ORAL PRESENTATIONS

Session 1

Plant genetic resources conservation and use: an overview

CROP WILD RELATIVES AT THE GENEBANK OF CNR, BARI, ITALY

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The Italian Gene Bank of the National Research Council (CNR) at Bari, started to collect crop wild relatives (cwr), together with threatened crops in 1970. At the beginning cwr did not receive much attention, as it was later on, in collaboration with FAO, IPGRI, ICARDA, IPK (Germany), Institute of Agrobotany (Hungary), University of Tuscia (Italy), and others. Germplasma, gathered in all the Mediterranean Countries, including Italy, Ethiopia, South Africa, Middle East, etc., were shared with national institutions and in some occasions were duplicated to IPK gene bank. The most important collected cwr concern species related to wheat, barley, oat, rye, pea, bean, cabbage, cowpea, lentil, sugar beet, meadow grass, white clover, lettuce, sage, crambe and others. They are preserved *ex situ* at 0°C and 35% of R.H (short and medium term) and at –20°C (long term). A database of the collection by genera and species has been created. A part from the research carried out in other centers on the material provided to them, for which, unfortunately, there is no feedback, a lot of research has been carried out at Bari in collaboration with other Italian and foreign researchers. From 1988 to 2000 the Italian Gene Bank of Bari coordinated a national project of CNR on plant, animal and microbial biodiversity, including cwr, with the aim to improve *in situ* and *ex situ* conservation and utilization of genetic resources. From 2002 to 2005, the Gene Bank, in collaboration with the Ministry of Environment, the Regional Council of Basilicata and the University of Bari, has also realized in Basilicata (at Policoro, PZ) a Thematic Center for the Safeguard and Protection of Mediterranean Plant Biodiversity, including cwr and endemic species of naturalistic importance. Data and information concerning genera and specie of cwr collected, preserved and studied at the Bari Gene Bank for utilization will be presented.

GENETIC EROSION OF LAND RACES OBSERVED DURING THE JOINT CZECH, SLOVAK AND POLISH EXPEDITIONS

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During the period 1990 to present many joint or individual expeditions for collecting of genetic resources have been undertaken. Most of them (12) were joint missions organized by the Czech Republic, Slovakia and Poland, mainly in border region but also inland. The main share of collected samples is represented by wild plants (4296 accessions) with agricultural and horticultural use. Out of them 40 % were grasses and 25 % fodder legumes. Land races were of primary attention, but their availability differed according to region and time. While in the Czech territory only a very low number of landraces were found, in Slovakia their cultivation was kept traditionally till now. We were able to collect about 80 % of the land races in Slovakia. Similarly, we collected valuable land races in Beskyd Orawski in Poland. Altogether 168 accessions were collected, out of them cereals were prevailing. From other crops beans were often found in home gardens together with herbs and spices. The most important findings of field and horticultural landraces are discussed with notes on their cultivation and use. Among them were three findings of emmer, *Lathyrus sativus*, dark compact *Sorghum bicolor*, black form of *Pisum sativum*, various landraces of poppy – *Papaver somniferum*, lettuce – *Lactuca sativa* and ornamentals. It is obvious, the land race availability decreases very rapidly from early ninetieths and at present any finding is very rare. A comparison to the land races availability in 70 and 80 have been done on the base of results of German-Czechoslovakian collections leaded by Kühn, Hammer, Hanelt, Pistrick and others and Germen-Polish collections leaded by Kulpa, Góski, Jastrzebski, Hammer, Hanelt and others.

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SCOTTISH LANDRACES: OCCURRENCE, RESEARCH AND *EX SITU* CONSERVATION

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The 2003 UK National Inventory of Plant Genetic Resources for Food and Agriculture commissioned by the Department of Environment, Food and Rural Affairs (DEFRA) identified a number of threatened cereal and fodder landraces, many of which are endemic to Scotland. A brief overview of Scottish landraces, their geographic spread and research projects associated with these crops is provided. The majority of these landraces are found on the Scottish Islands of Orkney, Shetland and Fair Isle in the North, and the Hebrides in the West. Three unique cereal landraces, bere barley, Hebridean and Shetland oat (*Avena strigosa* Schreb.) and a rye landrace (*Secale cereale* L.) are still present. Potato landraces can also be found. Some of the problems associated with UK landrace maintenance are illustrated by the example of Shetland cabbage (*Brassica oleracea* L.) which has been grown on the Shetland Islands for centuries but is now in serious decline. Details of a collecting mission to sample these landraces for *ex situ* conservation is provided and a new *ex situ* conservation maintenance system, the Scottish Landrace Protection Scheme, developed for the protection of Scottish landraces, is explained.

LINGUISTIC ISLANDS AND PLANT GENETIC RESOURCES - THE CASE OF GERMAN SPEAKING VILLAGES IN NORTHERN ITALY

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Missions for collecting plant genetic resources in northern Italy proved the fast proceeding genetic erosion. Relatively well preserved landraces could be found in an isolated village in the mountains of northern Italy in 2001. This was confirmed in 2003. Further isolated linguistic communities in five additional areas have been visited in 2006. The outcome of the mission showed that there is a positive correlation between the landraces still available in an area and its cultural and linguistic integrity. But the evolution of plant genetic resources is also influenced by the surrounding pressures from Italian agriculturists. Linguistic studies can help in the collection of traditional landraces and in the interpretation of evolutionary pathways.Collecting of folk names is an important feature of ethnobotany and completes the information about plant genetic resources. The material collected includes rye, oats, peas, beans but also very rare crops like poppies and buckwheat. Material has been taken for conservation in the Bari genebank and for further characterization and evaluation.

DIVERSEEDS: NETWORKING ON CONSERVATION AND USE OF PLANT GENETIC RESOURCES IN EUROPE AND ASIA

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Conservation and sustainable use of plant genetic resources (PGR) is vital in meeting the world's future development needs. Traditional crop varieties and crop wild relatives are often highly

endemic, ecologically rare, and most of them still survive in vulnerable ecosystems in developing countries. Given the importance of genetic resources for food safety, and the fact that centres of origin are mainly located in developing countries, we are convinced that it is absolutely necessary to link European researchers with scientists from these world regions that otherwise do have little or no resources to exchange their research results. Our two year project DIVERSEEDS aims to open European research networks to Asian research colleagues, to establish a communication platform, and to promote knowledge exchange on PGR and its management, taking existing initiatives into account. Participating researchers come from the European Union, Israel, China, Cambodia, Myanmar, Vietnam, and Thailand. The main objective of this project is – guided by the International Treaty of Plant Genetic Resources - to jointly elaborate a list of important PGR issues and recommendations for conservation and sustainable use of plant genetic resources in Europe and Asia. These recommendations will be published and made avaliable to researchers, policy makers, farmers and the general public. Diverseeds is an initiative that promotes international dialogue and cooperation between researchers working on PGR and agricultural biodiversity. – At the EUCARPIA section meeting, we will start with a brief presentation of DIVERSEEDS and will then use most of the time for an interactive workshop with meeting participants to discuss PGR issues of mutual interest to European and Asian colleagues, and possible ways to further promote cooperation and dialogue between PGR experts from these regions.
www.diverseeds.eu

MANAGEMANT AND EVALUATION OF EX SITU COLLECTIONS - THE GATERSLEBEN GENEBANK

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World-wide more than 6 million accessions have been accumulated in ex situ genebanks. One of the four largest global collections, housing 150,000 accessions belonging to 890 genera and 3,032 species is maintained at the Leibnitz Institute for Plant Genetics and Crop Plant Research in Gatersleben. This presentation highlights activities of the IPK genebank on management improvement and evaluation of genebank material.

Studies on the genetic integrity after 50 years of maintenance were performed for self-pollinating (wheat) and out-pollinating (rye) crops applying DNA fingerprinting techniques. For wheat a high degree of identity was revealed, which underlines the efficiency of the precautions taken by the IPK genebank to preserve the genetic integrity. In contrast, the out-pollinating accessions revealed extensive shifts in allele frequencies. The extent of changes observed was related to the number of multiplication cycles. Strategies of maintenance and management germplasm collections are discussed.

With respect to the evaluation activities, data from sixty years disease resistance screening of Gatersleben genebank accessions (wheat) will be presented. In total nearly 150,000 tests against different diseases were performed at seedling and adult plant stages. The screening comprised 10,348 accessions belonging to 21 species of the genus *Triticum* as well as 489 randomly selected accessions belonging to 20 species of the genus *Aegilops*. Most of the investigated accessions were hexaploids (8,725), although also tetraploid (1,339) and diploid (127) wheats were included. The probability for finding resistant material was shown to be highest in *Aegilops* and within the diploid species of the genus *Triticum*. Within the genus *Triticum* the percentage of highly resistant accessions decreased with increasing ploidy level.

STATE OF ART OF GRAIN LEGUME MANAGEMENT IN GENE BANKS: RESULTS OF AN INTERNATIONAL SURVEY

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An online survey addressed to members listed in the European Cooperative Program for Crop Genetic Resources Networks Working Group on Grain Legumes and Grain Legumes (GL) germplasm managers and breeders was carried out to pinpoint the current problems in the management of GL germplasm, to work out the criteria and decisions involved in the implementation of regeneration procedures and to identify strategic areas where further research is required.

The presentation is based on the online responses and it is the product of author thoughts. Thus, colleagues from around the world who responded to the survey contributed to this presentation that attempts to highlight the main issues concerning the ongoing management and regeneration practices in GL collections.

The survey was divided into three sections: 1) germplasm collection details and current status of the regeneration needs; 2) Assessment over the understanding of basic information required to carry out appropriate regeneration procedures such as the breeding systems, the pollination requirements and pollinating agents, the isolation techniques, etc.. and regeneration facilities; and 3) Assessment of different options, in addition to *ex situ*, such as "in situ" and "on farm" conservation.

Obtaining, collating and analysing different kinds of existing data on mating system of GL species, effective pollination control methods and isolation facilities by species and location is one example of priority issue. In addition, the GL community has made clear in the survey for greater support for development of well-designed methodologies of regeneration that maintain the genetic structure of population. Regarding that the optimum regeneration strategy is more probably to be achieved integrating pollinators with the regeneration procedures. A major concern of GL community is the lack of empirical scientific information on the most suitable pollinator agents. The consequences of *on farm* and *ex situ* conservation strategies have not been well studied and resolved but also the method of researching, understanding and quantifying the complementary role of these strategies have not been well developed. Encouraged by the outcome of the survey authors are eager to support an ecosystem approach to the maintenance of GL germoplasm that consider the four way-interaction between plant, pollinator, environment and farmer and promote the linkage of sustainable use of germplasm with related efforts such as pollinator conservation and farmer participatory breeding.

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INTEGRATING GENEBANKS INTO BIODIVERSITY INFORMATION NETWORKS

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As called by the International treaty on PGRFA (Article 17), existing information systems should collaborate to form a global information network. According to the Food and Agriculture Organization of the United Nations (FAO), there are more than six million *ex situ* germplasm accessions of agricultural and horticultural crops conserved by genebanks worldwide. Many genebanks have computerised their information, but the database software and data models implemented may differ substantially between genebanks. Under the coordination of Bioversity International (formerly IPGRI), standards for the exchange and integration of germplasm information were developed and adopted by many genebanks.

Today there is no single point of access to all genebank collections worldwide at the accession level, but germplasm data portals such as the EURISCO (European search portal), numerous Central Crop Databases (CCDBs), the Nordic Genebank (NGB, Northern Europe), and the CGIAR's System-wide Information Network for Genetic Resources (SINGER) among others, show that distributed data on genebank accessions can

be accessed from global and regional as well as crop-specific data portals, implemented as classical data warehouses.

The Global Biodiversity Information Facility (GBIF) promotes the exchange of biodiversity related information using a new information technology called web services. Such technology deployed at the level of data providers offers the opportunity to tap remotely into the "living" database. Germplasm collections are very similar information-wise to other biodiversity collections, such as natural history museums, botanical gardens or herbaria. Initiated by Bioversity, GBIF data exchange technology was further developed to suit the needs of the PGR community.

From 2004 on, several genebanks became GBIF data providers, the first being NGB, IHAR (Poland) and IPK (Germany), followed by USDA-GRIN (USA) and CGN (Netherlands). Bioversity joined GBIF in 2006, bringing in SINGER and EURISCO. Thus, with two million accessions, one-third of the world's germplasm holdings are presently searchable via GBIF. The wide adoption of GBIF technology for PGR information exchange would facilitate an alliance of distributed germplasm information systems. Already, Bioversity International has undertaken a feasibility study for such a global system comprising more than 2.3 million accessions.

A QUALITY MANAGEMENT SYSTEM FOR OPTIMISING THE CONSERVATION AND UTILISATION OF PLANT GENETIC RESOURCES

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A quality management (QM) system is the documented classification system of a given institution. All relevant key processes are visualized by procedure instructions and described in detail by working instructions. The establishment of a QM system is a measure to increase the satisfaction of the stakeholders (service quality) and to improve the internal genebank management. Moreover, the documentation of the individual processes is a key issue to perpetuate the long standing experience of the employees and their knowledge for a sustainable continuation of the conservation of genetic resources at the Federal *ex situ* Genebank in Gatersleben, Germany.

Three different process types are essential for a successful QM system of the genebank. Service processes to fulfil the customer requirements and to enhance the customer satisfaction, management processes to define the responsibilities and authorities, and supporting processes to assist with all necessary help for a smooth accomplishment of the service processes. Four main service processes for the German genebank have been defined: 1. To provide excellent seed and plant material. 2. To provide scientific knowledge, e.g. by publications or by resources such as the herbarium. 3. To perform research projects to further improve the conservation efforts and the utilisation of genetic resources. 4. To generate the human resources required for the future work on plant genetic resources. The implementation of these four service processes needs governance (management processes) and administrative support (supporting processes). Altogether, this results in a continual improvement of the QM system and in an optimal conservation and utilisation of plant genetic resources.

EVALUATION OF THE INRA BREAD WHEAT (*TRITICUM AESTIVUM L.*) COLLECTION FOR AGROMORPHOLOGICAL, TECHNOLOGICAL AND MOLECULAR TRAITS; BUILDING A CORE COLLECTION FOR CARRYING OUT A MORE COMPLETE EVALUATION

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INRA cereal collections have been grouped in one site at Clermont-Ferrand to optimize the management of these collections. New facilities have been built and an evaluation has been carried out on bread wheat collection of about 10000 accessions. We evaluated agronomical traits: heading date, height, and tolerance to diseases, to frost in field conditions. We described morphological traits: colour of ear and grain, awnedness, compacity, Thousand Grain Weight (TGW). Technological values were estimated through NIRS diagrams while genetic diversity was

analysed with microsatellites markers. Diversity within and among different geographical origins or periods of cultivation has been described and a core collection of 372 accessions has been built in order to carry out a deeper evaluation of traits of agronomic interest in wheat germplasm.

UK NATIONAL FRUIT COLLECTIONS APPLE MORPHOMETRIC DATA ANALYSIS

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Multivariate methods were used to study the structure of morphological variability within the UK apple cultivar collection and to investigate the applicability of these methods to apple germplasm management. Characterisation data was collected from 164 accessions. Twenty-three characters were scored, comprising 10 quantitative and 13 qualitative traits. Ten sets of quantitative scores were recorded per variety.

Principle Components Analysis (PCA) of the quantitative traits visualised the apple varieties as a single continuous group and accounted for their diversity well. PCA, Canonical Variates Analysis (CVA) and ANOVA from the k-cluster analysis all indicated that the 10 quantitative traits significantly contribute to distinguishing between the apple varieties. Similarly, factor analysis of the 13 qualitative traits using CatPCA (Categorical PCA) produced a single group qualitative model of apple diversity. It also showed that fruit colour traits are both important differentially and are correlated.

The absence of identifiable groups of apple varieties was confirmed by cluster analysis. Various Hierarchical Cluster Analysis procedures were applied to the quantitative data, while the 2step method was used to analyse quantitative and qualitative data together. The results were inconsistent across clustering methods and subsequent CVA of the results showed poorly defined groups with considerable overlapping of group members.

Most previous large scale taxonomic studies of apple varieties have failed to identify groups. This is because, like other perennial out-breeding species, most variation is present within apple populations. Small scale investigations often appear to identify groups, and in this study when a randomly selected subset of 4 varieties was analysed by CVA the results were highly significant and the varieties clearly distinguished. Selection of a 'core collection' helps to target genebank resources. The generally accepted method for identifying representative accessions depends on the presence of genetically differentiated subgroups. Given that no such subgroups of apple cultivars exist, a different method is required, possibly based on parentage.

EVALUATION OF ADAPTIVE POTENTIAL OF WILD WHEAT SPECIES AND THEIR USE IN BREEDING OF EMMER WHEAT

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Having a wide spectrum of adaptation to unfavorable environment conditions wild wheat relatives represent a valuable source of genetic variation for improvement of abiotic stress tolerance in cultivated wheat. New variety of emmer wheat has been created based on crossing of wild two-grain wheat (*T. dicoccoides*) with new form of hard cultivated two-grained wheat.

The evaluation of adaptability and plasticity degree of parental forms with the purpose of appropriate initial material selection has been done based on auxanography method of plants linear growth study. Daily periodicity of linear growth of wild wheat has been studied in the field conditions in pre-mountainous zone of Armenia. Hourly observations for linear growth have been carried out twenty-four hours a day from the first leaves appearance to termination of flowering stage. The daily periodicity of growth has been investigated depending on endogenous and exogenous factors (air temperature, relative humidity, solar radiance duration, organogenesis stages). Several valuable characteristics for breeding have been revealed, such as high adaptation to changing factors of environment including low temperature of air, intensive influence of light flow and solar radiation, low humidity of air.

The data obtained have been used in selection of parental forms for crossings wild and cultivated wheat species. As a result of interspecific artificial hybridization the new variety of emmer wheat Zvartnotc (*T.durum conv. echinoramosum* X *T.dicoccoides*) has been created. Selected variety of emmer wheat combines the adaptive features of wild wheat and productivity characteristics of cultivated emmer variety, and distinguished by stability to stress exogenous factors fluctuations. The new variety has been submitted for state variety testing.

LANDRACES ARE STRUCTURED POPULATION AND SHOULD BE MAINTAINED ON FARM

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Knowledge of the landrace (LR) levels of diversity is fundamental for LR use in breeding, as well as for planning in situ (on-farm) conservation activities. If genetically similar populations of a certain LR exist in an area, a single farm could carry out the conservation activity. If, however, the populations are different, several farms would need to be involved in their preservation. The level of variation within a population is also important because it affects the persistence of the population over time. Assessing the level of variation also provides the possibility of monitoring population changes and verify conservation effectiveness which is an essential step.

In order to define an appropriate on farm conservation strategy for LRs under threat which can serve as a model for other threatened populations, we studied a cowpea (Vigna unguiculata L.), a common bean (Phaseolus vulgaris L.) and celery (Apium graveolens L.) LR coming from different areas of Italy. The formers are autogamous species, the latter is an allogamous species. Each LR is cultivated in very restricted area (a few hectares). Different samples of each LR were collected from different farmers. In each LR overall and within population variation for several morpho-physiological and genetic traits (by using AFLP; SAMPL and SSR molecular markers) was assessed.

Each LR studied is structured as a metapopulation with a substantial genetic differentiation of subpopulations (i.e. farmer populations) which increases its effective size and consequently its chances of survival. Local extinction of a single subpopulation would reduce the overall amount of variation and should therefore be prevented.

Consequently, the best strategy for preserving the diversity of LRs, even in a restricted area, would be to maintain the entire metapopulation on-farm. This means that each farmer should receive appropriate advice and support to maintain his own population.

GENETIC RESOURCES OF VEGETABLE AND MAPS IN THE CZECH REPUBLIC

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Genetic resources of vegetables and medicinal, aromatic and culinary plants (MAPs) are maintained in the Olomouc workplace since 1953. These collections are incorporated in “National Programme for Plant Genetic Resources Conservation and Utilisation” which was accepted in 2002 and whose activities are focused on the protection, conservation and utilisation of plant resources of culture plants. At this time 8985 accessions of vegetables and 619 accessions of MAPs are collected in Olomouc.

Seed propagation as one of the most important tasks of genetic resources conservation is one of the biggest pride of Olomouc workplace. The system and type of isolation cages as well as an ideal insect pollination conditions is an outcome of long-standing optimization of this process. Regeneration of cross-pollinated plants is performed in the conditions almost identical to their natural environment. The airy mobile cages with netting cover are used to discriminate unfavourable hybridisation and bees, bumble-bees and syrphid-

flies (*Eristalis arbustorum*) are used to improve seed production.

The passport, characterization and evaluation data of accessions (values in scale 1 - 9, estimated on the base of national descriptor lists, which are presently available for the most important and numerous crops) and documentation of seed store in the Gene Bank are summarized to the national documentation system EVIGEZ. The passport data and short information about availability for users are on line on view at http://genbank.vurv.cz/genetic/resources.

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ANNUAL FORAGE LEGUMES COLLECTION (AFLC) IN NOVI SAD, SERBIA

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Institute of Field and Vegetable Crops in Novi Sad is one of the leading institutions in Serbia in breeding various annual legumes, such as soya bean (*Glycine max* (L.) Merr.), beans (*Phaseolus* spp.), vegetable and field peas (*Pisum sativum* L.) and vetches (*Vicia* spp.). During the last decade of the last century, collecting of accessions of annual forage legumes, undertaken by Forage Crops Department of Institute of Field and Vegetable Crops and Faculty of Agriculture of University of Novi Sad, led to the establishment of Annual Forage Legumes Collection (AFLC) in 2001. The largest part of the collection are accessions either exchanged or donated, with ICARDA as the greatest donor, while others are wild and local populations, collected in various parts of Serbia, new genetic variability, developed within diverse breeding programmes, and cultivars purchased at local markets and healthy food shops. Today, the collection contains 1,460 accessions of 16 genera and 67 species, with 22 species of *Vicia* L., and 16 species of *Lathyrus* L. and with with 555 accessions of pea and 287 accessions of common vetch (*Vicia sativa* L.). Nearly one half of the accessions are advanced cultivars, about 300 accessions are traditional cultivars or landraces and more than 200 each are wild populations and breeders lines. The collection is maintained as a field collection at the Experimental Field of Institute of Field and Vegetable Crops at Rimski Šančevi, near Novi Sad, on a slightly carbonated chernozem soil. The collection passport database contains all relevant data according to Grain Legume Passport Descriptors. All activities related to the sustainable utilisation of the collection are based upon characterisation of its accessions for the most important morphological characteristics, as well as upon their evaluation for yields and chemical composition of forage and grain and tolerance of abiotic and biotic stress.

THE CZECH CORE COLLECTION OF ALFALFA MATERIALS

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Altogether 53 characters were evaluated in the set of 457 materials (varieties, newly bred varieties and wild forms collected in the nature) of the world collection of the alfalfa (*Medicago sativa, Medicago x varia* and *Medicago falcata*). Thirty plants of each origin were planted at the field, ten of them were evaluated in the years 2005 and 2006. All the evaluated characters were included into the analyses. Missing values were replaced by mean value. Cluster analysis was performed in the software Statistica for Windows for all the materials together. Complete linkage method was used for clustering and Euclidean distance as the measure of distance.

GENEPOOL OF UNTRADITIONAL HORTICULTURAL PLANTS OF NATIONAL BOTANICAL GARDENS IN KYIV

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About 400 species of fruit and berry plants in Ukraine were introduced. From 50 genus only for two monotype species – *Cydonia* Mill. and *Mespilus* L. was appeared specific reserve by exhausted one, while for most species he remained considerable. The collection of department of acclimatization is represented more than by 120 species and forms of growing wild and 2000 sorts of cultural plants; among them are: *Actinidia* Lindl., *Amelanchier* Medic., *Aronia* Pers., *Chaenomeles* Lindl., *Cornus* L., *Crataegus* L., *Cydonia* Mill., *Cynoxylon* Nakai., *Diospyros* L., *Elaeagnus* L., *Hippophae* L., *Mespilus* L., *Morus* L., *Shepherdia* Nutt., *Sorbus* L., *Shizandra* Michx., *Zizyphus* Mill., *Viburnum* L. and etc. The long-term work showed possibility of the wide use of material of a different botanical-geographical origin for introduction. The best sorts have been incorporated in the "Register of Plants Varieties of Ukraine".

ON THE IMPACT OF CRYOPRESERVATION ON GENETIC RESOURCES CONSERVATION OF THE TWO MOST ADVANCED TEMPERATE CROPS - POTATO AND GARLIC

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Genebanks counteract genetic erosion by various preservation methods. Usually seed storage is the most efficient way. Vegetatively propagated crops require more efforts. Cryopreservation is most efficient for these crops. Despite the potentially similarly high importance for all such material, some crops are more advanced. In Germany, these are potato and garlic. Regarding potato, activities started 1992 in Braunschweig and 1997 at IPK Gatersleben. Since 2004, IPK hosts the central German potato genebank. The droplet cryopreservation method is based on shoot tips cooled in DMSO droplets and fixed on aluminium foil. During the merging process of both German cryocollections, the power of this method was demonstrated using a second re-warming check. The mean regeneration rate of 968 accessions did not change significantly from 40% to 47%. As consequence, IPK follows a combined strategy of field, in vitro and cryopreservation at Gatersleben (cryo) and Gross Luesewitz (field, in vitro). Presently, 9.5% of 3057 accessions are exclusively cryopreserved, while 25% are maintained by an additional method. Efficiency considerations are conducted assessing cryopreservation reliability for different material. Further improvement is expected from research on influence of cold preculture, carbohydrates, amino acids, and phytohormones. The analyses of the methods comprise metabolic and expression studies and visualization of freezing and morphogenesis by electron microscopy. Garlic is maintained by vitrifcation of shoot tips from in vitro plantlets. Cold preculture and plantlet quality are important. The present mean of regeneration capacity is 36%. For further extension of cryopreservation a European GenRes project, starting recently, is used. Organizational structures are established for a tripartite cryobank including safety duplication.

TAXONOMIC DETERMINATION OF PLANT GENETIC RESOURCES - IMPACT AND CONSEQUENCES: CASE STUDY OF *LACTUCA* SPP.

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The set of 95 *Lactuca* spp. accessions, provided by gene banks in Olomouc (Czech Republic), Gatersleben (Germany), Wageningen (Netherlands), Wellesbourne (Great Britain), Pullman and Salinas (USA), included 12 *Lactuca* species (*L. aculeata, L. altaica, L. dentata, L.*

dregeana, L. indica, L. livida, L. perennis, L. quercina, L. saligna, L. serriola, L. tatarica and *L. virosa*) grouped into 34 duplicate groups on the base of passport data. Plants were grown in the greenhouse and assessed for morphological traits and developmental stages following to the descriptor list (Doležalová et al., 2003). The aim of this work was to verify the taxonomic status of accessions and to define morphologic similarities within duplicate groups. The taxonomic status of 37 accessions was re-determined on the level of species and/or of the lower taxonomic units. Some accessions expressed a hybrid character. The whole set was clustered into five main categories: 1. taxonomic status of 20 accessions from 8 duplicate groups was re-determined, and accessions were morphologically different within the groups; 2. taxonomic status of seven accessions from four duplicate groups was confirmed, and accessions were morphologically different within the groups; 3. taxonomic status of 13 accessions from two duplicate groups was either re-determined, and/or either confirmed, accessions formed subgroups, and they were morphologically similar within subgroups; 4. taxonomic status of 29 accessions from ten duplicate groups was re-determined, and accessions were morphologically similar within groups; 5. taxonomic status of 26 accessions from 10 duplicate groups was confirmed, and accessions were morphologically similar within groups. Taxonomic status of wild *Lactuca* spp. accessions, as declared by holding gene banks, is not always correct and should be verified. The attention should be paid to the passport data of accessions, to identify the original holding institution of accessions and ways of their distribution. Knowledge of correct taxonomic ranging should be a base of all operations with plant material in gene banks, to prevent any genetic pollution and lost. The taxonomic status of germplasm material should be verified before starting of research work with this material, to avoid any confusing interpretation of the results. Morphological assessment should be a starting point and a base of identification of duplicates by other more sophisticated procedures, e.g. by mean of protein and molecular markers (Dziechciarková et al., 2004).

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EVOLUTION OF CHICKPEA FROM *CICER RETICULATUM* LADIZ. TO KABULI TYPES

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Chickpea, *Cicer arietinum* L., (Leguminosae-Papilionoideae) belongs to tribe Cicereae Alef (Kupicha, 1977; Nozzolillo, 1981; van der Maesen, 1987; Ladizinsky, 1995). The genus *Cicer* L. contains 43 species which are mostly perennial and nine species including cultivated chickpea are annual (van der Maesen, 1987). The cultivated chickpea, *C. arietinum* L., is easily crossed with *C. reticulatum* Ladiz., which was discovered in 1974 in south-east Turkey (Ladizinsky and Adler, 1976). Morphological, cytological, biochemical and molecular studies between the wild form and the cultivated form and also their easily crossability relations indicated that *C. reticulatum* Ladiz. is considered the wild progenitor of the cultivated forms (van der Maesen, 1987; Ladizinsky, 1995). As a result of different ecological pressures and selection for agricultural traits by humankind, two types of cultivated chickpea have emerged. The first one, which is referred to as the *desi* characterized by blue-violet flower color and small, dark colored seeds with pigmentation on plants, looks like the progenitor. The other type is referred as *kabuli* type characterized by white flower and large, cream colored seeds without pigmentation on plants.

A total of 1500 seeds of *C. reticulatum* Ladiz. (AWC 611), i.e. 500 seeds each dose, was irradiated with 200, 300 and 400 Gy of gamma rays from a ^{60}Co source in TAEK (Turkish Atomic Energy Agency), Ankara, Turkey. M_1 plants were grown at Antalya location and harvested individually. M_2 generation was raised in separate rows at Antalya location. After germination, treated plants were carefully observed for all viable mutations throughout the life period. A mutant with white flower color was isolated in M_2 generation. Mutation frequency of this was estimated approximately 1/30000 on the basis of M_2 plant progenies. This mutant has white flower color with

pigmentation on plant. Flower color (blue, violet/pink and white) in chickpea is controlled by three factors; B, P and C (Muehlbauer and Singh, 1987; Salimath et al., 1996; Kumar et al., 2000).

This results relieved that kabuli types were selected from mutant which were white flowers, thick and cream seed coat color of *C. reticulatum* mutant The result clarified that mutations was one of the factors affecting evolution of chickpea.

FRUIT GERMPLASM IN REPUBLIKA SRPSKA: INVENTORY, COLLECTION AND CONSERVATION

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Republika Srpska is placed in the northern and eastern part of Bosnia and Herzegovina. Owing to its geographical position in Republika Srpska there are two types of climate: continental in the north and mediterranean in the south. Republika Srpska was exposed to the different civilizations and culture influences through the history. Ottoman Empire ruled until 1878 (1372 - 1878) when Austrio-Hungarians' took a domain.

In time Republika Srpska (Bosnia and Herzegovina) became very rich in biological diversity as the civilizations and climates mixed here.

Fruit genetic resources inventory, collection and documentation in Republika Srpska started during 1989 - 1991 within the project Plant Gene Bank of Yugoslavia. According to the saved documentation there has been inventoried and documented with MCPD details next accessions: *Malus* × *domestica* (11), *Prunus domestica* (6), *Pyrus communis* (11), *Prunus avium* (4), *Prunus cerasus* (2), *Prunus persica* (2), *Prunus armeniaca* (1), *Prunus cerasifera* (6) and *Juglans regia* (4).

Because of known reasons these activities were stopped and enabled to start again through the project »South Eastern European Network on Plant Genetic Resources 2004 - 2014 «. Focal points for SEEDNet implementation in Republika Srpska is Faculty of Agriculture, University of Banjaluka. This project enforced renovation of inventory and collecting activities and supported capacity buildings in order to establish Gene Bank. Inventory and collecting is directed through the Working Group for Fruits and *Vitis* established according to the project proposal. Since 2004 next accessions have been either inventoried or collected: *Malus* × *domestica* (28) and *Pyrus communis* (17). These accessions are documented with collection form and MCPD. Conservation is done *ex-situ* in collection orchard 20 km south from Banjaluka.

SELECTION OF DONORS FOR FRUIT QUALITY AND THEIR UTILIZATION IN BREEDING OF APRICOTS

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We have been study of the inheritance in apricot progenies of some parent cultivar from different eco-geographic group. The research of inheritance of the main pomological traits into progenies proved that the easily persistant heritage characters (cases when over 50 % of individuals inherited the value of trait identical to their parents or in between them) include: fruit firmness, flesh colour, skin overcolour, time of ripenning, fruit shape, pit adhesion. On the contrary, variable heritage characters (the value of traits inherited from parents dropped under 50 %) include: fruit taste and fruit size.