

Crop Research Institute



**Public Research Institution under the
auspices of Ministry of Agriculture**

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Crop Research Institute



- ✓ CRI was founded in 1951
- ✓ Total employees: 300 (175 researchers)
- ✓ Annual budget: 250 mil crowns (10 mil Euros)

Four divisions:

- ❖ Division of Crop Management Systems
- ❖ Division of Crop Genetics and Breeding
- ❖ Division Crop Protection and Plant Health
- ❖ Division of Experimental stations



Main Activities

- **Basic and applied research and innovations** in: agroecology, plant genetics, breeding and product quality, plant health, plant nutrition and field experiments
- **Cooperation with and teaching** at Universities (Czech and foreign)
- **Transfer** of research results, including consultations
- **Coordination of the National Programme** on Conservation of Genetic Resources of Plants, Microorganisms
- Maintenance of **Long-Term Experiments**
- **Coordination of two National Scientific Committees** on Phytosanitary and Environment, and Genetically Modified Food and Feedstuffs



Main Research Themes

➤ **Sustainable arable land management and cropping systems**

Optimization of farming systems and technologies for crop production in terms of their sustainability, leading to the maintenance soil fertility and quality of arable land, improving plant nutrition and the prevention of adverse effects of agriculture practices on soil and environment.

➤ **Genetics, plant breeding and quality of plant products**

Study the genetic properties of economically important traits, selection, creation and preservation of genotypes with desired properties and characteristics and use them to improve the production potential and value of crops.

➤ **Environmentally balanced systems of crop protection and plant health**

Study of the interaction between plants, pathogenic microorganisms and pests in agro-ecosystems for the development of sustainable systems of protection of cultivated plants to ensure the stability of their production potential and safety of plant products.



Sustainable arable land management and cropping systems

- Innovation cultivation processes (technology) of field crops and grasslands, optimize the structure and productivity of agroecosystems in different soil and climatic conditions in terms of biological and technological aspects of sustainable use, lead to increasing carbon sequestration and efficient management of water and nutrients;
- Assessment of methodology that allows the interaction of G (genotype) x E (environment) x M (management) increased use of biological potential of yield and quality of the economically important crops;
- Elaboration methods of bioindications of soil quality and take advantage of beneficial soil microorganisms for improvement of plant nutrition and microbiological recovery of poor soils and soils affected by erosion;
- Application of genetically and physiologically based differences in varieties of field crops in the metabolism of nutrients to improve their uptake and utilization by plants;
- Improvement of integrated weed management methods in agro-ecosystems;
- Study the effect of agro-environmental measures in the permanent grassland (PG) on the production, quality and species diversity of vegetation to improve arable land uses.



Sustainable arable land management and cropping systems

- Development of technology of cultivation of crops for non-food uses and production of biotechnology to develop complex multi-stage processing and utilization of agricultural biomass and biodegradable waste as a renewable raw materials and energy.

Eight Research Teams:

- ❖ **Integrated Crop Nutrition**
- ❖ **Management of Nutrients in Agrosystems**
- ❖ **Agricultural Soil Science and Pedobiology**
- ❖ **Crop Physiology and Plant Nutrition**
- ❖ **Weeds and Vegetation of Agroecosystems**
- ❖ **Sustainable Management and Utilization of Permanent Grassland**
- ❖ **Technologies for Sustainable Agriculture and Landscape Restoration**
- ❖ **Agricultural Extension**



Genetics, Plant Breeding and quality of plant products

- Evaluation and conservation of plant genetic resources; increase the efficiency of breeding methods of field and horticultural crops, selection and use of appropriate donors with important traits;
- Introduction of minority and new crop varieties with specific properties for the expansion of agro-biodiversity and the use of food, feed and industry;
- Characterization of genome interactions and mechanisms of regulation of gene expression in different plant genotypes under different environmental conditions; determine their importance for phenotypic plasticity with regard to changing climate and requirements of crop management practices;
- Development of new genetic-breeding techniques using molecular Omics methods to create varieties and lines with higher productivity, improved use value and the desired resistance to biotic and abiotic stresses;
- Study the genetic basis of species or varieties of plants and study their metabolic pathways to ensure the health and nutritional quality of crop production



Genetics, Plant Breeding and quality of plant products

Seven Research Teams:

- ❖ **Gene Bank**
- ❖ **Physiology and Cryobiology of Plants**
- ❖ **Quality of Plant Products**
- ❖ **Plant Stress Biology and Biotechnology**
- ❖ **Plant Genetics and Breeding Methods**
- ❖ **Molecular Genetics**
- ❖ **Genetic Resources of Vegetables and Specialty Crops**



Environmentally balanced systems of crop protection and plant health

- Improvement of the system of integrated pest management and plant products against pathogens and pests to minimize the use of pesticides and reduce their risk in food and feed to promote safety and enhance biodiversity in agro-ecosystems;
- Study the biology and ecology of pathogens and pests, analysis their relationships with crop plants in respect to global change;
- Innovation of diagnostic methods and procedures for the fast and reliable detection and quantification of pathogens and pests, including diagnosis of resistance to pesticides and the elaboration of anti-resistance strategies;
- Exploration of the etiology of biotic stresses of plants and analysis the genomes of the organism for the determination of properties influence virulence or pathogenicity of harmful organism;
- Study the mechanisms of plant resistance to pathogens, pests and weeds using molecular and biotechnological methods and techniques;
- Development of predictive models of epidemiology in crop protection and risk assessment of the occurrence and spread of pathogens and pests (pest risk analysis-PRA).



Environmentally balanced systems of crop protection and plant health

Ten Research Teams:

- ❖ **Secondary Plant Metabolites in Crop Protection**
- ❖ **Biologically Active Substances in Crop Protection**
- ❖ **Stored Product Pest Control**
- ❖ **Plant Virus and Vector Interactions**
- ❖ **Integrated Crop Protection against Insect Pests**
- ❖ **Phytopathogenic Prokaryotes in Agricultural Crops**
- ❖ **Diagnosis and Control of viruses and Phytoplasmas of Horticulture Crops**
- ❖ **Function of Invertebrate and Plant Biodiversity in Agrosystems**
- ❖ **Epidemiology and Ecology of Microorganisms**
- ❖ **Ecology and Diagnostics of Fungal Plant Pathogens**



Cooperation

- ❖ **Scientific collaborations with other research institutions in the Czech Republic as well as abroad**
- ❖ **Coordination and participation in EU projects – 7FP (4 projects), bilateral and multilateral projects (COST, KONTAKT – 31 projects), national projects funded by Ministry of Agriculture (47 projects), Czech Science Foundation (8 projects), Technological Agency of the Czech Republic (18 projects) and others**
- ❖ **Cooperation with private bodies, including farmers in application of research results**
- ❖ **Cooperation with Universities - lecturing at University courses and supervision of undergraduate and graduate students**



Running EU Projects – 7FP

- **HealthyMinorCereals** - An integrated approach to diversify the genetic base, improve stress resistance, agronomic management and nutritional/processing quality of minor cereal crops for human nutrition in Europe – Cooperator – CRI, with 18 other institutions
- **ADAPTAWHEAT** - Translating knowledge on flowering time to improve breeding efficiency
- **INTEREST** - Intercontinental and temporal research studies on transgene engineered in plums
- **PreSto GMO-ERA-Net** lays the groundwork for transnational research on health, environmental and techno-economic impacts of GMOs



Topics for future Horizon 2020 projects

- Studies crop nutrition in relation to crop product quality as well as environment protection
- Investigates processes of organic matter transformation in soils
- Studies nutrient uptake and utilization of nutrients by plants
- Studies sustainable crop production systems aiming at soil fertility conservation and maintenance of biodiversity
- Develops innovative methods of crop protection against weeds
- Develops new biotechnologies of biomass utilization (e.g. for energy production)



Some of Excellent and Transfer Results

- **Expert system for support of decision-making about using pesticides for improvement of economics of production and quality of environment**

Award of the Technological Agency of the Czech Republic for 2014

- **Award for systematic work and contribution in the area of research and development environmentally safe preparations for plant protection based on biologically active plant substances**

Award of the Minister of Education of the Czech Republic “Česká hlava” – “Czech Head”) for 2013

- **New botanical pesticide formulation**, registered as Utility model no. 19315, by the Industrial Property Office of the Czech Republic

- **Honorary Award L'Oréal-UNESCO for Women in Science in 2014** for the project „Identification of proteins responsible for cold acclimation and vernalization processes in cold-treated common and einkorn wheat (*Triticum aestivum* and *T.monococcum*) lines using two-dimensional differential in-gel electrophoresis (2D-DIGE) approach“

