Contact us:
Timiryazev street 49
127550 Moscow
Russia
Tel +7 (495) 977 84 29
Fax +7 (495) 977 84 28
E-mail:
ludmila.khrustaleva@rambler.ru
karlov@timacad.ru

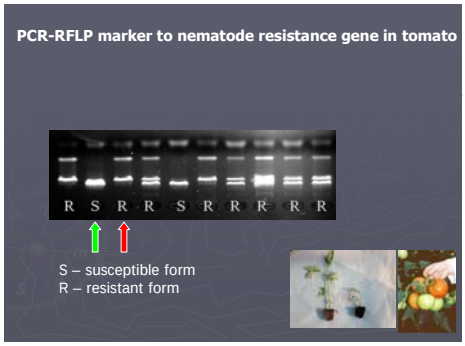
Center of Molecular Biotechnology

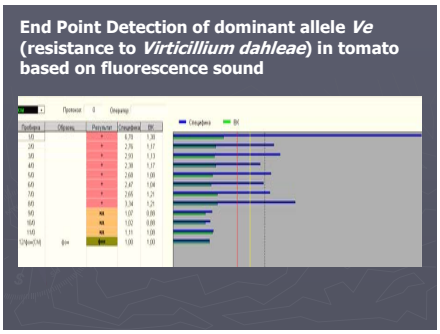
Russian State Agricultural University – Moscow Agricultural Academy named by K.A.Timiryazev

Molecular Biotechnology Center specialises in fundamental and applied research. With our knowledge and expertise in molecular biology, genetics, ecology, plant breeding, seed farming, phytopatology, plant physiology, animal breeding and reproduction we have established unique platform for large-scale analysis in agro-production process. We serve the main chain in food production from DNA level to crop and animal reproduction. We offer a comprehensive system including molecular marker assisted selection; screen the genetic diversity in crop plants and their wild relatives, seed purity control, biomonitoring and environmental genetic risk assessment, molecular genetic approaches to improve the nutritional quality of staple food crops, cloning genes and producing transgenic plants. Our fundamental researches mainly focus on gene organization in species with large genome, meiotic recombination and evolution of plant telomere.

Our research products:

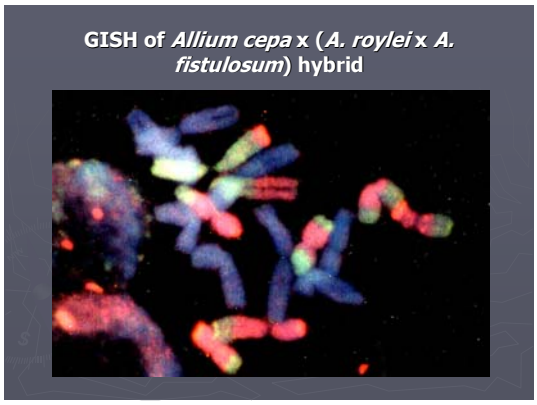
The Molecular Genetics Team provides new genetic tools and information to plant and animal breeders. The team concentrates on developing molecular markers for disease resistance genes with specific focus on tomato, sunflower, cabbage, cucumber, pepper, rice and sunflower. . Recently we have done research also on molecular mapping of the fertility-restoration gene *RF4* for WA-cytoplasmic male sterility in rice.

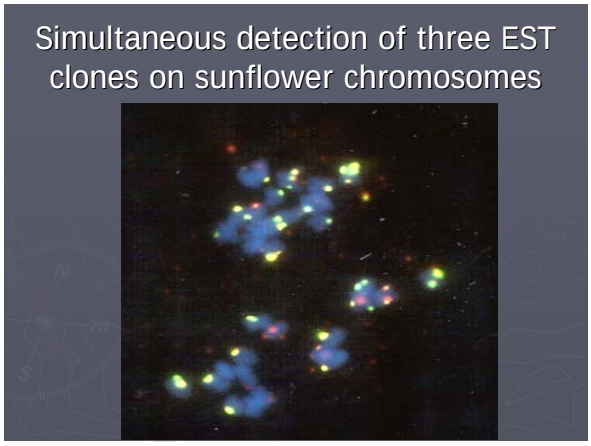




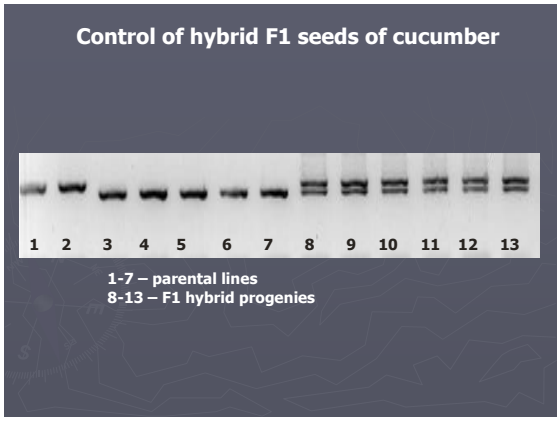
The Molecular Cytogenetic Team focuses on large scale organization and evolution of genomes. A particular area of interest is gene organization in large-genome species, meiotic recombination and telomere molecular structure. We use a combination of genetic, molecular and cytological methods - molecular cytogenetics - including *in situ*

hybridization, fluorescence microscopy and cytometry. We also work on the technology of fluorescence imaging, improving the sensitivity and discrimination of probes used for *in situ* hybridization. A lot of this fundamental work is directed towards applications in breeding programs, for instance, monitoring of introgression process in interspecies hybridization, detection of T-DNA insertion in transgenic plants etc.

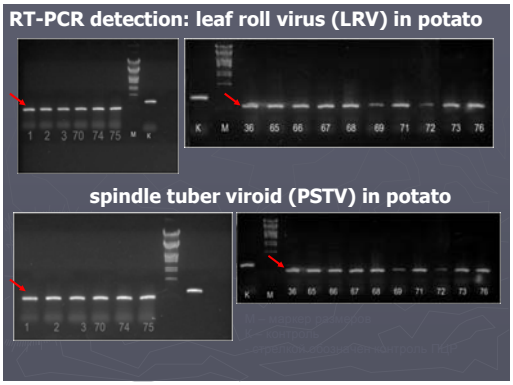




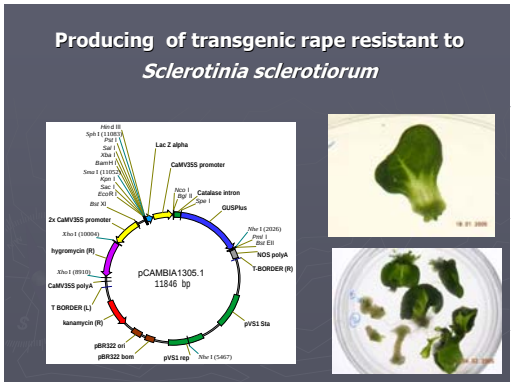
The Team of Seed Control has a focus on the use and development of some Polymerase Chain Reaction DNA based new technologies (RAPD, microsatelites, ISSR) for genetic purity determinations in seed testing. Seed testing for quality assurance is one important step in the process of production of high quality seed. Recently we began to specialize on the hybrid seed control. Market of hybrid seeds is rapidly extending from vegetables and flowers to rice and some forage crops. The hybrid seeds are prized because they produce uniform plants benefiting from the effect called heterosis (hybrid vigor). We also use the storage protein analysis for evaluation of seed purity.

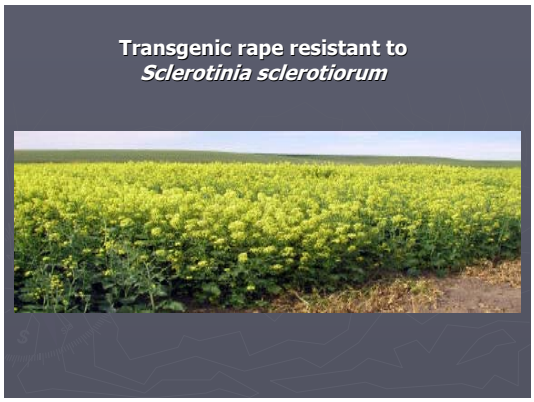


The Plant Health Team specializes on developing molecular techniques for detection of the plant virus. We use real time RT-PCR (reverse transcription-polymerase chain reaction) for identification of virus in plant material and establishing of the infection degree. Real time RT-PCR is the most sensitive technique for mRNA detection and quantitation currently available. We focus on potato (X-virus, Y-virus), cucumber (CMV- cucumber mosaic virus) and strawberry (crinkle virus and mottle virus).

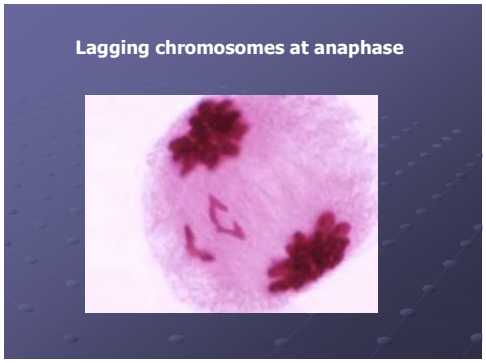


The Genetic Engineering Team implements gene cloning, develops vectors for transformation and produces transgenic plants. We specialize on cloning genes resistant to plant pest. Currently we work on producing transgenic rape (*Brassica napus* L) resistant to *Sclerotinia sclerotium* - a plant pathogenic fungus. Oilseed rape, or canola, is the world's third most important oilseed crop. Plant breeders developed it from the 'weed' rapeseed (*B. napus oleifera*). Rape methyl ester provides a renewable replacement for diesel fuel that gives off fewer sooty particles and none of the sulphur dioxide that causes acid rain.





The Ecology Team specializes on bio-indication , biomonitoring and environmental genetic risk assessment. We develop scientific approach and applied aspects of genetic response at different levels of organization (molecular, cells, organisms and populations) towards of mutagenic pollution in native and transformed ecosystems. We use complex test–system for bio-indication of mutagenic pollution, including (i) analysis of spectrum and frequency of cytogenetic aberration in plant reproductive organs, (ii) analysis of storage protein spectrums, (iii) analysis of pollen fertility, (iiii) study of biodiversity using molecular marker approach.



On-going projects

Supported by:

Russian Ministry of Agriculture

Developing and improving the identification methods of resistance gene to plant pathogens.

DNA-markers of resistance gene to phytopatogens of tomato in cabidge and producing based on that DNA-diagnosticums.

"Rosnauka" RF

Study of alternative mechanism of telomere elongation, using *Allium fistulosum* as a model

Russian Foundation for Basic Research (RFBR)

Molecular cytogenetic study of sex chromosome organization in hop (*Humulus lupulus* L.)

Selected publications

Danilova T.V. & G.I. Karlov (2006) Application of inter simple sequence repeat (ISSR) polymorphism for detection of sex-specific molecular markers in hop (*Humulus lupulus* L.) Euphytica (in press).

A. Ahmadikhan & G.I. Karlov (2006) Molecular mapping of the fertility-restoration gene *RF4* for WA-cytoplasmic male sterility in rice. Plant Breeding 125:363-367.

Khrustaleva . L. I., P. E. de Melo, A. W. van Heusden & C. Kik (2005) The integration of recombination and physical maps in a large-genome monocot using haploid genome analysis in a tri-hybrid Allium population. Genetics 169: 1673-1685.

Tikunov Yu.M., Khrustaleva L.I. & Karlov G.I. (2003) Inter-simple sequence repeat (ISSR) polymorphism in *Lycopersicon.* Euphytica 131: 71-80.

Karlov, G.I., T.V. Danilova, C. Horlemann & G. Weber. (2003) Molecular Cytogenetics in Hop (Humulus lupulus L.) and Identification of Sex chromosomes by DAPI-banding. Euphytica.132:185-190.

Fesenko I.A., Khrustaleva L.I. & G.I. Karlov. Study of organization of a 378 bp satellite repeat in terminal heterochromatin of *Allium fistulosum.* Genetics (Russian), 2002, 38 (7):894-903.

L.I. Khrustaleva & C. Kik. (2001) Localization of single copy T-DNA insertion in transgenic shallots (*Allium cepa* L.) by using ultra-sensitive FISH with tyramide signal amplification. Plant J 25 : 699-707

L.I. Khrustaleva & C. Kik (2000) Introgression of *Allium fistulosum* into *A. cepa* mediated by *A. roylei*. Theor Appl Genet 100: 17-26

G.I. Karlov, L.I. Khrustaleva**,** K.B. Lim & J.M. van Tyul (1999) Homeologous recombination in 2n-gamete producing interspecific hybrids of Lilium (Liliaceae) studied by Genomic in situ hybridization (GISH). Genome **42**: 681-686

L.I. Khrustaleva and C. Kik (1998) Cytogenetical studies in the bridge cross *Allium cepa* x (*A. fistulosum x A. roylei*). Theor Appl Genet. 96:8-14

Prof. L. Khrustaleva