Evaluation and utilization of vine genetic resources in Czechoslovakia

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S u m m a r y : The organization of research with plant collections in Czechoslovakia, including grapevine, is described. The collection of *Vitis* genotypes maintained at the Research Institute for Viticulture and Enology includes about 1,500 varieties. Research is directed toward collection, preservation, investigation of varietal characters, use for breeding programs and establishment of a computerized information system. The results obtained up to now and new perspectives are discussed.

K e y w o r d s : gene resources, gene bank, collection, varietal evaluation, breeding, information system, Czechoslovakia.

Czechoslovakia has a rich tradition in the collection, storage and utilization of genetic resources of cultural plants. Since the beginning of this century, collections of species and varieties have been established in several research centres and intensive work with them was started in the 1930's. Since 1954, the Research Institute for Plant Production in Praha-Ruzyne has assumed the coordinative activity of this work and at present there are 29 research and breeding institutes involved in this field (BARES 1987). At the Research Institute for Plant Production the Board for Plant Genetic Resources was established, the members of which are researchers responsible for individual crop collections and those others from cooperating organizations. The Board is a consultative authority for all institutions researching and utilizing genetic resources in Czechoslovakia. For each crop the work in collections is methodically controlled by responsible persons. The Research Institute for Plant Production in Praha-Ruzyne secures in a centralized way the introduction of plant genetic resources, the evidence of the information system of plant genetic resources and since 1988 the long-term storage of collections of seed species.

The international solution programme is linked up to the cooperation of COMECON member countries under the coordination of the Research Institute for Plant Production in Leningrad. Further cooperation has been developed particularly in the framework of the International Board for Plant Genetic Resources (IBPGR) and of its European programme ECP-GR (European Cooperative Programme on Conservation and Exchange of Crop Genetic Resources) in which Czechoslovakia has participated since 1983. Cooperation is also developed in the framework of the EUCARPIA (European Association for Research on Plant Breeding) gene bank (DOTLACIL 1987).

The work with the vine collection is included in this framework.

In the past, the vine collections created an inseparable component of the viticultural research, breeding and educational institutions in Czechoslovakia. Until the 1950's, their function was more or less collectional or they served pedagogical purposes. The first larger vine collection of approximately 350 varieties was established at the Viticultural Research Station in Mutenice in the 1930's. Later, this collection was transferred to the Research Institute for Viticulture and Enology in Bratislava where it has become the basis of today's large collection. It is also worth mentioning the smaller collection of the Agricultural University in Lednice na Morave which contains from the total number of 287 cultivars 173 interspecific hybrids.

The work with the vine collection is divided into the following programmes:

- Collection and conservation of varieties *in situ*
- Study of collection varieties

- Utilization of collection varieties
- Information system creation.

1. Collection and conservation of varieties *in situ*

Since 1962, we have collected about 1,300 cultivars from many countries of Europe, Asia and America in our central collection, the majority of which are *Vitis vinifera* L. varieties.

For today as well for future, we have directed the introduction of varieties towards the extension of the basis of species of the *Vitis* genus. We also try to obtain new hybrid materials from the interspecific resistant breeding. We consider the registration of our own materials from hybridization programmes as inevitable. The conservation of clones of currently grown varieties as well as those of less economic importance in the collection is also one of our tasks. Systematic clonal selection narrows varietal populations genetically. Therefore, genetic variability of these populations can only be conserved in collections.

Intensification tendencies in viticulture have substantially reduced the varietal composition of our producing vineyards which was found in old private vineyards until 1945. One of our tasks is to conserve these autochthonous or acclimatized varieties in the collection for the needs of the future.

During the last few years, even the supply of foreign varieties in the collection seems to be problematic. Increasingly strict phytoquarantine precautions often hinder the release of labouriously obtained material in the collection. We also struggle with practical aspects of the production unrentability of the collection stands.

The situation of decreasing genetic resources in Czechoslovakia is also being managed from the ecological point of view. At the National Academies of Sciences commissions for protection, conservation and rational utilization of gene pools including also vine were established with the goal of maintaining a diversified ecosystem of plants and animals. The situation is urgent and it is the subject of discussions of the highest managing authorities. Production intensification not only reduces the genetic variability of species but it also threatens the weed flora and the fauna.

2. Study of collection varieties

One of the main tasks in the work with the collection was the study of foreign varieties under the ecological conditions of our country. The entire work was aimed at the following two directions:

a) The collection of 60-70 varieties was studied in approximately 80 ampelographic, biological and agrotechnical characters over 3-year periods. The hitherto obtained results of the study of about 500 foreign varieties and 200 selections from our own crossings were concentrated in 8 final reports with detailed results, ampelographic descriptions of varieties and recommendations to their utilization for growing and breeding purposes as well as for their collection value.

b) In Czechoslovakia we have established and evaluated an ecological experiment with four different geographic and ecological groups of varieties in three significantly different localities. We have attained the following generalized conclusions (Pospisilova 1978, 1979):

- The division of varieties in accordance with the territory of their origin into geographic groups (Negrul) appeared to be correct.
- Regional differences influence the varieties of the *occidentalis* group inexpressively but those of the groups *orientalis antasiatica* significantly. The groups *proles pontica* are intermediate.
- Regional conditions do not influence only the physiological characters (fertility, sugar content, acid content etc.) but they also cause morphological convertibility (leaf size and shape; cluster, berry and grapeseed size). The most significant differences are to be found again in the group of *orientalis* varieties and the least ones in the *occidentalis* group.
- Similarly, the individual varietal groups are also influenced in their growth intensity, lignification and other physiological characters.

These results have practical utilization in the introduction and acclimatization of foreign varieties as well as in the application of their genome in breeding.

3. Utilization of collection varieties

The vine collection is also utilized for practical purposes.

a) It serves for the establishment of breeding collections at viticultural breeding and educational institutions in Czechoslovakia.

b) It is the source for varietal exchange at international level.

c) Some of the collection varieties have practical utilization (Pannónia kincse, Guzal kara, Feteasca regala, Alibernet, Zweigeltrebe etc.). However, the collection consists of only a small quantity of such varieties especially in consideration of the geographical conditions in Czechoslovakia.

d) It is one of the sources for breeding of new vine varieties.

During the last 30 years, considerable work has been done on the breeding of new varieties in Czechoslovakia and particularly this collection of varieties has contributed to their creation.

In spite of a considerably strong representation of traditional white wine varieties, new crossings (of traditional varieties with those from the collection) e. g. Devin, Breslava, Mopr etc. have found their place in practice. Also, the limited number of traditional red wine varieties has been enriched with our new breedings. With the use of French, Italian and Soviet varieties (Castets, Abouriou noir, Teinturier, Aleatico nero and Puchljakovski) we have bred a whole range of new types from among which especially the varieties Dunaj, Váh and Hron have come in practice.

The consumption of table grape varieties in Czechoslovakia is relatively low and this fact induced us to breed table grape varieties suitable for our ecological conditions. With the use of Pannónia kincse, Julski biser, Cardinal, Aptish aba, Dunavski misket and many others we have created a whole range of table grape varieties of significant production importance which are grown in our warmest viticultural regions. These are for example Dóra, Diamant, Opál, Topas etc.

Seedless grape types have their specific place. They were created with the help of collection varieties Katta kurgan, Perletta, Delight, Ceaus roz, Chibrid bessemen V-6 and others. We have bred seedless grape varieties, small-fruited as well as large-fruited, which doubtless have their importance at least for amateur gardeners (Muscat Susanna x Delight 11/8, 12/17; Ceaus roz x Delight 5/1, 6/6, 5/9; Ceaus roz x Perletta 17/40; Ceaus roz x Carica na lozjata x Bolgar 5/11; Ceaus roz x Chibrid bessemen V-6 21/8; Katta kurgan x Perletta 14/44, 15/42; Katta kurgan x Chibrid bessemen 25/34).

The latest trend in plant breeding in Czechoslovakia is the breeding of resistant varieties, especially of table grape cultivars which practically cannot be bred without pertinent genetical resources from our own as well as foreign collections.

4. Information system creation

The effective work with genetic resources is dependent on a functional information system. Such a system was founded in Czechoslovakia at the Research Institute for Plant Production in Praha-Ruzyne under the designation EVIGEZ (Rogalevicz *et al.* 1986). It secures information for all institutions in Czechoslovakia on the following issues:

- Import, distribution and export of genetic resources
- Passport data of genetic resources
- Descriptive data of genetic resources
- Other information

The vine collection is included in this system and at present the passport data of each variety have been entered into the computer. For the descriptive data we have developed the Classifier of the *Vitis* Genus (Pospisilova *et al.* 1988) which allows the coding of 110 descriptors and also contains the codes of botanical taxons. This Czechoslovak vine classifier has become the basis for the elaboration of the International Classifier in the framework of the COMECON member states.

After the passport introduction of varieties into the computer system, it will be continued with data processing through coding of individual descriptors in case of about 700 evaluated varieties for the creation of the database and its universal utilization.

In the sense of the international information activity on the state of the vine genetic resources, Czechoslovakia has become involved in the working programme of the O.I.V. (Groupe d'Experts 'Sélection de la Vigne') with providing of foundations from about 1,000 varieties for the elaboration of the world survey of sorts and varieties of the *Vitis* genus (ALLEWELDT 1987).

Perspectives of the work with vine genetic resources

All activities connected with vine genetic resources in the future will be concentrated on the completion of the collection especially with species and varieties relevant to plant breeding, on the study of the main characters of those varieties of the collection which have not yet been evaluated, and on the completion of the database.

Also important is the collection of *Vitis silvestris* GM. resources from meadow soil forests of the Danubian Lowland, of old regional varieties and participation in international expeditions especially in the Caucasian centre of origin of vine varieties.

At present we are founding a biotechnological laboratory at our institute. One of its activities will be the screening of varieties on stress and pathological factors as a portion of our resistant vine breeding programme. The detection and evidence of genes of major effect (major genes) and their alleles play an important role in genetic resources. It is a very complicated task by the use of classical methods in persistent cultures.

Another possibility for the future is the conservation of the collection *in vitro*. These cultures are useful for genetic studies and manipulation. But up to now, *in vitro* culture does not enable the conservation of germplasm in its original condition for unlimited periods. Therefore, it seems that the *in vitro* collections will only complement the contemporary collections in vine plantations. Concerning the clones, especially the virusfree ones, the collections *in vitro* will play their important role.

Even though much work has been done for the conservation and utilization of vine genetic resources, new plant breeding and cultivation methods will require further work with genetic resources. The most important demand of the present time is the conservation of the genetic variation of cultural plants and its utilization for the benefit of mankind in the future.

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