizing the function of the mycorrhizal associations for phytoremediation purposes.

Effects of arbuscular mycorrhizal inoculation on uranium and arsenic accumulation by Chinese brake fern (*Pteris vittata* L.) from a uranium mining-impacted soil

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Abstract

Uranium (U) is one of the highly toxic radionuclides to both plants and mammals. Sometimes other toxic elements such as arsenic (As) also occur in U mines, which adds to the difficulties of the management of the U-contaminated soils. A glasshouse experiment was conducted to investigate U and As accumulation by Chinese brake fern, *Pteris vittata* L., in association with different arbuscular mycorrhizal fungi (AMF) from a U and As contaminated soil. The soil used contains 111 mg U kg^{-1} and 106 mg As kg^{-1}. *Pteris vittata* L. was inoculated with each of three AM fungi, *Glomus mosseae*, *Glomus caledonium* and *Glomus intraradices*. Two harvests were made during plant growth (two and three months after transplanting). Mycorrhizal colonization depressed plant growth particularly at the early stages. TF (transfer factor) values for As from soil to fronds were higher than 1.0, while those for roots were much lower. Despite the growth depressions, AM colonization had no effect on tissue As concentrations. Conversely, TF values for U were much higher for roots than for fronds, indicating that only very small fraction of U was translocated to fronds (less than 2%). Mycorrhizal colonization significantly increased root U concentrations

at both harvests. Root colonization with *G. mosseae* or *G. intraradices* led to an increase in TF values for U from 7 (non-inoculation control) to 14. The highest U concentration of 1574 mg kg^{-1} was recorded in roots colonized by *G. mosseae* at the second harvest. The results suggested that *Pteris vittata* in combination with appropriate AMF would play very important roles in bioremediation of combined contaminated environments.

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(Y.-G. Zhu)

International Conference «Modern Problems of Genetics, Radiobiology, Radioecology and Evolution» Yerevan, Armenia, 8-11 September 2005

The conference is dedicated to the 105th anniversary of birth of N.V. Timofeff-Resovsky, a famous Russian scientist, and the 70th anniversary of publication of the book by N.V. Timofeeff-Resovsky, K. Zimmer and M. Delbruck «On the nature of gene mutations in the gene structure», the first publication on the regularities of radiation effects on living cells.

The conference «Modern problems of genetics, radiobiology, radioecology and evolution» continues a scientific tradition initiated in Dubna (Russia) where it was first held in 2000 under the UNESCO aegis and with participation of the leading scientific and social international organizations.

The organizers of the conference are 17 scientific and social international organizations, including the International Union of Radioecology, Joint Institute for Nuclear Research, American Genetic Society (USA), Delbruck Center for Molecular Medicine (Germany), National Academies of Sciences of Russia, Armenia, Belarus and Ukraine.
The program of the conference covers 6 sections:

I. Genetics
1. Mutation processes in genes and chromosomes.
2. Transition and heritable mutations.
3. Mutation process in natural populations.
4. Problems of medical genetics.

II. Radiobiology
1. A genetic concept of biological effects of ionizing radiation.
2. The hit principle and non-target effects.
3. Radiation biology of contaminated areas.
4. Radiation biophysics.

III. Radioecology
1. Ecosystems and their sensitivity to contaminations.
2. Radiation dosimetry in populations and communities.
3. Methods for estimating contamination of large areas.
4. Radioactive sensors as a tool in biochemistry and biogeocenology.

IV. Adaptive evolution
1. Evolution mechanisms.
2. Evolution prerequisites.
3. Stress effects on DNA.

V. Biospherelogy
1. A theory of biosphere is a child of the Russian national school in science
2. Levels of life organization on the Earth and the environment of the evolutionary processes.
3. Biosphere and mankind in the third millennium.

VI. Memorial section
1. The round table «The world outlook (ideology) of N.V. Timofeeff-Resovsky»

The working languages of the conference – Russian, English.
For more details visit the website:
http://www.jinr.ru/~drrr/Timofeeff

Recent Journals, Books and Reports

Ipatyev V.A., Bulko N.I., Mitin N.V., Shabaleva M.A., Didenko L.G. Radioecological Phenomenon of Forest Ecosystems. Gomel, Forest Institute, National Academy of Sciences of Belarus. 2004. 310p.

The monograph integrates results of long-term field, microfield and greenhouse experiments for studying interactions of different components of forest ecosystems of Belorussian Polesyes affected by the Chernobyl accident with the main dose-forming radionuclides (137Cs, 90Sr).

For the first time phytological (control of species composition of forest phytocenoses), agrochemical and hydroameliorative methods have been devised to reduce radionuclide accumulation in the root horizons of soils, in plant and food products of forest, as well as economic effectiveness and prospects of these methods for various conditions of growing of forest ecosystems in radioactively contaminated areas have been assessed.

The book is of interest to a wide range of specialists - foresters, radiobiologists and radioecologists. It was published in Belarus (Gomel) in Russian, each chapter contains an abstract in English.

B.N. Annenkov, A.V. Yegorov, R.G. Ilyazov. Radiation Accidents and Mitigation of Their Consequences in the Agricultural Sphere / Ed. B.N. Annenkov. Kazan: «Fen» Publishers, Tatarstan Academy of Sciences, 2004. 408p.

The book is written by the leading radioecologists of Russia and the Republic of Tatarstan who took part in the mitigation of consequences of the accident at the «Mayak» Production Association in 1957 and Chernobyl accident in 1986 and is based on the authors' own materials of research carried out on the agricultural lands contaminated by the accidents.

The book summarizes data on radionuclides entering the biosphere as a result of nuclear weapons tests and radiation accidents. It describes the regularities of migration of the main dose-forming radionuclides (^{90}Sr, ^{137}Cs) in the sphere of agricultural production, considers the most effective agrotechnical, agrochemical and zooveterinary measures which provide manyfold reduction in the radionuclide uptake to the basic foodstuffs of humans. The starting postulates and principles of farming on lands heavily contaminated by radionuclides have been formulated.

Kudyasheva A.G., Shishkina L.N., Shevchenko O.G., Bashlykova L.A., Zagorskaya N.G. Biological effects of radioactive contamination in populations of mouse-like rodents. Ekaterinburg: Urals division of RAS, 2004, 215p.

The book integrates results from the long-time investigations carried out with natural populations of mouse-like rodents inhabiting areas with normal and elevated level of natural radiation background (stations in the Komi Republic).

The following was analyzed: the dynamics of the population, sex-age structure of field mice, morpho-physiologic parameters, system of lipid peroxidation, activity of enzymes for antioxidant protection and energy exchange, processes of reproduction and development, micronuclear test, cytogenetic parameters in cells and tissues of these parameters.

The regularities and specific features of responses of the parameters studied have been revealed as a function of ecologo-physiological condition of animals and level of radioactive contamination of the area.

Moskalev A.A. Radiation induced alteration in Drosophilla melanogaster lifespan.

Syktyvkar, 2004, 104p. (Komi Science Center of Urals division of RAS).

Original experimental data are presented on the role of genome destabilization and apoptosis deregulation in the aging process.

Nonirradiated drosophilla lines with defected repair system, antioxidant protection and apoptosis are shown to have higher aging rate than lines of this kind.

It has been proved that cells with reduced protection will accumulate damages and will be subject to aging at a higher rate, their radiation induced elimination at early ontogenesis stages will result in slowing down of age-dependent alterations and reduce the aging rate.

However in succeeding irradiated generations this hormesis stress-response is replaced at the population level for negative genetic effects, thereby reducing the lifespan.

Matery L.D., Ermakova O.V., Taskaev A.I. Morphofunctional estimation of the state of small mammals in radioecological investigations (exemplified be a field mouse). Syktyvkar, 2003, 164p.

A generalized material is presented from radioecological studies of radiation effects on liver, endocrine and hematopoietic systems of Microtus oeconomus Pall. inhabiting natural biogeocenoses with the elevated due to natural (Komi Republic) and anthropogenic (30 km ChNPP zone) factors radiation background.

Induced by low-level radiation morphophysiological alterations in the systems studied are caused by both destructive and compensatory-recovery processes, the effectiveness of which depends on the physiological peculiarities of animals, changes of the population cycle phases and on genesis (nature) of radioactive contamination of the area.

Pan Ziqiang et al. Radiation environmental impact assessment of the nuclear industry in China in the three decades (1955-1985). China, Atomic Energy Press, 2004. 217 p.

The Chinese edition of Radiation environmental impact assessment of the nuclear industry in China in the three decades (1955-1985) was published in 1990 by Atomic Energy Press, Beijing, China.
The present edition is an English version of it.
This book is aimed to present an overall summary of the environmental situation in the surrounding areas of China's nuclear facilities in such a manner as to collect a wealth of research results in the decades since the founding of China's nuclear industry.
Emphases are placed on describing the models and parameters used in assessing environmental quality, environmental background radiation levels in China and the work of environmental quality assessments carried out at various systems of the nuclear industry. In addition, a comprehensive overview is made of the environmental quality in the areas surrounding the nuclear facilities for the three decades, with projections made of the potential impacts upon environmental quality that would be created in the future development of nuclear energy.
This book should be useful those who are involved in the sectors of nuclear and other energies, environmental science, radiation protection and nuclear technique applications and for university teachers and students majoring nuclear energy environmental engineering.

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