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Acknowledgements

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PROGRAM OF CONFERENCE

"Using Genetic Biodiversity to Increase the Quality of Organically Grown Fruits"

27-th October 2013 (Sunday)

17:00-19:30 Registration

20:00-21:30 Welcome Reception (RIH, Pomologiczna 18)

28-th October 2013 (Monday)

8:30-9:30 Registration

Opening Ceremony

9:30-10:30 Welcome

***Prof. Dr. Franciszek Adamicki** (Director of the Research Institute of Horticulture, Skierniewice, Poland).*

***Dr. Elżbieta Rozpara** (Conference Host).*

10:30-11:00 Coffee Break

SESSION 1 - GENETIC BIODIVERSITY OF FRUIT CROPS

Chairman: Prof. Dr. Daniela Benedikova, Prof. Dr. Dragan Milatović

*11:00-11:30 Prof. Dr. Daniela Benedikova – Invited Speaker (Plant Production Research Centre, Piešťany, Slovak Republic) **Review of the Prunus Genetic Resources within the Frame of Europe – ECPGR.***

*11:30-11:45 Dr. Elżbieta Rozpara - (Research Institute of Horticulture, Skierniewice, Poland) **The Status, Importance and Organization of the Fruit Crops Collections in the Research Institute of Horticulture in Skierniewice.***

*11:45-12:00 Dr. Monika Höfer - (Julius Kühn-Institute - Federal Research Centre for Cultivated Plants, Institute for Breeding Research on Horticultural and Fruit Crops, Dresden, Germany) **Conservation and Evaluation of Genetic Resources in Cherry in Germany.***

*12:00-12:15 Prof. Dr. Dragan Milatović - (Faculty of Agriculture, University of Belgrade, Serbia) **Genetic Resources of Stone Fruit Crops in Serbia.***

12:15-12:30 Prof. Dr. Jerzy Lisek - (Research Institute of Horticulture, Skierniewice, Poland). ***Gathering and Assessment of Grapevine Genotypes in Skierniewice Collection – Central Poland.***

12:30-12:45 Dr. Mirosław Sitarek - (Research Institute of Horticulture, Skierniewice, Poland) ***Diversity of Peach (Prunus persica L.) Genotypes Collected at the RIH in Skierniewice, Poland.***

12:45-13:00 Discussion

13:00-14:30 Lunch

SESSION 2 - MEANING OF OLD CULTIVARS IN RURAL LANDSCAPE

AND ORGANIC PRODUCTION

Chairman: Dr. Nikita Fajt, Dr. Franco Weibel

14:30-15:00 Dr. Franco Weibel – Invited Speaker (Research Institute of Organic Agriculture, Switzerland) ***Using Genetic Biodiversity to Increase the Quality of Organic Fruits.***

15:00-15:15 Dr. Nikita Fajt – (Agricultural and Forestry Institute of Nova Gorica, Fruit Growing Centre of Bilje, Slovenia) ***Old and Auchthon Fruit Varieties in Slovenia and Their Importance for Our Rural Landscape.***

15:15-15:30 Dr. Jiri Sedlak - (Research and Breeding Institute of Pomology, Holovousy, Czech Republic) ***Collecting of Important Fruit Landraces on Territory of Czech Republic.***

15:30-15:45 Dr. Muhabbat Turdieva - (Biodiversity International, CWANA sub - regional office for Central Asia, Tashkent, Uzbekistan) ***Current Status of in situ/on Farm Conservation of Local Diversity of Temperate Fruit Trees in Central Asia.***

15:45-16:00 Discussion

16:00-16:30 Coffee Break

16:30-17:30 Poster Session

17:30-18:00 Summary of Poster Session – Dr. Dorota Kruczyńska (Research Institute of Horticulture, Skierniewice, Poland).

18:00-19:00 COST FA 1104, WG 1 Meeting:

METHODOLOGY OF CHERRY GENE RESOURCES MANAGEMENT IN EX SITU

COLLECTIONS, ACCOUNTING PROBLEM OF VIRUSES

18:00-18:30 Dr Beata Komorowska - Invited Speaker (Research Institute of Horticulture, Skierniewice, Poland) ***Survey of Viruses in Cherry Cultivar Collection in Skierniewice.***

18:30-19:00 Comments and discussion

20:00-22:00 Gala Dinner

29-th October 2013 (Tuesday)

8:30-9:30 Visit to the Pomological Orchard in Skierniewice (Breeding Department).

9:30-11:00 Visit to the Experimental Orchard in Dąbrowice (Field collections of different fruit crops).

11:00-11:30 Coffee Break

SESSION 3 - USING OF GENE BANK RESOURCES IN BREEDING PROGRAMS

Chairman: Prof. Dr. Edward Żurawicz, Dr. Dorota Kruczyńska

11:30-12:00 Prof. Dr. Edward Żurawicz - Invited Speaker (Research Institute of Horticulture, Skierniewice, Poland) ***The Role of Genetic Resources in the Breeding of New Varieties of Fruit Plants at the Research Institute of Horticulture in Skierniewice.***

12:00 -12:15 Prof. Dr. Małgorzata Korbin - (Research Institute of Horticulture, Skierniewice, Poland) ***Molecular Tools in Assessment of Genetic Resources and Breeding of Fruit Plants.***

12:15-12:30 Dr. Dorota Kruczyńska - (Research Institute of Horticulture, Skierniewice, Poland) ***Evaluation of Genome Size of Polish Apple Cultivars Collected in Gene Bank in Relation to Some Morphological Traits.***

12:30-12:45 Discussion

12:45-13:00 Closing Ceremony

13:00-14:30 Lunch

REVIEW OF THE PRUNUS GENETIC RESOURCES WITHIN THE FRAME OF EUROPE – ECPGR

Daniela Benedikova

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The European Cooperative Programme for Genetic Resources (ECPGR) is a collaborative program among most European countries aimed at facilitating the long-term conservation and utilisation of plant genetic resources (PGR). The Programme operated through networks and working groups where are specialize under the crops. The last meeting of *Prunus* Working Group was organising in September 2010 on Forli, Italy. Before meeting were prepared special survey questionnaire and was updating information on the status of *Prunus* genetic resources in member's countries. More than 22,700 *Prunus* accessions are conserved in *ex-situ* collections across Europe. In all 64 European institutions from 20 countries preserve accessions from six *Prunus* species, for some like are cherry to develop the European *Prunus* DataBase. Collected accessions are mostly used for breeding purposes, such as increasing fruit quality and resistance to biotic and abiotic stresses.

Preservation of Slovak PGR is provided through National Program of Slovak Republic for conservation PGR for years 2010-2014. Totally 25 357 samples of genetic resources are registered in National Program, which are solved at PPRC Piešťany as the coordination workplace and at the other 18 co-operant subjects. National Program incorporates all activities related PGR *ex situ*, in situ and *in vitro* methods. The Gene Bank for SR has the storage capacity for 50 000 accessions of cultivated plant seeds, with possibility for medium and long term conservation. In Gene bank of SR 17 158 samples are stored in active collection and 3 684 seed samples are in basic collection. Vegetative propagated species as for example fruit species and grapes are stored in repositories (100 apricots, 128 peaches, 242 cherries, 53 plums, 35 almond, 35 walnuts, 600 grapes etc.).

Important and necessary part of activities concerning our genetic resources is their maintenance and development of information databases (passport and description data), identification of PGR by bio molecular techniques using the study of differences in storage proteins and in nucleic acid composition and other.

Key words: *Prunus* species, genetic resources, evaluation, fruit collections

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THE STATUS, IMPORTANCE AND ORGANIZATION OF THE FRUIT CROPS COLLECTIONS AT THE RESEARCH INTITUTE OF HORTICULTURE IN SKIERNIEWICE

Elżbieta Rozpara

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The fruit crops collections *ex situ* kept in the Research Institute of Horticulture are the biggest in Poland and one of the bigger in Europe.

Since 1951 the Polish gene bank of fruit plants was maintained by Research Institute of Pomology and Floriculture in Skierniewice, which in 2011 was converted into Research Institute of Horticulture. At the end of 2012 in the big collections there were 4673 genotypes of fruit crops, which covered the area of 14,5 ha and comprised separate smaller collections of following crops: apple (1399 taxons), pear (511), plum (302), sweet cherry (305), sour cherry (198), peach (154), apricot (123), walnut (63), hazelnut (76) as well as rootstocks for mentioned crops (197), wild species of *Malus, Pyrus & Prunus* (237) and small fruit collections of: strawberry and wild strawberry (225), raspberry and blackberry (142), blueberry (100), black and color currants (209), gooseberry (59), grape (279), cranberry (48) and some others less known small fruit species (70).

The new genotypes are acquired from the other Polish collections and from abroad. Old varieties are collected during scientific expeditions organized to different part of Poland and Europe. Other genotypes are obtained from gardeners and breeding programs realized by different institutions and amateur breeders.

Passport data are obligatory prepared for collected genotypes. Additionally, each genotype is evaluated in accordance with UPOV and IPGRI descriptors. The growth vigor, winter hardiness, crown habit, intensity and time of flowering, ripening period, yield, fruit description and other data are collected in each collection.

Some of the data have been entered in the European Database. Collections serve a purpose professional courses for students and farmers, bud the main goal of the collection is to protect and preserve the genetic resources of pomological plants for the next generations. Some of them are useful in breeding programs realized in Research Institute of Horticulture. In last period the collections are very useful in the research connecting with elaboration of effective technology of ecological fruit production. For these research works the pest and disease resistant (or tolerant) genotypes are looked for. Their good productivity, high fruit quality, winter hardiness and tolerance to other stresses are also very important. The research work on the elaboration of the effective ecological fruit production methods are carried out in Experimental Ecological Orchard, which was established in the spring of 2004 on 5 ha of land in Nowy Dwór - Parcela 15 km from Skierniewice (Central Poland). The orchard is situated in the vicinity of a large forest complex, far away from industrial sites and main traffic routes. The surrounding land belongs to individual farmers running family-owned farms. The study of the suitability of various fruit species, cultivars and rootstocks growing by ecological methods is one of most important in this experimental orchard.

The gene resources of fruit plants are also used in breeding program, which is realized in Research Institute of Horticulture. The main task of this breeding program is constant improving the fruit quality, research the new cultivars suitable for in different agro-climatic regions of Poland and performing crops adapted to organic/low-input growing conditions. Breeding of novel cultivars having valuable traits for fresh market and processing and also production of top-quality fruits with health benefit traits for consumers, enhancing human health and protecting the environment is also very important.

Thank the Ministry of Agriculture and Rural Development for support the Collection of Pomological Plants.

Thank the Curators of all Collections of the Institute of Horticulture for their hard work in particular collections:

- Dorota Kruczyńska (Apple and Pear)
- Agnieszka Głowacka & Elżbieta Rozpara (Cherry, Prune & Plum)
- Mirosław Sitarek (Peach, Apricot & Rootstocks for Stone Fruit Trees)
- Grzegorz Hodun & Małgorzata Hodun (Walnut, Hazelnut, Wild Spp. and ancient Apple and Pear)
- Paweł Bielicki (Rootstocks for Pome Fruit Trees)
- Bohdan Koziński (Blueberry, Black and Colour Currants, Gooseberry)
- Justyna Wójcik (Strawberry, Raspberry, Blackberry)
- Jerzy Lisek (Grapevine)
- Tomasz Golis (Little known spp. of small fruit such as: *Lonicera, Sambucus nigra, Hypophae rhamnoides*)

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CONSERVATION AND EVALUATION OF GENETIC RESOURCES IN CHERRY IN GERMANY

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Sweet (*Prunus avium* L.) and sour cherry (*Prunus cerasus* L.) are two economically important species in Europe, especially in Germany. Cherry production ranks on the third place after apple and strawberry. Altogether 37.035 t of sweet cherries and 22.294 t of sour cherries were produced in 2011 (http://faostat.fao.org). However, the cultivar spectrum in fruit production is limited; for sweet cherry 'Naprumi', 'Merchant', 'Valeska', 'Oktavia', 'Viola', 'Regina', 'Karina', 'Kordia', 'Namare' and 'Sunburst' are planted. In sour cherry, the old well known cultivar 'Schattenmorelle' originating from the Middle Age still dominates the production; newer cultivars are 'Ungarische Traubige', 'Kelleris 16', 'Safir', 'Fanal' and 'Achat'. Within the frame of the project 'Inventory-taking and documentation of fruit genetic resources in Germany' funded by the Federal Agency for Agriculture and Food, 493 cultivars of sweet cherries and 172 cultivars of sour cherries were registered. For a suitable and efficient conservation the German Fruit Genebank was established as a decentralized network, which is aimed at the coordination of different germplasm collections in Germany to minimize the risk of losing fruit genetic resources. The work is organized in species-specific networks. Currently, the cherry network includes seven collections held at federal and state institutions as well as in communities and towns. Altogether 289 sweet and 97 sour cherries cultivars are part of the German cherry network. The preservation guidelines arranged determine at least two trees at two different locations. All trees will be recorded pomologically and fingerprinted based on molecular markers. Genetic resources are a highly valuable resource for fruit breeding. In order to utilize genetic resources in breeding it is necessary to obtain evaluation data, i.e. on fruit and tree characteristics. Several research projects are running to describe more precisely cherry genetic resources using phenotypic and genotypic parameters.

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GENETIC RESOURCES OF STONE FRUIT CROPS IN SERBIA

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Balkan Peninsula is a rich source of germplasm of fruit tree crops. In the spontaneous flora of Serbia seven stone fruit species belonging to the genus *Prunus* can be found: *P. avium* L., *P. cerasifera* Ehrh., *P. fruticosa* Pall., *P. laurocerasus* L., *P. mahaleb* L., *P. padus* L. and *P. spinosa* L. In addition to these wild species, there are also many indigenous varieties of plum (*P. domestica* L. and *P. insititia* L.), as well as genotypes of vineyard peach [*P. persica* (L.) Batsch.], apricot (*P. armeniaca* L.), and sour cherry (*P. cerasus* L.).

Plum (*Prunus domestica* L.) is the most cultivated fruit crop in Serbia, with a share of 44% in the total fruit production. Average production of 557.177 t (2009 - 2011) ranks Serbia in the second place in the world behind China. 'Požegača' has long been the leading plum cultivar in Serbia. It has a small fruit (about 17 g) of excellent quality. However, it is very susceptible to the Plum Pox Virus (PPV). With the expansion of PPV in Serbia, the number of 'Požegača' trees has been gradually reduced. It was replaced mostly with local indigenous varieties, such as: 'Crvena Ranka', 'Metlaš', 'Crnošljiva', 'Trnovača', 'Piskavac', 'Belošljiva' and others. In the former Yugoslavia more than 90 indigenous plums varieties were described, of which the largest number originates from Serbia and Bosnia. These varieties have modest requirements for growing, and are relatively resistant to frost, drought and diseases (especially PPV). Their fruits are small, clingstone, and they are mainly used for the processing into brandy. Some of them are used as rootstocks for plum, peach and apricot.

Cherry plum (*Prunus cerasifera* Ehrh.) is widespread in Serbia. Due to generative propagation it shows great variability for many traits: tree vigour, yield, maturing time, fruit size and quality, resistance to frosts and diseases, seed germination, and seedling vigour. In selected clones fruit weight ranged from 4.1 to 26.6 g, stone weight 0.2 - 2.2 g, soluble solids content 8.6 - 17.7%, and the acids content 1.0 - 3.4%. Fruits are used for processing into juice, jam and brandy. Seeds are used to obtain rootstocks for plum and apricot.

Peach [*Prunus persica* (L.) Batsch.] grows sub-spontaneously in Serbia in natural populations, known as 'vineyard peaches'. Propagation by seeds generated a rich source of genetic variability. Useful traits of vineyard peach include winter hardiness, drought resistance, and tolerance to diseases, such as powdery mildew and leaf curl. Most genotypes have late maturing (from mid-August to late September), small fruit (20 - 100 g), white flesh, and a strong flavour. Seedlings are used as rootstock for peach, and fruits are used for fresh consumption and processing.

Apricot (*Prunus armeniaca* L.) was often propagated by seeds in the past. That allows the selection of genotypes with positive traits, such as high yield, good fruit quality, and resistance to unfavourable environmental conditions. Of the nine new cultivars of apricots that have been released in Serbia so far, eight cultivars were obtained through selection from natural populations:

‘Čačansko Zlato’, ‘Vera’, ‘Biljana’, ‘Aleksandar’, ‘NS-4’, ‘NS-6’, ‘Novosadska rodna’, and ‘Novosadska kasnocvetna’.

Sweet cherry (*Prunus avium* L.) can be found as wild or cultivated trees. Wild cherry is widespread in Serbia in spontaneous populations. Because of self-incompatibility and generative propagation it shows high polymorphism of the large number of traits, such as crown shape, vigour, yield, leaf shape and size, maturing time, fruit shape, skin colour, stalk length, fruit and stone weight, flesh percentage, and seed germination. Some old, indigenous varieties of sweet cherry such as ‘Đurđevka’, ‘Belica’, ‘Crnica’ are also cultivated, but only at a small extent.

Sour cherry (*Prunus cerasus* L.) is in the third place among fruit trees in Serbia. Average production of 87,391 t (2009 - 2011) ranks Serbia in the sixth place in the world. ‘Oblačinska’ sour cherry is dominant in production (more than 60% of the total number of trees). It is characterized by high genetic diversity as a result of vegetative propagation by suckers, when planting material is often mixed with seedlings. ‘Oblačinska’ is low vigourous and very productive. It has small fruits of good quality that are mainly used for freezing and processing in juice. It is relatively resistant to frost, drought and diseases. A number of ‘Oblačinska’ clones was selected, whose fruit weight ranged from 2.5 to 5 g, stone weight 0.2 - 0.5 g, soluble solids content 9.8 - 19.7%, and the acid content 1.0 - 2.1%.

Gene pool of stone fruits in Serbia is rapidly decreasing due to urbanization and mass cultivation of a small number of cultivars. Therefore, it is necessary to inventory the available material with a special emphasis on wild forms and indigenous varieties, then describe the individual genotypes and collect them in the gene bank. Research work on the germplasm of stone fruits takes place at the Institute of Fruit Growing in Čačak, and at the faculties of agriculture in Belgrade, Novi Sad, and Čačak.

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GATHERING AND ASSESSMENT OF GRAPEVINE GENOTYPES IN SKIERNIEWICE COLLECTION – CENTRAL POLAND

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Present acreage of grapevine growing in Poland is estimated at 500 ha. Most cultivars planted in vineyards are grown for production of wine. Wine introduced into market may be produced from grapes of cultivars classified as wine cultivars in at least one EU country which has a national register of cultivars.

The grapevine collection of the Research Institute of Horticulture in Skierniewice (Central Poland, latitude 51^{o} 57' N, longitude 20^{o} 08' E), has 302 genotypes (autumn 2013). The average sum of active temperatures in Skierniewice amounts to 2550^{o}C. Winters are cold, with minimal temperatures varied from –20^{o}C to –35^{o}C. The aims of the collection are: gathering and preservation of grape diversity, including cultivars breeded in Poland (Iza Zaliwska, Izopan, Czekoladowa, Małgorzatka, Danmarpa Polonia, Jutrzenka, Triumf Polski) and preliminary cultivar assessment. In the collection, the following features of genotypes are being assessed: morphological characteristics, course of phenological phases, susceptibility of bushes to frost and fungi diseases, fertility of the bushes, weight of clusters and berries, time of ripening, soluble solids content and taste of fruits. French-American hybrids Seyval (B), Marechal Foch (N) and Leon Millot (N), characterised by high fertility and satisfactory resistance to frost and fungi diseases, make up the group most reliable in yielding. Currently, inter-intraspecific hybrids originated in Germany, classified sometimes as *Vitis vinifera*, belong to the group of most valuable and, at the same time, most frequently planted cultivars: Solaris, Sibera, Hibernal, Johanniter, Merzling, Phoenix, Helios, Saphira, Orion – for the production of white wine and Regent, Rondo, Cabernet Cortis, Bolero, Monarch, Reberger – for the production of red wine. Cultivars that do well in Central Poland are Hungarian Bianca (B) and Austrian Roesler (N). Interspecific and inter-intraspecific hybrids are more useful for cultivation than *V. vinifera* cultivars, which are characterised by relatively low resistance to low temperature and fungi diseases. Among the traditional *V. vinifera* cultivars the following deserve attention: Riesling (B) – most resistant to frost but ripening late, Auxerrois (B), Pinot Gris (R), Pinot Noir (N) and Chasselas Dore (B). German cultivar Ortega (B) and Hungarian cultivar Nektar (B) are equal Riesling in frost resistance. Out of the newer *V. vinifera* genotypes, German cultivars Acolon (N), Cabernet Dorsa (N), Dornfelder (N) and Siegerrebe (R) and the Hungarian Cserszegi fueszeres (R) are suitable for limited cultivation if their bushes are covered for winter. Cultivars originated in the USA – Delaware (R), Cayuga White (B), Canada – Veeblanc (B), Ukraine – Gołubok (N), Muscat Odesskij (B) or France – Aurore (B), Baco Noir (N), De Chaunac (N) and Czech Republic – Sevar (N), not registered in the EC are useful in Polish conditions but their fruits may be used only in production of home wine or juice.

Vines of table cultivars are planted mainly in home gardens, agrotouristic and organic farms. For this purpose useful are interspecific hybrids obtained by crossing *V. vinifera* with *V.*

labrusca in the USA – Price (N), Canadice (R), Reliance (R), Einset (R); Canada – Festivee (N); Ukraine – Ananasnyj Rannyj (B); Latvia – Supaga (B). Their bushes are respectively tolerant to winter frost and fungal diseases, but berries are soft. The attractive table grapes, with firm flesh, were characteristic of interspecific hybrids (*Vitis vinifera* x *Vitis* spp) originated in Hungary – Nero (N), Palatina (B), Aron (B), Lilla (B), Fanny (B); Switzerland – Muscat Bleu (N); Germany – Garant (B), Galanth (N); Russia – Wostorg (B), Timur (B).

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DIVERSITY OF PEACH (*Prunus persica* L.) GENOTYPES COLLECTED AT THE RIH IN SKIERNIEWICE, POLAND

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Peach (*Prunus persica* L.) collection at the Research Institute of Horticulture in Skierniewice has been maintained since 1995. Presently, in the collection there are trees of 154 different genotypes. Each taxon is represented by three trees planted in a spacing of 5 x 3 m. From among all peaches, there are fresh-market varieties, canning/processing varieties, nectarines, local varieties, flat/donut peaches/nectarines with different fruit shape, color of flash and skin, hybrids, as well as seed genotypes for production of generative rootstocks (Table 1). Depending on genotype and year, fruit ripens from the second week of July (‘Harrow Diamond’, ‘Maja’, ‘Manon’), to end of September or first days of October (‘Dum Tao’, ‘Inzurnyj Botsaga’, ‘Uzbek’). The blooming time depends on season and variety too. The mean date for the beginning of blooming of early blooming varieties in Central Poland is April 26-th (‘No 3052’, ‘Anita’, ‘BPK’), and varieties belonging to late blooming time group – May 3-rd (‘Caprice’, ‘Bobińska’, ‘Canadian’). The length of the blooming period depends mainly on meteorological changes. In seasons with relatively high temperature is 7 days, and in the colder seasons, the blooming period is much longer – up to 14 days.

Table 1. Number of genotypes in different peach groups classified in terms of fruit properties.

Group	Number
Peach	
Yellow fleshed fresh-market peach varieties	78
White fleshed fresh-market peach varieties	19
Red fleshed peach varieties	1
Seed genotypes for production of generative rootstocks	20
Local varieties	10
Canning/processing varieties	5
Peento “donut” varieties	2
Nectarine	
Yellow fleshed nectarine varieties	15
White fleshed nectarine varieties	3
Flaterines	1

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USING GENETIC BIODIVERSITY TO INCREASE THE QUALITY OF ORGANIC FRUITS

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In many countries, within the fruit business, the organic segment is the only market with positive growth rates. E.g. in Switzerland or Germany the share of the organic apple market has reached quantity-wise 8 – 10%, and financial-wise estimated 10 – 14% (due to higher producer and consumer prices). So organic fruit production is for sure a very attractive market segment.

Producing according to organic standards mean to grow the trees and fruits without herbicides, without chemical-synthetic and often systemic fungicides and insecticides, without growth regulators including chemical thinning agents, without antibiotics in case of Fire Blight infection risk, without directly plant available fertilizers, without 1-MCP to prolong storage etc.; all this means a completely different production world.

Of course, organic producers have a certain range of plant protection and fertilizer products at their disposition. Fortunately, by increasing efforts of federal and private research, the range of organic inputs is getting larger and smarter. But still, yield security and levels of organic fruit production are considerably lower compared to conventional production. To compensate the lower power and efficacy of organic inputs, the chosen fruit cultivar plays a much more important role than in conventional apple growing. For organic apple production in central Europe growers look for for cultivars with – beside good yield and quality - robustness or resistance against Scab (*Venturia inaequalis*), Powdery Mildew (*Podosphaera leucotricha*) and Fire Blight (*Erwinia amylowora)*. But at the same time, the desired cultivars should be also tolerant against Bitter Rot (*Gloeosporium sp.*), Sooty Blotch (*Schizotorium pomi*), Marssonina, alternate bearing and limited storability. Thus, scab resistance alone is not enough to be judged as a cultivar suited for organic apple growing. This fact is, among others, the reason that e.g. a cis-genetic scab resistant Gala cannot be considered as suited cultivar for organic production.

In Switzerland in 2012 42% of the organic apple production was on basis of scab resistant cultivars (based on the Vf gene). For around 18 years this strong focus on scab resistant cultivars in combination with an innovative concept to introduce these easily into the market (Taste Group Concept) was a very satisfying success story and certainly the right concept. Since two years however, breakthroughs of the Vf resistance appear more and more frequent. There is a need to "anchor" the scab resistance better in newly selected cultivars. Not a few of the old cultivars have a relatively good polygenetic resistance against scab and other diseases. Thus especially nowadays they can be of high value as breeding parents.

In Switzerland, FiBL with partner organization Pro Specie Rara also runs a project to re-introduce old table fruit apple cultivars in the offer of the supermarket chain Coop. After having selected theses cultivars very strictly over several testing years down to 7, the marketing and selling of these old cultivars can be considered as a success. But on the side of the organic production of these cultivars there are still more than a few challenges to overcome.

In 6 years lasting organic field trials with a selection of 16 old and traditional Swiss cherry cultivars we could not select a single cultivar which was sufficiently robust against monilia disease and had enough yield potential and satisfactory fruit quality properties for the today's market.

Conclusion: For organic fruit production the genetic potential of the chosen cultivar to prevent major problems is of much higher importance than this is the case in conventional production. The genetic potential of old fruit cultivars can be interesting for the organic market because they add more diversification to the offer (forms, colors, flavors). However, not automatically these cultivars fit to the nowadays standards of consumer expectations; nor they are automatically easy to produce organically. Last but not least, old cultivars can be or are of high importance for the breeding of new cultivars with a wider range or a better anchored robustness against diseases and other cultivar weaknesses that cannot be sufficiently controlled by organic input products.

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OLD AND AUCHTHON FRUIT VARIETIES IN SLOVENIA AND THEIR IMPORTANCE FOR OUR RURAL LANDSCAPE

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Even though Slovenia is a small country, it is very rich in its genetic biodiversity, especially in terms of old and autochthon fruit varieties. Slovenia boasts good pedoclimatic conditions for growing different fruit species. In the east and south part of Slovenia, there are suitable conditions for growing apples, but in the west and south-west part major quantities of cherries, peaches and pears are produced. As we also have Mediterranean climate, we grow a lot of olive and persimmon trees as well.

Up till now, we have not taken enough care for old and auchthon fruit varieties, especially for stone fruit varieties. In intensive orchards, we have planted more commercial varieties, because they are more appreciated, as they boast attractive colour, big fruit size, a sweet taste and they mostly reach a better price. Nowadays, consumers are far more well-informed about farming methods and fruit production techniques, and this is why they are convinced that organic, i.e. integrated, bio-farming, is healthier than traditionally way of food producing. The request for organic fruit offer is increasing nowadays, but its production in our country is still very low. There is only about 8% of organic production of a total fruit production (SURS, 2012) in Slovenia. Over past years, consumers have wanted to buy and eat more locally produced fruit and vegetables, and consequently they are looking forward to old and auchthon fruit varieties; many of the consumers want to produce their own, home-made products.

Gene bank of fruit plants, financed by the National programme of the gene bank, was made in 1994 in the Karthusia Pleterje Monastery. At the moment, 119 different apple and 44 different pear cultivars are being brought together in this orchard. Five trees have been planted for each cultivar and they were grafted on the proper rootstocks. The cultivar sensitivity to diseases and pests can be observed due to the biological protection, which has been carried out in this plantation. Afterwards, some more wonderful collections of old and auchthon varieties were planted; the first one in the south-east part of Slovenia, in Kozjanski park, the second one in the west part, in the Goriška Brda region and two of them are in Fruit Growing Centres, one near Nova Gorica and another near Maribor. In the collection in Kozjanski park, there are 101 apple varieties and 53 pear varieties. Many of them are in the sort list, so multiplication is possible because they have maintained mother trees. The last bigger old variety collection was planted in Goriška Brda in 2009 as a result of the project "The Rehabilitation of Old and Auchthon Fruit Varieties in the Goriška Region: Using and Marketing Possibilities" – the project was carried out as a contribution for a responsible regional economy. This orchard, apart from 60 varieties of new plants of selected old varieties, includes also many very old trees, e.g.: more than 60-year old apricots, cherries, apples, nuts and figs. It was supported by the Swiss contribution to the European Union. At the end we would like to present some of this old varieties, their qualities and the possibility of usage in the modern market and fruit processing industry.

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COLLECTING OF IMPORTANT FRUIT LANDRACES ON TERRITORY OF CZECH REPUBLIC

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It can be expected that wider genetic diversity will be required by future breeding programmes. Landraces possess higher diversity without having the associated drawbacks of undesirable genetic traits connected with wild crop relatives. Because of the importance of landraces and the likely extinction risk due to various factors in the area of the Czech Republic, the program for collecting and long term conservation of fruit landraces was started in Research and Breeding Institute of Pomology Holovousy Ltd. The territories not influenced by intensive industrial and agricultural production (national parks, protected landscape areas, deserted army areas) were mostly preferred. These expeditions were prepared in cooperation with managers of national parks and protected landscape areas, who provided source materials (maps etc.) with occurrence of fruit species.

Important accessions of apple, pear, sweet cherry, sour cherry and plum were localized by Global Positioning System and registered *in situ*. The determination of found accessions was the most complicated part of our work. We used old pomological literature and literary search during the determination. Found landraces showed a high variation in tree size, fruit set, ripening time, fruit size and quality and resistance to diseases. These indigenous cultivars and forms of grown fruit species with high diversity of vegetative and fruit traits represent a valuable material for breeders as donors of desired characteristics (for example resistance against diseases, pests and abiotic stresses). Obtained information will widen the utilization of Czech landraces for breeding, organic farming or landscaping. Described cultivars grown historically on the territory of the Czech Republic also constitute a cultural heritage of the region and nation. They represent objects of cultural identity and an integral part of cultural landscape.

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CURRENT STATUS OF *IN SITU* ON FARM CONSERVATION OF LOCAL DIVERSITY OF TEMPERATE FRUIT TREES IN CENTRAL ASIA

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Central Asia is a home for 5,500 vascular species 10% of which are endemic plants. The region is one of the eight world centres of origin and domestication of globally important crops including cereals (wheat, barley), food legumes (chickpea) and vegetables (onion, garlic, carrot). Many temperate fruit crops were originated in the region and are of particular importance for horticulture development at the global level. Wild fruit and nut-bearing species are still used by local people as rootstocks to produce fruit trees with healthy and strong root system. Resistance of wild fruit trees relatives to biotic and abiotic pressures make them valuable genetic resources for reducing crop vulnerability on-farm and providing genetic material for crop improvement. Passed from farmers' generations to generations over centuries traditional varieties and forms of fruit crops distinguish with their good taste quality, external appearance, big fruit size and nice shape, long shelf life, nutritional value. Unfortunately, this unique diversity of fruit crops is threatened due to overgrazing, tree logging, overharvesting of fruits and nuts in the wild, and use of uniform high-yield varieties, chemical fertilizers and pesticides in farmers' orchards. Actions on assessment and increase of distribution of genetic resources of fruit trees in Central Asian countries: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan have been implemented within a regional GEF project "*In situ*/on farm conservation and use of agricultural biodiversity (horticultural crops and wild fruit species) in Central Asia" (2006-2012). Promising forms of wild relatives of fruit and nut-bearing trees including 22 promising forms of walnut *(Juglans regia)*, 44 of pistachio (*Pistacia vera*), 17 of almond (*Amygdalus* sp.), 17 of apple (*Malus sieversii*) were identified in the forests (*in situ*) of the region and multiplied for establishment of plantations in deforested lands. Rich traditional diversity of cultivated fruit trees is maintained by farmers in their home gardens and orchards including 239 local varieties and forms of apple, 221 of apricot, 158 of grapevine, 59 of pear, 18 walnut, 35 of pomegranate, 14 of almond. However, many of them are represented only by one or two trees and the project helped to increase their number in farmers' orchards through multiplication in fruit tree nurseries. This local diversity of fruit and nut bearing crops is a valuable basis for sustainable development of organic horticulture in changing environment due to its resistance to environmental stress factors as drought, chilling, soil salinity, late spring frost, pest and diseases.

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SURVEY OF VIRUSES IN CHERRY CULTIVAR COLLECTION IN SKIERNIEWICE

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Cherry is host to a number of viruses, which can cause a variety of disease symptoms. The most common and the best characterized are *Prune dwarf virus* (PDV) and *Prunus necrotic ring spot virus* (PNRSV) but heavy losses of crop yielded in some commercial cultivation can be caused by other viruses too. Economically important are *Little cherry virus-1* (LChV-1), *Little cherry virus -2* (LChV-2), *Cherry mottle leaf virus* (CMLV), *Cherry necrotic rusty mottle virus* (CNRMV), *Cherry green ring mottle virus* (CGRMV), *Cherry leafroll virus* (CLRV) and *Cherry rasp leaf virus* (CRLV). *Cherry virus A* (CVA) may not be significant when present alone, but may enhance severity of symptoms when combined with other viruses. In many cases the infection remains latent and the trees do not show visible symptoms. However, in other cases, severe symptoms may develop due to infection, which can cause substantial yield losses, unmarketable crops or even death of the trees. Some of the viruses are efficiently transmitted in nature by pollen (PDV, PNRSV), nematodes (CLRV, CRLV) and mealybugs (LChV-2).`It means that plant material must be under systematic control. The mode of natural spread for LChV-1, CVA and CNRMV has not been determined. Therefore, use of clean starting materials is important in preventing spread of these viruses.

Because cherry species maintained at the collection of the Research Institute of Horticulture in Skierniewice have not been screened for viral pathogens, studies on occurrence and detection of PDV, PNRSV, LChV-1, LChV-2, CMLV, CNRMV, CGRMV, CLRV, CRLV and CVA were conducted. Totally 152 cherry trees were tested for the presence of these pathogens. RNA was isolated from the leaves using the silica capture (SC) method and then was evaluated by reverse transcription polymerase chain reaction (RT-PCR) with the specific primers recommended for the detection of the viruses studied. PDV was detected in 19 samples. The RT-PCR results showed that 11 trees were infected with PNRSV. The presence of LChV-1 and LChV-2 was confirmed in 5 and 2 samples, respectively. Incidence of CVA in tested samples was the highest – 34 trees. CGRMV and CNRMV were detected in 8 and 15 cherry trees, respectively. The presence of CLRV was confirmed in 16 trees. The sampled trees were tested negative for CMLV and CRLV using RT-PCR. The viruses were found to occur as single or mixed infections of different combinations in individual cherry trees. DNA sequencing confirmed the identification of the viruses in selected samples and a comparative analysis indicated that their isolates shared a close molecular identity with the corresponding isolates in GenBank.

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THE ROLE OF GENETIC RESOURCES IN THE BREEDING OF NEW VARIETES OF FRUIT PLANTS AT THE RESEARCH INTITUTE OF HORTICULTURE IN SKIERNIEWICE

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Genetic resources of fruit plants are large collections of different genotypes within the existing genera and species of fruit plants, which are carriers of genes determining various biological characteristics of plants. In view of the large genetic and phenotypic differences among the plants gathered in the collections, such resources are characterized by a very high biodiversity. The Convention on Biological Diversity, the international agreement adopted at the Earth Summit in Rio de Janeiro in 1992, obligates all the countries that are signatories to the Convention to collect, protect, and use in a sustainable way the existing biodiversity. In Poland, genetic resources of fruit plants have for many years been collected, preserved and described in detail at the Research Institute of Horticulture (formerly Research Institute of Pomology and Floriculture) in Skierniewice. This activity is funded by the Ministry of Agriculture and Rural Development as part of financing biological advances in crop production. Overall, the gene resources accumulated at the Institute include several thousand of different taxa belonging to the group of fruit plants grown on a commercial scale in temperate climate conditions. These resources do not only allow to preserve the existing biodiversity for future generations but they are also widely used at the Institute as a source of important functional traits in the ongoing breeding work aimed at obtaining new varieties of fruit plants. At present, the Institute is engaged in breeding all the species of fruit plants cultivated in Poland (apple, plum, sour cherry, sweet cherry, peach, apricot, vegetative rootstocks for apple and plum, blackcurrant, gooseberry, raspberry, highbush blueberry, amelanchier, and strawberry), and the breeding is conducted in three directions, i.e. for resistance, quality, and adaptation. In this work, various genotypes held in the Institute's gene bank are used as parental forms for cross-fertilizations, serving as donors of desirable traits. The selection of parental forms for crossbreeding depends on the direction of a given breeding programme and in most cases is made on the basis of complementarity of the phenotypic traits of the parental components to be crossed. However, parental genotypes possessing the desired functional traits do not always pass on those traits to their progeny. Therefore, especially in the case of berry shrubs (plants with short breeding cycles), crossbreeding programmes are preceded by genetic and breeding studies of potential genotypes to enable an accurate assessment of their general and specific combining abilities, and thus the usefulness of those genotypes for the planned breeding programmes. The most promising genotypes, prior to them being incorporated into crossbreeding programmes, are also subjected to an analysis of the DNA profile to avoid crossing closely related parental forms, thereby eliminating the risk of the inbreeding effect among progeny seedlings.

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MOLECULAR TOOLS IN ASSESSMENT OF GENETIC RESOURCES AND BREEDING OF FRUIT PLANTS

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The era of molecular markers in agricultural sciences began in the late 20th century. The last two decades have brought significant increase of number of techniques generating markers, as well as the scope of markers' abilities. Starting from RFLP (*Restriction Fragment Length Polymorphism*), through arbitrary markers (*Randomly Amplified Polymorphic DNA*), microsatellites (*Simple Sequence Repeats* and *Inter-Simple Sequence Repeats*), transposon-based markers (*Sequence-Specific Amplified Polymorphism and Inter-Retrotransposon Amplified Polymorphism*), and SNP (*Single-Nucleotide Polymorphism*), to systems analyzing thousand markers simultaneously, such as microarrays, HTS (*High Throughput Sequencing*) and GWA (*Genome Wide Association*) – all of them can support investigations in plant collections and study devoted to generation of new varieties. Molecular markers are useful in the following areas: (a) plant identification (assessment of unique character, determination of genetic relationship, confirmation of pedigree and plant breeder rights), (b) planning of breeding programs (MAS – marker assisted selection, choice of parental forms), and (c) dissection of genes linked with economically important traits of cultivated plants.

Laboratory of Unconventional Breeding Methods have been involved in application of molecular tools for assessment of genetic resources and breeding of fruit plants since 2000. Basing on wide program covering molecular study on majority of plant species cultivated in temperate climate zone, abilities of different types of markers, necessity of parallel use of the markers from diverse groups and their limitations will be presented in present lecture. Bottle necks in „gene hunting", problems connected with selection of parental forms/ progenies in case of additive polygenic traits, and phenomenons observed during markers' mapping will be also shown.

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EVALUATION OF GENOME SIZE OF POLISH APPLE CULTIVARS COLLECTED IN GENE BANK IN RELATION TO SOME MORPHOLOGICAL TRAITS

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Apple species and cultivars differ in genome size, i.e. nuclear DNA amount, and ploidy level. Majority of these genotypes are diploids, but there are some triploids and a few tetraploids. Ploidy level is associated with nuclear DNA content that translates into larger nuclei, cells and stomata sizes. It is well known that increased ploidy level is often associated with alteration of morphological, physiological or phenological characteristics such as, e.g. larger leaves, flowers and fruits or delayed flowering time. Taking into account the climatic conditions of Poland, one of the apple breeding directions can be creating genotypes characterized with late flowering. Such genotypes could be less liable to flower damages by spring frosts. Genome size evaluation and stomata measurement (easy to evaluate marker of increased ploidy level) for the genotypes collected in the gene bank of The Institute of Horticulture will be very valuable on either scientific or practical aspects, with possible application in a breeding directed to creation of new cultivars with the larger fruits and late flowering time.

Forty nine apple genotypes of Polish origin were used for the study. Genome size was evaluated in relation to stomata and flower sizes. Analysis of genome size was done using flow cytometry (FCM/PI) (CyFlow PA, Partec, Germany). Young leaves were sampled in June/July. Analyses were done using fresh material. Stomata were measured using light microscopy. Flower size was evaluated measuring diameter of the 2nd and 3rd flower in florescence. For standard cultivars of the known chromosome number, DNA size (2C value) was 1.69 pg for the diploid cultivar 'Alwa' (2n=2x=34), 2.40 pg for triploid 'Boskoop' (3x=51), and 3.20 pg for 4xMcIntosh (4x=68). In 45 cultivars, DNA size ranged from 1.58 to 1.71 pg indicating on their diploid chromosome number. Fife cultivars were identified as triploids ('Bursztówka Polska', 'Pagacz', 'Rapa Zielona', 'Rarytas Śląski' and 'Witos') owing to their DNA sizes ranged between 2.42 and 2.47 pg. Stomata and flower sizes were significantly larger in triploids. Thus, in 3x plants mean flower diameter was 53.0 mm whereas in diploids 45.4 mm and stomata lengths were 32.1 µm and 28.8 µm, respectively.

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BREEDING OF HALF-HIGHBUSH BLUEBERRY IN LITHUANIA

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Growing of half-highbush blueberry in Lithuania has been limited till the present time. One of the main reasons for such situation was absence of local cultivars. The collection of half-highbush blueberry germplasm and respective breeding programme started at Kaunas Botanical Garden of Vytautas Magnus University in 1993. Fifty seedlings were examined in the years 1993-2010. The genotypes No 11, No 16, and No 17 were selected for further cultivar testing. Fruiting potential of Lithuanian half-highbush blueberry genotypes was determined, taking into account following characteristics: number of berries and number of simple clusters in a composite cluster, average berry mass, and productivity per bush and compared with half-highbush cultivars ‘Northland’, ‘Putte’, and ‘Northblue’. Total phenolic, quinic, and chlorogenic acid amounts were determined in berries of blueberry genotypes too. The genotype No 17 was distinguished by the biggest clusters with the largest number of berries and the largest number of simple clusters in a composite cluster. The average berry mass of selected genotypes was smaller than berry mass of the half-highbush cultivar ‘Putte‘. Berries of the genotypes No 11 and No 16 were harvested completely during 2-3 pickings, whereas harvesting berries of the No 17 was completed in 3-4 pickings. The high-bushblueberry No 17 appeared the most productive, its yield reached from 1.8 to 3.3 kg in different years. Yields of the No 11 and the No 16 were significantly lower. The half-highbush blueberry genotypes were distinguish by exceptionally high levels of total phenolic (No 16, ‘Northland, No 17, and No 11), quinic acid (No 17, No 11, and No 16), chlorogenic acid (No 16, ‘Northland’, and No 17) amounts. The genotypes of Lithuanian origin No 17 and No 11 were confirmed as the first Lithuanian cultivars ‘Danutė‘ and ‘Freda‘ in 2012.

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THE EVALUATION OF EUROPEAN CRANBERRYBUSH (*Viburnum opulus*) FOR BREEDING IN LITHUANIA

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European cranberrybush (*Viburnum opulus* L.) is a native plant in Lithuania. The species of genus *Viburnum opulus* L. (European cranberrybush), and their varieties such us *V. opulus var. trilobum* (sometimes called the American cranberrybush) as well as *V. opulus var. sargentii* are widely used in traditional and folk medicine. Very rich chemical composition of biological active substances both in the berries and other parts of the plants – roots, bark, seeds, flowers and leaves determine that European cranberrybush (*Viburnum opulus* L.) is up-and-coming plant for food, pharmaceutical and cosmetics industry. Fruits of European cranberrybush are of extreme value notwithstanding in some literature sources they are mentioned as poisonous.

The investigations of the fruits were carried out in European cranberrybush (*Viburnum opulus* L.) collection at Kaunas Botanical Garden of Vytautas Magnus University in 1999-2013. The biological peculiarities of cranberrybush cultivars and clones were estimated according to the methods of evaluation of horticulture plants. Reliable differences were determined between accessions with respect to productivity, number of fruit per cluster and mean weight of a fruit. The investigations of biochemical composition of fruit of different cultivars and clones revealed significant differences in the amounts of phenolic compounds (anthocyanins and flavonols), benzoic, and ascorbic acids. The accession of Lithuanian origin P1 was typical of the largest amount of ascorbic acid (46.1 mg/100g). Fruit of the cultivar 'Leningradskaja Otbornaja' accumulated the largest amounts of anthocyanins. The cultivars 'Krasnaja Grozd' as well as the clone P2 were distinguished for the largest benzoic acid amounts. The value of the most productive European cranberrybush accessions were determined by the number of fruit in a cluster. The results of biochemical investigations corroborated that selection of European cranberrybush accessions in respect of benzoic acid, anthocyanins and ascorbic acid amounts could be advisable.

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INFLUENCE OF FOLIAR SPRAYS OF BORON TO THE GENERATIVE DEVELOPMENT OF PLUMS (*P. domestica*)

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Boron (B) is a micro fertilizer that contributes to the whole plant metabolism. B foliar sprays mostly are needed for peaches, plums, cherries and almonds. B deficiency most significantly affects reproductive organs – plants do not bloom or after flowering they have no fruits. B in the plant is slow-moving, that is why the foliar sprays were chosen. Providing optimal amounts of B ensures faster bloom, developing of high quality fruits. Plums were planted at the Latvia State Institute of Fruit-Growing in 2008, the study was done with Latvian breeding cultivars 'Sonora' and 'Lase', as control used the 'Duke of Edinburgh'. B foliar spray (0.25% boric acid (H_3BO_3)) was used in the period from 2011 to 2013, the data analyzed for the years 2012 and 2013. Evaluation was conducted of the impact of fertilizers on fruit formation by calculating the percentage of fruit set and fruits from the flower amount as well as yield density (amount of fruits per the branch cross-sectional area). In 2013 was evaluated soluble solid content (Brix %), total content of acids (%) and fruit flesh firmness (kg cm^{-2}). The aim of the study was to determine the effects of B on the fruit set and development. Significant adjustments to the results of the 2012 were affected by strong frost damage during the winter. Not only buds suffered from frost, but also fruit–twigs. Thaws in the spring of 2012 disrupted plum bloom period and fruit development. In 2013 there was not significant frost damage. Cultivar 'Lase' has late start of production and in 2012 was without yield. Foliar spray of B had a positive impact on the amount of fruit set and fruits, yield density, soluble solid content and fruit flesh firmness. For the cultivar 'Sonora' foliar spray of B had a positive impact on the amount of fruit set and fruits, yield density and fruit flesh firmness. For the cultivar 'Duke of Edinburgh' in 2012 B had a positive impact on the amount of fruit set and fruits, and yield density. Total content of acids (%) of the B variant of all cultivars was lower than control.

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PRESERVING OLD VARIETIES OF FRUIT TREES

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In Poland there are still a lot of old varieties of fruit trees. They have survived in home orchards, monastic gardens, along avenues and as single trees. They have been preserved without chemical protection and often with no special care. They have survived many harsh winters which decimated orchards of modern varieties many a time. The old varieties of fruit trees that occur in Poland still represent a very diverse genetic material which may be a source of valuable genes. These varieties also constitute historical, cultural and natural heritage. Therefore, it is so important to preserve them for future generations. To achieve this aim, the Research Institute of Horticulture in Skierniewice alone, and together with the Plant Breeding and Acclimatization Institute in Radzików, which is a substantive coordinator of the National Programme of Crop Plant Germplasm Conservation, has organized expeditions for many years. Old varieties of fruit trees found in different regions of Poland are propagated at the Institute. Next, the plant material is planted in field collections (*ex situ* conservation) where it is identified and evaluated. Based on this assessment pomology descriptions of old varieties of fruit trees are made and the varieties are recommended for the agro-environmental programme financed by the Ministry of Agriculture and Rural Development, which aims at *in situ* preservation of old varieties of fruit trees. As far as possible, the varieties that may be useful, for example, to the organic farms will also be evaluated in experiments in terms of specific characteristics, for instance, susceptibility to diseases. At present, in the collections of the Institute there are about 650 varieties, including 500 old apple ones, coming from expeditions in different parts of Poland. As part of plant genetic conservation, for about 10 years one-year-old shoots of the varieties have been made available to the nurserymen.

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SUITABILITY OF STRAWBERRY CULTIVARS TO ORGANIC GROWING IN THE HIGH TUNNELS

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The area of strawberries grown in the high tunnels quite, has reached about 10 ha during the last five years in Latvia. Recently the main problem for such growing technology is a lack of methods and appropriate products for plant protection.

One of the biggest problems for strawberries grown in high tunnels is the damages of berries, caused by strawberry Thrips sp.

One of the factors that contribute to their multiplication is inadequate high temperatures. When the air temperature rises above +25 °C it is a greater likelihood of Thrips invasion.

Because of pests and diseases resistance against the pesticides, the biological methods more and more widely are used in the protected cultivation. One of them are using of predator organisms. The other possibilities are growing of pest resistant cultivars. The study was carried out at the Latvia State Institute of Fruit-Growing. FVG (FOLIEN-Vertriebs GmbH) type of high tunnels with cover film "SUN SAVER 5 PRO" as well as a few as Agryl additional covers (17 and 23 g m^{-2}) and perforated film (perforation 500 m^2) were tested. Trial Three strawberry cultivars - 'Rumba', 'Honeoye' and 'Darselect' were planted in the trial of 2012th. The first harvest was collected in 2013. The damages cased by Thrips and *Botrytis* were observed on berries. The tendency of higher resistance against the Thrips was found for cultivar ‘Darselect’.

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THE DYNAMICS OF APPLE TREES SCAB LESIONS IN KAZAKHSTAN

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At present, the genebank of apple trees is presented by home apple varieties - *Malus domestica*, but there are also Siberian apple - *M. Baccata*, as well as varieties obtained with *M. Floribunda* - Prima, Priscila, Red free, Liberty, Florin which are resistant to scab. (Nurtazina N. Yu., Nurtazin M.T.)

The aim of study was to investigate the dynamics of scab on apple varieties of Zailiyskoye in two growth areas: in the foothills of Almaty region and the southern zone of the South - Kazakhstan region. It was revealed that in the southern zone of the country the maximum scab damage of apple trees falls on May month, when favorable conditions for the disease development remain. In the foothills these optimum conditions for the destruction of apple scab remain until July.

It was found that in the foothills the first signs of scab appeared in mid-April, with a gradual increase during the growing season. Maximum disease defeat, 28 %, was marked in July. With the beginning of dry weather in August, the scab severity was reduced to 18%. In terms of South Kazakhstan in connection with dropped heavy rainfall the scab hit the plants in April, and reached a maximum of 12.5 % in May. Because of the dry conditions the disease began to decline. In August there was a minimal manifestation of the disease - 2.5%. The degree of scab development on apple varieties Zailiyskoye in Almaty and South Kazakhstan regions were studied.

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GENETIC RESOURCES OF WILD FRUIT SPECIES IN UZBEKISTAN AS A SOURCE OF RESISTANCE GENES TO BIOTIC AND ABIOTIC FACTORS OF ENVIRONMENT

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Central Asia is one of the world centers of origin and domestication of fruit crops. Crop wild relatives of these globally important temperate fruit species as apple, pear, apricot, walnut, pistachio, almond, etc. are still growing in the forests of the region.

Useful genes which these wild crop relatives possess provide resistance of cultivated crops to diseases, pests and abiotic stresses of environment as drought, soil salinity, high and low air temperatures. The importance of wild fruit plants as the source of initial material for development of new varieties of agricultural crops has been constantly increasing. More than 50 species of different forest fruit crops are the richest fund for intensive development of fruit industry and viticulture, and the source for increasing their productivity.

Researches carried in the frame of Bioversity International/UNEP-GEF project "In situ/On farm conservation of agrobiodiversity (horticultural crops and wild fruit species) in Central Asia" showed that distribution of wild fruit species in mountainous areas of Central Asia, the home of crop wild relatives, depends on environmental conditions of the habitat. Hydrophilous (moisture loving) species as walnut, hawthorn and apple are growing on the northern slopes of mountains where more moisture is accumulated in the soil. Drought resistant fruit species as almond, apricot, cherry plum, pistachio, jujube, dwarf cherry and others are growing on the dry southern slopes. Many of wild fruit species are used as a rootstock for cultivated varieties. Among them two apple species native for Central Asia: apple Siversi (Malus sieverii Lbd. MRoem) and kirgiz apple (Malus kirghisorum Al. et An. Theod.) are widely used by farmers-horticulturists as rootstock for vegetative multiplication of cultivated apple varieties. Wild pear species: common pear (Pyrus communis L.) pear Regeli (Pyrus regelii Rehd.), bukharian pear (Pyrus bucharica) are of great interest for breeding drought resistant and dwarf pear varieties. Wild apricot (Armeniaca vulgaris Lam.) growing in forests of Central Asia is used in breeding high yielding varieties of apricot. Natural stands of pistachio (Pistacia vera L.) are used for harvesting pistachio nuts and are natural genepool for selection of local forms and varieties of pistachio with economically valuable traits of drought resistance, regular yield production, high yielding, big size of nuts, openness of nuts' shell. Six almond species are naturally grow in Central Asia including Amigdalus communis L., Amigdalus bucharica Korch, Amigdalus spinosissima Bge., Amigdalus vavilovii M. Pop., Amigdalus petunnikowii. All of them are characterized as very drought resistant species. Wild stands of nut bearing and fruit species occupy large territory of about 600, 000 ha in Central Asia.

Natural stands of walnut (*Juglans regia* L.) are existing only in Central Asia. Walnut is a valuable plant, all parts of this species including nuts, leaves, timber, bark have very high practical value. This plant is important food crop and source of income for people living in walnut forests. Walnut is is characterized with high polymorphism. Trees with high habitus, diverse shape of trunks, leaves, crown, yielding capacity, nuts quality and size, level of drought, pests and diseases resistance are available in natural stands and can be used in breeding of new varieties. Wild plum, cherry plum (alycha), Mahaleb cherry, hawthorn, trebizond date, barberries, grapevine and other nut, fruit and berry species are widely spread in Central Asian forests. They all are unique genetic pool and source for improvement of assortment of cultivated fruit crops.

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SPREADING OF SCAB ACTIVATOR ASCOSPORES ON FRUIT CROPS. THE CASE OF BOTANICAL GARDEN NAMED AFTER E. GAREYEV

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Apple scab is a fungal disease caused by the ascomycetes *Venturia inaequalis*. Scab is widespread in temperate climate, especially in areas with cold wet spring. It has great economic importance in commercial horticulture, since it reduces greatly the yield and quality of apples. Scab is prevalent everywhere, where different kinds of apple trees are growing. In regions with a rainy summer the lesion can be 90 – 100% in every two years. The hotter and drier summer, the less is the number of years of strong development of the disease. The infection is being spread through the garden in spring by the fungus, overwintering in fallen leaves.

Only one such leave may release 2000 000 – 3000 000 spores. But this requires a rain of such strength for all infected leaves to become soaked. Therefore scab particularly affects apple trees in rainy springs. Strong development of scab is almost never fatal to apple trees, but it can significantly reduce fruit yield (the number and weight of fruit are decreasing) and fruit quality. Fruits are shallow, unattractive, of ugly shape, with lower vitamin content.

During our experiments conducted to capture ascospores from the air, the traps were exposed on the surface of the soil, and at a height of 1 m and 2 m. from the ground. Experiments on identifying the period of the primary infection by ascospores were performed in the Botanical Garden named after Gareyev during the summer from February to May 2013.

Three plots were studied:

1. Collection nursery
2. Lining-out nursery (young trees)
3. Selection breeding plot.

Ascospores were captured by sedimentation method (natural settling on agar Petri dishes) and calculated for 1 cm^2 of surface.

With help of these experiments, the greatest flying of ascospores was observed at the end of April. Weather conditions in April, compared with the month of March had much more rainy precipitation, on 16-17 April it was 2.1 mm, the average temperature was in the range of 11.4 to 19.2^{0}C, which contributed to the germination of ascospores.

In addition, during all months studied we discovered following types of micromycetes *Alternaria, Fusarium* sp., *Monillia* sp., *Acremonium, Aspergillius, Penicillium* it should be noted that in the temperature range of -2+ 90 C^0 the following types increased in number: *Alternaria* (12,9%). With increasing temperature the following micromycetes were represented: *Aspergillius* (6,8%), *Penicillium* (5,3%), *Acremonium* (3,8%), *Monillia cinereus* (3,5%), *Venturia inaequalis* (3,2%).

Conclusion: In summary, these results proved a basis for the possibility of the development of scab on trees in the botanical garden named after Gareyev in summer of 2013, which amount may be up to 45% and above , if appropriate preventive control measures would not be taken.

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THE INFLUENCE OF PHYTOEXTRACTS ON RHIZOGENESIS OF SIEVERS APPLES IN VITRO

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The most important task is to keep the Siversii Apple, which is one of the important sorts of apples in fruit leaf bearing and forest forming zone of Republic Kazakhstan.

Currently, wild forms and many other varieties of apples are disappearing due to deteriorating environmental conditions and unsustainable human activities. For rapid multiplication of apple forms micro -propagation method has been successfully used in world practice. In comparison with traditional methods of reproduction micro -propagation in vitro can significantly increase the multiplication factor and sanitary improvement of plants from fungal and bacterial infections simultaneously. However, one of the main limiting factors for the introduction of technology into practice is rooted in low yield of microclonal propagation .

The aim of research was to optimize the composition of the standard medium (1/2 MS with 0.5 mg / l IBA) to enhance root formation in Sivers apple microsprouts using plant extracts from the aerial parts of the plants and rootstock *Sanquisorba officinalis* L.

The results showed that in the control with the IBA and the additional introduction of a standard of 50 mg / l of an extract from the rootstock the rooting ability was 66.6 %. When applying of a low dose of 1 mg / l of extract from the overground parts of the plants of Sivers Apples root formation was stimulated only in 33.3% of the shoots. A significant increase in root formation was observed with the additional introduction of a standard medium extracts from the rootstock of *S. officinalis* in 1 mg / l concentration. Rooting ability of microshoots was 150 % compared with the control with 0.5 mg / l IBA**.**

Thus, the synergistic stimulatory effect on root formation in vitro in extracts isolated from the rootstock of *S. officinalis* was observed.

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CONSUMER ACCEPTANCE OF NEW AND POPULAR IN POLAND APPLE CULTIVARS

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The apple (*Malus*x *domestica* Borkh.) is belonged to the rose family (*Rosaceae*). Apple is one of the most widespread and popular fruit trees in the world. Over 10 000 apple cultivars are known across the globe, whereas nowadays the word's production is based on the limited number of cultivars. The reason for it is the need to adapt the cultivation to the climatic conditions and consumers demands. Polish climate is suitable for apple production, however some of cultivars couldn't be chosen to commercial production due to the long vegetation season. Eating quality (flavor ,taste and texture) is depending on some chemical and physical feature of apples: (soluble solids content, acidity values, flesh firmness).

During the January and February from 2007 to 2009 on the University of Life Sciences in Lublin the evaluations of fruit quality and consumer acceptance of thirteen apples cultivars ('Beni Shogun', 'Braeburn Helena', 'Braeburn Hillwell', 'Braeburn Mariri Red', 'Cameo', 'Golden Deliciuos', 'Honeycrisp', 'Jonagold Decosta', 'Junami', 'Kanzi', 'Mutsu', 'Rubens', 'Šampion') were done. Additionally the sports of Braeburn's varied in methods of apple storage: in ordinary storage room and cold storage room. Consumer test were carried out between two groups: academic teachers and students. The highest flesh firmness characterized apples of 'B. Mariri Red', 'B. Helena' and 'B. Hillwell' from cold storage room. Among studied cultivars all sorts of 'Braeburn', 'Šampion', 'Kanzi', 'Junami', 'Rubens' and 'Cameo' distinguished by soluble solids content. The highest total soluble solids/acid ratio stated in apples of 'Beni Shogun', 'Šampion' and 'Junami'. The cultivar with the highest notes of consumer acceptance for appearance was 'Mutsu' in academic teacher group and 'Braeburn Mariri Red' from cold storage room in student group. The best acceptance for flavor in bought group stated for 'Kanzi'.

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DISCRIMINATION OF HIGHBUSH BLUEBERRY GENOTYPES WITH ISSR-PCR AND EST-PCR TECHNIQUES

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Research Institute of Horticulture in Skierniewice manages a gene bank of highbush blueberry which consists of over 80 taxons and is continuously expanded with new cultivars. Due to difficulties in identification of cultivars on the basis of morphological traits, two techniques based on the analysis of the DNA polymorphism were used: EST-PCR (Express sequence tag-polymerase chain reaction) and ISSR-PCR (Inter simple sequence repeat-polymerase chain reaction). EST-PCR markers are based on the sequences of expressed genes and are more likely to be conserved than markers targeting non-coding regions. A set of EST-PCR primers was developed for *Vaccinium* L. using a cDNA library derived from floral buds of cold acclimated blueberry plants (Rowland et al., 2003a). EST-PCR primers developed for highbush blueberry were also applied to other members of the *Ericaceae* family (Rowland et al., 2003b). The ISSR technique allows to amplify the microsatellites present in the plant genome and was successfully used in the assessment of genetic diversity of many horticultural species, including blueberry (Debnath 2009). The ISSR markers allow to obtain high degree of DNA polymorphism and do not require any prior knowledge of flanking sequences.

The aim of this work was to discriminate 24 cultivars of *Vaccinium corymbosum* L. using the ISSR-PCR and EST-PCR techniques, and to compare the suitability of those techniques for the differentiation of cultivars. There were used 15 ISSR primers (The University of British Columbia, Canada) and 8 pairs of EST primers (Rowland et al., 2003). Amplification of DNA was performed with 42 ISSR cycles (95^{o}C/30s, 55^{o}C/30s, 72^{o}C/90s) and 40 EST-PCR cycles (95^{o}C/40s, 52-60^{o}C/70s, 72^{o}C/2 min.). DNA fragments were separated in 1.4% agarose, stained in ethidium bromide and visualized under ultraviolet light. As a result of reactions with EST primers, 42 polymorphic DNA fragments were obtained in total. Size of those reaction products was described as between 200 and 2500 bp. In reactions with single pairs of EST primers, 2-8 polymorphic DNA fragments were observed (5,2 fragments per primer on average). As a result of reactions with 15 ISSR primers, altogether 107 polymorphic DNA fragments were obtained; their size varied from 300 to 1600 bp. Five to eleven polymorphic products were obtained in reactions with single primers (7,1 fragments per primer on average). Reactions that were carried out allowed to discriminate all tested cultivars. More polymorphic fragments were obtained for ISSR-PCR markers, but both techniques can achieve DNA polymorphism that will allow to discriminate among tested cultivars. The techniques are fast and simple, and so they can be applied to differentiation of taxons of *Vaccinium corymbosum* L. gathered in the gene bank.

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DNA PROFILING OF *Vitis* spp. CULTIVARS USING ISSR MARKERS

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At present, the grapevine collection run by the Institute of Horticulture in Skierniewice consists of 302 taxons and is constantly expanded with new genotypes. The maintenance of the collection requires correct and precise identification of gathered cultivars, clones and forms. Phenotypical observations sometimes show high similarity between certain taxons, which hinders the correct discrimination. The correct identification is difficult when the same taxons have different names (synonyms) or when different taxons are given the same name (homonyms). The use of DNA-based markers enables fast and precise comparison of the genetic material of the plants regardless of environmental conditions, as well as explicit determination of distinctness of the taxons in comparison. One of the techniques used for this purpose is ISSR-PCR technique (Inter simple sequence repeat-polymerase chain reaction). ISSR primers are complementary to di- or trinucleotide simple sequence repeat motifs that are abundant in the plant genome. ISSR-PCR is recognized as one of the most useful molecular techniques because it is simple, fast, reproducible, and cost effective (Zietkiewicz et al., 1994). Moreover, the use of the ISSR technique allows to obtain high degree of DNA polymorphism and does not require any prior knowledge of flanking sequences. The ISSR-PCR technique was used for many species of plants, also for *Vitis* spp. (Meneghetti et al., 2012, Jing and Wang 2013).

The aim of the research was to identify 26 grapevine cultivars belonging either to *Vitis vinifera* L. or to interspsecific hybrids *Vitis* spp. The ISSR-PCR technique was applied with the use of 14 primers (The University of British Columbia, Canada). The amplification of the DNA was performed in 42 ISSR cycles (95^{o}C/30s, 55^{o}C/30s, 72^{o}C/90s). DNA fragments were separated in 1.4% agarose, stained in ethidium bromide and visualized under ultraviolet light. As a result of the reactions, 107 polymorphic DNA fragments were produced, and their size varied from 300 to 2200 bp. The reactions with single primers produced from 4 to 12 polymorphic DNA fragments. Two genotypes were observed to have the same DNA profiles, which indicates their being synonyms, i.e. the same cultivar under two different names. Other cultivars were identified on the basis of different DNA patterns. The obtained results will be used in verification of the genetic identity of the genotypes imported to the collection of *Vitis* spp.

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IDENTIFICATION OF INCOMPATIBILITY ALLELES IN SWEET AND SOUR CHERRY CULTIVARS

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In sweet cherry there can be observed gametophytic self-incompatibility system (GSI), and its compatibility is conditioned by singular multiallelic locus. It is described as S-locus and contains two genes that condition the synthesis of the protein responsible for the incompatibility reaction. The incompatibility reaction of the pistil is determined by the S-RNase gene, whereas the S-haplotype-specific F-box gene (SFB) determines the incompatibility reaction of the pollen. In order to obtain good yield in sweet cherry orchards it is necessary to know the status of S-alleles present in sweet cherry cultivars, which allows the selection of appropriate pollinators. Moreover, the determination of S-alleles is one of the traits that should be characterised in cultivars and taxons gathered in collections. The research aimed to identify the incompatibility alleles of sweet cherry cultivars with the use of molecular biology techniques based on PCR.

Tests were conducted for 24 cultivars of sweet cherry gathered in the collection of the Research Institute of Horticulture in Skierniewice (Poland). 8 pairs of amplifying primers of the I and II intron of the S-RNase gene and 13 pairs of specific primers for S_1-S_{16} alleles of the S-RNase gene were used in the research. After the application of all primers that allow the amplification of the I and II intron of the S-RNase gene, the obtained DNA fragments corresponded to the S-alleles. The identification of S-alleles with the use of one pair of primers was difficult due to the fact that for some S-alleles the obtained DNA fragments were of similar size. In order to identify the S-alleles it was necessary to use at least two pairs of primers amplifying the I and II intron of the S-RNase gene, and then to use specific primers. As a result of the tests, alleles S_1 - S_6 and S_9 were identified. Monitored pollination in the orchard and microscopic observation of overgrowth of pollen tubes through the style of the pistil confirmed the identification of S-alleles that had been obtained with the use of molecular techniques. Moreover, the preliminary research showed the usefulness of amplifying primers of the I and II intron of the S-RNase gene in the identification of S-alleles of sweet cherry cultivars. The obtained results will be used in selecting the pollinators in the orchards and in characterizing the sweet cherry and cherry cultivars and taxons gathered in the collection of the Research Institute of Horticulture in Skierniewice.

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SWEET CHERRY CULTIVAR EVALUATION FOR TWO GROWING SYSTEMS

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The choice of appropriate cultivar and growing system is essential precondition of sweet cherry growing. The cultivars with large and firm fruits are susceptible to rain induced fruit cracking and following fruit rots. Protective covers above trees are a possibility to reduce these fruit damages. The trial was established in Latvia State Institute of Fruit-Growing to evaluate several sweet cherry cultivars with firm fruits (‘Iputj’, ‘Lapins’, ‘Tyutchevka’ and ‘Bryanskaya Rozovaya’ on *Prunus mahaleb* L.) grown traditionally without cover and under VOEN type plastic cover. The trees were covered at the beginning of June (at time of green fruit) and throughout the harvest period 2010 – 2012. After harvest time pruning of sweet cherries was done to keep trees in frame accordingly the cover. Tree branching was evaluated in points from 0 (no young shoots) to 3 (many shoots) for lowest, middle and highest part of crown after pruning. The outcome of marketable fruits (healthy and undamaged) was calculated in % under cover and without cover for each cultivar.

Sweet cherry cultivar ‘Iputj’ had trees of moderate-low vigour. The branching in the lowest part of crown was weak (1 point), in the middle and highest part of crown medium (2 points). The outcome of marketable fruits was 59 % on average under cover, but 26 % without cover; fruit weight was 6.3 g under cover and 5.6 g without cover. The cultivar ‘Lapins’ had trees of moderate vigour. The development of new branches was medium in all parts of crown. The outcome of marketable fruits was 78 % under cover, but 40 % without cover; and fruit weight was 8.1 g and 7.6 g respectively. The cultivar ‘Tyutchevka’ had trees of moderate-strong vigour. After pruning new productive shoots with wide branching angles appeared in the crown from lower to upper part (3 points). The outcome of marketable fruits was 95 % and 71 %, but fruit weight was 6.3 g and 5.3 g with or without cover respectively. The cultivar ‘Bryanskaya Rozovaya’ had trees of strong vigour. In the lower and middle part of tree the branching was medium, but many strong upright shoots appeared in upper part of crown. The outcome of marketable fruits was 91 % and 82 %, but fruit weight was 4.7 g and 4.4 g with or without cover respectively.

The fruit quality and tree features of cultivars ‘Iputj’, ‘Lapins’ and ‘Tyutchevka’ were suitable for growing under cover. The growing system with covers was not profitable for cultivar ‘Bryanskaya Rozovaya’ due to large tree, small fruit size and comparatively low cracking level.

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STATUS OF APRICOT COLLECTION AND CHARACTERISTICS OF SOME POLISH LOCAL VARIETIES

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Many apricot varieties are available to tree fruit producers in the world. However, in Poland apricots are not produced commercially on big scale due to raw climate. In the Polish National List of Fruit Plant Varieties there are 9 cultivars only. Almost all knowledge about value of varieties come from observations in collection. Currently, 123 cultivars, selections and seed genotypes of *Prunus armeniaca* L. are presently evaluating in the field collection of Research Institute of Horticulture in Skierniewice. Each genotype is representing by three trees planted at a spacing of 5 x 3 m. Annually, a weed-free strip is maintaining under the trees with herbicides, fertilizer and pesticides are applying according to actual recommendations for commercial orchards. Trees are not pruning except to remove low or broken branches. Fruit thinning is not practiced in the collection. The paper presents characteristics of some Polish local cultivars: ‘Wczesna Rejmana’, ‘Wczesna z Kiernozi’, ‘I/K1 seedling’, ‘Późna Rejmana’, ‘Mazanów seedling’, ‘Białomiąższowa z Kiernozi’ (Table 1).

Table 1. Fruit characteristics for some local apricot varieties

Variety	Harvest season	Fruit weight [g]	Stone weight [g]	Shape	Flash color	Comments
Wczesna Rejmana	Early	15-20	1.3-1.6	Oblong & round	Orange	High yields Small fruit
Wczesna z Kiernozi	Very early	25-50	3.0-3.2	Oblong & trapeze	Orange	Good flavor
I/K1 seedling	Early	35-40	2.6-2.8	Elliptic & oblong	Orange	High yields
Późna Rejmana	Very late	30-40	2.4-2.6	Round & round	Orange	Good flavor Late ripening
Mazanów seedling	Very late	25-35	2.4-2.6	Oblong & round	Orange	Good flavor Late ripening
Białomiąższowa z Kiernozi	Early	35-40	2.1-2.3	Round & round	White	Good flavor Poor yields

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GENETIC DIVERSITY OF FRUIT CROPS IN KYRGYZSTAN

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Kyrgyzstan is rich in diversity of local varieties and forms of fruit tree crops. The biggest area of wild nut-bearing and fruit species forests is located in mountains of western Tien Shan in the south of Kyrgyzstan. In Kyrgyzstan walnut and fruit tree forest grow at the altitude from 600 m up to 3,000 m above the sea level in area of 254,400 ha including 47,300 ha of walnut stands, 36,400 ha of pistachio, 16,500 ha of apple, 3,000 ha of hawthorn and 300 ha of cherry plum. This forest is the treasure of specific and intra-specific diversity of wild nut, fruit and berry plants. Many of them were domesticated and currently form a basis of horticulture in Kyrgyzstan. Seeds and stones of apple, pear, cherry plum, mahaleb cherry, apricot are also widely used as rootstock by local farmers. Many forms of wild apple Kara-alma (*Malus kirghisorum*) and Arkitskaya or Kizil olma (*Malus sieversii*) possess traits of high quality and could compete with improved apple varieties.

Availability of vast area of nut and fruit tree forest has influenced on the development of horticulture in Kyrgyzstan. Diverse local relief, soil and climate conditions specified development of rich diversity of fruit crops in the country. Many high yielding varieties of fruit crops with good fruit quality adapted to local environment were developed by the breeders in Kyrgyzstan. The State Register of Crop Varieties and Hybrids of Kyrgyzstan authorized in 2013 include 40 varieties of apple, 13 varieties of apricot and 4 varieties of walnut. The main fruit tree crops growing there are apple, pear, quince, walnut, almond, plum, cherry, cherry plum, peach, apricot, grape, fig, pomegranate, persimmon and others. Such berry crops as strawberry, raspberry, currant and barberry are cultivated there, too. The area of orchards is 50, 000 ha in Kyrgyzstan where 193.1 thousand tons of fruits are produced every year.

Apple is the most spread fruit tree crop and area of apple orchards is 44,600 ha in Kyrgyzstan. Nowadays apple assortment cultivated in Kyrgyzstan is based on range of apple varieties of local, European and north American origin which in their turn were developed on basis of Kyrgyz apple - *Malus kirghisorum* (Al et An Theod), Sieverse apple - *Malus sieversii* (Ldb.) M. Roem. and Niedzwetskiy apple – *Malus niedzwetzkiana* Dieck.

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ECOLOGICALLY SUSTAINABLE FUNCTIONING OF AGROECOSYSTEMS WITH BERRY PLANTS ON THE CUTAWAY PEATLANDS BASED ON EXPANSION BIODIVERSITY

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Belarusian peatlands have received little attention until recently in terms of “sustainable” management. They were, and still are considered by many as unproductive or wasted land. Peatlands, where peat was once extracted, were left to natural recolonization processes for their future evolution. The environmental problems (erosion, subsequent leaching of nutrients, source of atmospheric carbon, etc.) will be accentuated in the near future, since the area of cutaway peatlands abandoned by the peat industry in Belarus is predicted to reach 250 000 ha by the end of the year 2020 (Lishtvan et al., 2002). Practical methods for the rapid restoration and reuse of these disturbed ecosystems are therefore of major importance for both the landscape and the environment.

The success of natural revegetation depends essentially on the composition of seed-producing species growing in the immediate surroundings. Still, the propagation capacity of species does not at all times assure the rapid establishment of vegetation, because a harvested peat surface is a disadvantageous habitat. After ceasing peat production, another option is to use the area for the cultivation of American cranberries (*O. macrocarpon*), half-highbush (*V. corymbosum×V. angustifolium*) and wild (*V. angustifolium*) blueberries. This crop is commercially grown in the USA and Canada for berry production and in Belarus as a form of wetland rehabilitation (Yakovlev, 2009; Rupasova, Yakovlev, 2011).

Berry plantations are especially promising where afforestation or the conversion of peatland into arable land would not be successful owing to the hydrological conditions of the former peat cutting area. Because cranberries and wild blueberry have good colonizing abilities, abandoned peat production areas will quickly be covered. Eventually, other mire vegetation species such as peat moss or cotton grass will re-colonize, which helps to re-establish a full plant cover. The plant cover will further decrease aerial pollution from peat dust and turn ‘wasteland’ into economically useful wetland. Cranberry plantations on cutaway petlands in Belarus established from cuttings produced 3-5 tonnes/ha, blueberries – 1,5-2 tonnes/ha. Floristic and hydrological features indicate that a peat accumulation ecosystem is progressively or partially restored.

Key word: biodiversity, cutaway peatlands, restoration, wetland rehabilitation, berry plants, *Oxycoccus*, *Vaccinium*, yield

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