

RESEARCH PROJECTS AND GRANTS

1994 – "The exchange between signal molecules on the early stages of legume-rhizobia symbiosis". Research project supported by the Russian Foundation of Basic Research (94-04-11654-a), Russia.

1995-1997 – "Genes and signals in the formation of plant-bacterial communities". Research project supported by the Russian Foundation of Basic Research (95-04-12573-a), Russia.

1996-1998 – "The research of genetic control and molecular mechanisms of legume-rhizobia symbiosis foundation". Research project supported by the Russian Foundation of Basic Research (96-04-50361-a), Russia.

1996-1998 – "Life strategy analysis of the *Fusarium* fungi in dependence of soil conditions". Research project supported by the Russian Foundation of Basic Research (96-04-50364-a), Russia.

1996-1999 – "Rhizobacteria as biopesticides and phytostimulators for sustainable agriculture and quality food". Research project NWO collaboration with Russian Federation Action line agricultural and nutrition research. Corr. No: 96/10233a; Doss. No: 047.01.007.96.

1997 - "Interactions between barley and associative bacteria under cadmium stress". Fellowship of Dr. Belimov within the Sonderforschungsbereiche 251 grant, Wuerzburg University, Germany.

1998-2000 - "Legume associations with soil microbes: biological solution for restoring fertility of heavy metal polluted soils in sustainable agroecosystems". International research project sponsored by the INCO COPERNICUS programme (PL971112), Institut National de la Recherche Agronomique (France), Bielefeld University (Germany), Ancona University (Italy), Jagiellonian University (Poland), ARRIAM (Russia), Svalof Weibull SA (Sweden), Swedish University of Agricultural Sciences (Sweden), Uppsala University (Sweden).

1999 - "Effect of ACC-utilizing rhizobacteria on nutrient status of rape plants". Fellowship of Belimov A.A. within the JSPS Program for collaborative research (RC2/98116), Hitotsubashi University, Japan.

1999 and 2000 - "The effect of general defence responses on nodulation efficiency of legume plant: Heavy metal stress and the development of symbiosis with nitrogen fixing bacteria". Fellowships of Dr. Belimov sponsored by the DAAD (R325-A/99/09544) and by the Sonderforschungsbereiche 549 grant, Bielefeld University, Germany.

1999-2001 – "Diversity and relationship of *Verticillium* species". Project NATO № R0501015, Russia, USA, Greece.

2000-2001 – "Development of experimental and mathematical models for analysis of bacterial populations dynamics in plant-microbe interactions". Research project supported by the Russian Foundation of Basic Research (00-04-48852-a), Russia.

2000-2001 – "Development of soilborne micromycetes in soils with different texture". Research project supported by the Russian Foundation of Basic Research (00-04-49473-a), Russia.

2001-2003– "Identification and phylogenetic relationship of phytopathogenic and non-pathogenic species and sub-species in the genus *Verticillium* based on molecular, genetic and immunochemical techniques ". Greek-Russian cooperative international project № 54. The All-Russian Research Institute for Agricultural Microbiology (Russia) and the Department of Genetics and Biotechnology, Faculty of Biology, University of Athens (Greece).

2001 and 2004 - "Development of symbiotic systems between pasture legumes and soil microbes for restoring fertility of polluted and arid soils". Expert visits of Dr. Belimov to the ISPAAM CNR within the Italy-Russia Commission for Science and Technology Cooperation (T4 AGR 2001-2 and 3N60 AM7 2003-4), Sassari, Italy.

2001-2003 – "The effect of molecular composition of root exudates on the antagonistic relationship between bacteria and phytopathogenic fungi in the rhizosphere". Research project supported by the Russian Foundation of Basic Research (01-04-49640-a), Russia.

2001-2003 - "Development of plant-bacteria systems for phytoremediation of heavy metal polluted soils". Lincage Grant and Collaborative Linkage Grant supported by the NATO on (LST.CLG.978202), Waterloo University, Canada.

2002-2004 - "Taxonomy of new root nodule bacteria groups - microsymbionts of legumes belonging to the genera *Lotus*, *Astragalus*, *Hedysarum*, *Ornithopus* and *Scorpiurus*". Research project supported by the Russian Fubdation of Basic Research (02-04-4973-a), Russia.

2002-2004 - "A chemically induced *Pisum sativum* mutant with increased cadmium tolerance - A unique model to study adaptation of legume plants to toxic heavy metal concentrations". Research project supported by the the INTAS (01-2170), Bielefeld University (Germany), ARRIAM (Russia), Institute of Biochemistry and Genetics Ufa SC RAS (Russia), All Russia Research Institute of Legumes and Groat Crops (Russia), Uppsala University (Sweedon).

2002-2003 - "Rhizobacterial mediation of plant drought stress responses". IES grant for Ex-Agreement Visits supported by the Royal Society, Lancaster University, United Kingdom.

2003-2005 - "The role of rhizosphere bacteria in tolerance of Indian mustard (*Brassica juncea* Czern.) to cadmium". Research project supported by the Russian Fubdation of Basic Research (03-04-48252-a), Russia.

2004 - "Study of mechanisms of cadmium tolerance in plants for phytoremediation of polluted soils". Research project supported by the Governement of St.Petersburg, Russia.

2004-2005 – "Development of sustainable biotechnologies of plant cultivation in greenhouses with rhizosphere bacteria". Research project supported by the Russian Foundation of Basic Research (04-04-08168-ofi_a), Russia.

2004-2006 - "Improving plant productivity under limited water supply by inoculation with plant growth promoting rhizobacteria". The International Joint Project Grant supported by the Royal Society, Lancaster University, United Kingdom.

2005-2006 – "Microbial plant growth stimulation and control of plant fungal diseases for sustainable production of healthy food, focused on Uzbekistan". Research project supported by the INTAS 04-82-6969.

2006-2007 – “Importance of the environment factors in trophism of facultative phytopathogenic fungus *Fusarium culmorum*”. Research project supported by the Russian Foundation of Basic Research (06-04-48788-a), Russia.

2006-2008 – "The optimization of complex plant-microbe interactions in rhizosphere". Research project supported by the Russian Fubdation of Basic Research (06-04-48705-a), Russia.

2006-2008 - “Investigation of the role of rhizosphere bacteria containing enzyme 1-aminocyclopropane-1- carboxylate deaminase in plant tolerance to stresses and development of nitrogen-fixing symbiosis with nodule bacteria”. Research project supported by the Russian Fubdation of Basic Research (06-04-49486-a), Russia.

2006-2008 - “Role of cell division, cytoskeleton and murein metabolism genes of the cyanobacterium *Anabaena* sp. PCC 7120 in heterocyst differentiation and pattern formation”. Research project supported by the Russian Fubdation of Basic Research (06-04-49799-a), Russia.

2007-2008 –"Influence of root exudates on antifungal and phyto stimulation activity of *Pseudomonas* strains in rhizosphere of vegetables crops". Research project supported by grant of President of Russian Federation RF MK-1453.2007.4.

2008 - “Soil-plant signaling networks: manipulations to sustain plant productivity during drought”. Research project supported by the BBSRC, Visit of Dr. Belimov to Lancaster University, United Kingdom.

2008-2009 – "The co-adaptation of plant-microbe symbiosis partners metabolisms as method for improving of efficiency microbe biopreparations for plant protection against root phytopathogens". Research project supported by the Russian Foundation of Basic Research (08-04-13671-ofi_c), Russia.

2008-2009 – «Development of the technologies to manufacture mycorrhizal biopreparation based on research into the physiology of symbiotic interactions of host plant *Medicago lupulina* and fungus *Glomus intraradices*». Research project supported by the Russian Fubdation of Basic Research (08-04-13744-ofi_c), Russia.

2008-2009 – “Is there a competition for sites of colonization of barley roots between phytopathogenic fungus *Fusarium culmorum* and antagonistic bacterium *Pseudomonas fluorescens*?”. Research project supported by the Russian Foundation of Basic Research (08-04-00356-a), Russia.

2009 – “Molecular genetic basis for the formation and functioning of beneficial plant- microbial systems”. Research project supported by the Foundation of the President of the Russian Federation (NS-5399.2008.4), Russia.

2009-2010 – "Self-sufficient plant-microbial system based on wheat genotypes with a given composition of root metabolites". Research project supported by the Russian Foundation of Basic Research (09-04-13648-ofi_c), Russia.

2009-2010 (Borodina E.V.) – «Developing ways to protect cereal crops from *Fusarium* seedling blight». Project № 36 of the participant of youth Scientific Innovation Tender of the Foundation for Assistance to Small Innovative Enterprises in the scientific and technical field. Grant Ltd. "Technologies. Implementation. Science", Russia.

2009-2011 – “Rhizobacterial effects on plant long-distance signalling under drought stress”. The International Joint Project Grant supported by the Royal Society, Lancaster University, United Kingdom.

2009-2011 - “Mechanisms of tolerance of legume-rhizobia symbiosis to water stress in the presence of toxic cadmium concentrations”. Research project supported by the Russian Fubdation of Basic Research (09-04-01614-a), Russia.

2010-2011 (Borodina E.V.) – "Effect of predecessor and mulching on yield and suppression of permanent grasses *Fusarium* root rot". Project № 10208 of the participant of youth Scientific Innovation Tender of the Foundation for Assistance to Small Innovative Enterprises in the scientific and technical field. Grant Ltd. "Technologies. Implementation. Science ", Russia.

2010-2012 – “Assessment of colonization of various barley genotypes by *Fusarium culmorum* strains with different toxin production using real-time PCR and immunofluorescent staining”. Research project supported by the Russian Foundation of Basic Research (10-04-00488-a), Russia

2010-2012 - “Genetic and metabolic control of heterocyst differentiation in cyanobacteria”. Research project supported by the Russian Fubdation of Basic Research (10-04-01177-a), Russia.

2011 – “Study of 1-aminocyclopropane-1-carboxylate deaminase genes of symbiotic nodule bacteria”. Subsidy of the Science and High School Commission of St-Petersburg Government, Russia.

2011 – “Increase of plant tolerance to combined stress caused by climate changes and environmental pollution”. Subsidy of the Science and High School Commission of St-Petersburg Government, Russia.

2011-2012 – “Creation of symbiotic plant-microbe system for phytoremediation of cadmium contaminated soils”. Government contract supported by the Ministry of Science and Education RF, Russia.

2012 – “The role of root exudates in integration plants with symbiotic microorganisms”. Research fellowship of Dr. Kuzmicheva from the All Russia Research Institute of Legumes and Groat Crops in the ARRIAM”. Research project supported by the Russian Fubdation of Basic Research (12-04-90858-mol_rf_nr), Russia.

2012 – “Genetic, physiologic and functional characteristics of bacteria inhabiting soils of St-Petersburg and utilizing phytohormone abscisic acid”. Subsidy of the Science and High School Commission of St-Petersburg Government, Russia.

2012-present – “Study of mechanisms of component integration and phytoremediation potential of heavy metal tolerant legume-bacteria symbiotic system”. Research project supported by the Russian Fubdation of Basic Research (12-04-01501-a), Russia.

2013-present – “Utilization of phytohormone abscisic acid by symbitrophic bacteria: new mechanism of plant-microbe interactions? Research project supported by the Russian Fubdation of Basic Research (13-04-01655 A), Russia.