Activities concerning conservation of *Vitis* germplasm

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Summary: Activities in the field of *Vitis* germplasm conservation in the Federal Republic of Germany are reported. The results of the worldwide inventory of *Vitis* species, cultivars and genotypes are given.

The questionable identity of grapevine cultivars requires appropriate identification tools. Efforts to improve the currently performed methods in this field are described.

The necessity of national and international collaboration is stressed.

Key words: Vitis, germplasm, gene resources, gene bank, ampelography, ampelometry.

Introduction

The loss of plant species is a worldwide stateable phenomenon. Likewise all the grape growing nations are concerned by the loss of genetic resources of *Vitis* species and cultivars, due to expanding cultivation causing the loss of land races and due to progressing civilization and natural disasters.

For example the population of *V. silvestris* was decimated from some 1,000 plants recorded in the last century by BRONNER (1857) (quoted at SCHUMANN 1974) to about 100 specimens recorded by SCHUMANN (1976) today. In the USA similar phenomenons have been observed. For excample, COMEAUX (1984) did not find *V. rupestris* at those sites in Texas described by MUNSON (1909) (quoted at COMEAUX 1984) at the beginning of this century. With the invasion of phylloxera the decline of land races started and nowadays through restrictive legislation old cultivars are omitted anyhow.

Breeding makes use of genetic resources to provide viticulture with cultivars which are adapted to cultivation requirements and more disease resistant. In addition to the search for resistance genes, genetic resources will always be needed as a reservoir for future, still unknown requirements. That is why a maximum of genetic diversity is indispensable.

This attempt is supported by the OIV and the IBPGR. At the beginning in 1984 in close collaboration with both organizations, the Federal Centre of Grapevine Breeding (BFAR) started an inventory of the worldwide existing *Vitis* species, cultivars and genotypes.

Results and discussion

Some of the results are shown on the following tables.

Table 1 gives a general view of the results:

Information was received from 34 countries, 106 lists of grapevine collections were analysed, further information was obtained through 300 ampelographies and varietal descriptions.

The number of recorded prime names is 15,382. The number of recorded synonyms is 11,430 and the number of standing places for all genotypes is 25,742.

Table 2 shows the number of genotypes from collection lists and/or from literature:

The total number of accessions - 15,382 - is divided in genotypes we know from collections and from literature, which are 10,511 and 9,822 respectively.

Table 1: Information obtained from

Countries	34
Grapevine collections	106
Ampelographic publications	300

Results

n° prime names	15 382
n° synonyms	11 430
n° standing places in collections	25 742

Table 2: Number of cultivars known from collection lists and/or from literature

n° prime names	15 382
– in collections	10 511
– in literature	9 822
n° prime names	
– in collections and literature	5 276
– in collections only	5 235
– in literature only*	4 546
– without indications	325

* there seem to be no living examples any more

Table 3: Repartition of prime names on *Vitis* species

	Total	in collections pure	in collections hybrid	in literature only* pure	in literature only* hybrid	no coll.* no lit.
V. vinifera	9345	4627	1722	2320	475	201
I.C.	4225	2909		1189		127
V. species	677	203	83	272	110	9
without specification	1155	950	10	150	17	28

* the loss of these genotypes is probable

Genotypes found in collections and also described in literature are 5,276, found in collections only are 5,235 and described in literature only are 4546 genotypes; without any specifications are 325 individuals.

Most of the genotypes mentioned only in literature have probably been lost.

Table 3 shows the number of the recorded prime names alotted to *V.* spp.:

9,345 recorded prime names belong to *V. vinifera*, 4,225 are interspecific hybrids, 677 belong to *V.* spp. and 1,155 are of unknown membership. The most important column is where genotypes mentioned only in literature are listed. They may no longer exist.

About 2,320 pure *V. vinifera*, probably old land races, have disappeared as have 475 *V. vinifera* crossings, 1,189 interspecific hybrids, 382 *V.* spp. and descendants and 167 of unknown *V.* spp. membership.

The questionable identity of many grapevines complicates the conservation of the grapevine genetic resources. If a cultivar is held under different names, it may be conserved twice or more. On the other hand, if one name is utilized for several different genotypes, some genotypes may be unintentionally lost.

Therefore, identification of grapevines is urgent. Considering the large number of different grapevines in the world (12-15,000), it is important that identification can be accomplished with a minimum number of descriptors. The descriptors should ensure an objective evaluation. Measurable characteristics are prefered because they are reproducible. Furthermore, descriptors should be little influenced by environmental conditions and they should be quick and easy to record and should not depend on a high technical equipment.

My doctoral thesis (Dettweiler 1987) was carried out with these requirements in mind. 39 grapevines were described through measured leaf characters. Recording of data was made from leaves of three different climatic areas: arid – Jerez de la Frontera/Spain, humid – Lausanne/Switzerland, and an intermediate climate – Montpellier/France. Data processing was performed using discriminant analysis. A mathematically reduced number of 21 descriptors and the berry color were sufficient to obtain a 90 % identification accuracy. An identification analysis

was calculated with data obtained from leaves of 12 cultivars collected at sites other than those mentioned above. The average recognition accuracy was 87 %.

Based upon these results, the following research is currently being performed:

(1) The number of grapevine cultivars treated by discriminant analysis will be increased to test the performance of this identification tool

From more than 500 genotypes leaves have been collected and will be added to the system. But indispensable for varietal recognition is the establishment of the basic model with specimens coming from different climatic areas. Therefore, the collaboration of collection holders from arid regions would be very much appreciated. Interesting collections would be for example:

Greece: Thessaloniki
Italy: Palermo, Bari, Tormancina, Rome
Portugal: Regua, Oeiras
Soviet Union: Tibilissi
Tunesia: Ariana
Turkey: Izmir
Yugoslavia: Novi Sad, Split

(2) The usage of additional berry and seed characteristics

Initial results suggest that measured berry and seed characters are suitable for varietal description and could increase the identification accuracy.

(3) The computerized evaluation of leaf, berry and seed descriptors

Leaf characters will be recorded by means of a digitizer tablet. A computer program has been developed for this purpose. Likewise recording of berry and seed characters will be done with the computerized evaluation of their pictures.

(4) The quest for the application of a minimal descriptor list composed of measurable and notable leaf, berry and seed descriptors

This evening in the workshop 'Ampelographic Methods', we will discuss the principal descriptors for identification and we intend a resolution recommending a preliminary minimal descriptor list and its comprehensive application.

(5) The additional application of isoenzyme analysis and RFLP

At BFAR, Prof. BLAICH and Dr. BACHMANN are currently investigating RFLP and isoenzyme analysis respectively as tools for varietal description. These methods are to be applied if the identification by morphological features is not possible.

Documentation data obtained from the inventory of the worldwide existing grapevines, including their descriptions will be transferred to a national data base if it is established. Information on grapevine species and cultivars would be available from there.

In Germany the establishment of a national germplasm repository is planned. In 1987 the project group 'Plant Genetic Resources in the Federal Republic of Germany' foresaw the installation of specific 'Advisory Committees' for different plant species. Anticipating the implementation of such an 'Advisory Committee for Grapevines', a working group for 'Grapevine Genetic Resources' was initiated. Members are the collection holders from 8 viticulture institutions in Germany. Future goals are the double conservation of genotypes at two different sites, their description and evaluation, the control of virus-free status, the exchange of genetic material and the announcement of any intended changes.

Table 4 is listing the actual number of *V. vinifera*, interspecific hybrids and *V.* spp. existing in German collections:

Table 4: Distribution of grapevine genotypes in the German collections

	occurrence in collections 1 x	2 x	3 x	total number of genotypes	
Total number of genotypes	1272	294	294	1860	
V. vinifera	479	164	211	844	
pure genotypes (- old cultivars)	286	103	110	490	land races
hybrids	193	61	101	355	
I.C.	686	101	60	847	interest in disease resistant genotypes
V. species cultivars	23	8	6	37	
V. species	62	19	17	98	V. species and clones (V. silvestris)
V. species membership unknown	32	2		34	

The total number of distinct genotypes in German collections is 1,861. 1,272 occur in only 1 collection, 294 exist in 2 collections and the same number can be found in at least 3 collections. 844 are *V. vinifera* cultivars, of those no parentage is indicated for 479, so they could be considered as land races. 847 I.C. are maintained in German collections, which reveal the great interest in Germany for genetic resources providing disease resistant genes. 98 *V.* spp. and clones are registered, of that 48 are *V. silvestris* clones.

As I mentioned before, the aim of the German germplasm repositories is the maintenance of genotypes at two different sites to avoid their loss. This means for the more than 1,277 genotypes, currently found in only 1 collection, a 2nd location must be found.

But, at the moment, no adequate evaluation systems for screening the genetic material exist. Therefore, all of them should be retained.

It should be discussed soon how many genotypes should be kept for specific biotic and abiotic stresses. Is it sufficient to keep for example about 50 genotypes resistant to plasmopara or phylloxera or about 20 genotypes for seedlessness if the material assembled comes from the different centers of diversity, America, Eastern Asia and 'Eurasia'?

On an international level since 1984 a bilateral cooperation exists between the Research Institute of Jerez de la Frontera/Spain and the BFAR. The complementary conservation of grapevines is planned. Frost resistant and disease resistant cultivars could be maintained at the Geilweilerhof station, whereas frost susceptible or mediterrean cultivars could be maintained in the Jerez collection.

Besides the conservation *in vivo* at the BFAR, the long-term storage of 675 genotypes *in vitro* and seeds of *V.* spp. is intended to maintain their genetic diversity.

As I mentioned before, varietal identification is dependent on the description of individual cultivars in at least two different climatic areas. Therefore, the Jerez grapevine collection, consisting of about 1,400 genotypes, will also be described.

It would be very desirable if collection holders could contribute and assist in the efforts to identify and to maintain the grapevine genetic resources.

References

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