Accademia Italiana della Vite e del Vino

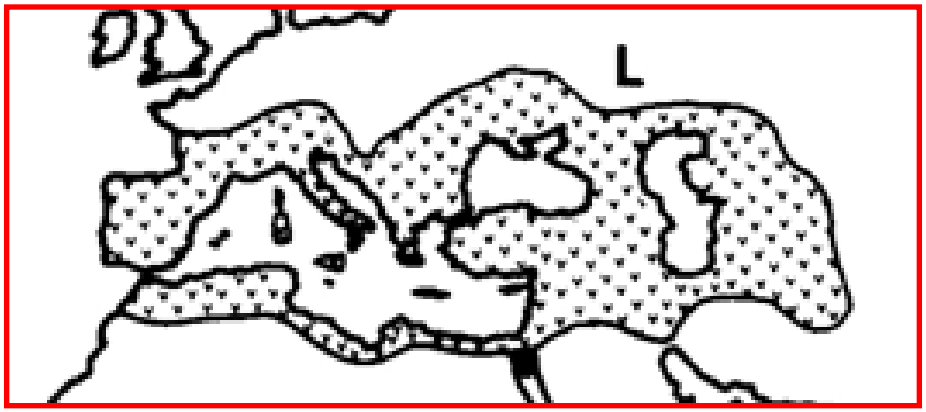
La Vigna
BIBLIOTECA INTERNAZIONALE CENTRO DI CULTURA E CIVILTÀ CONTADINA

Vicenza, 1 dicembre 2012

Le potenzialità genetiche della *Vitis vinifera*

Il valore del germoplasma orientale: verso la riscoperta del mito rimosso

A. Scienza e O. Failla (Università di Milano)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L. LEVADOUX
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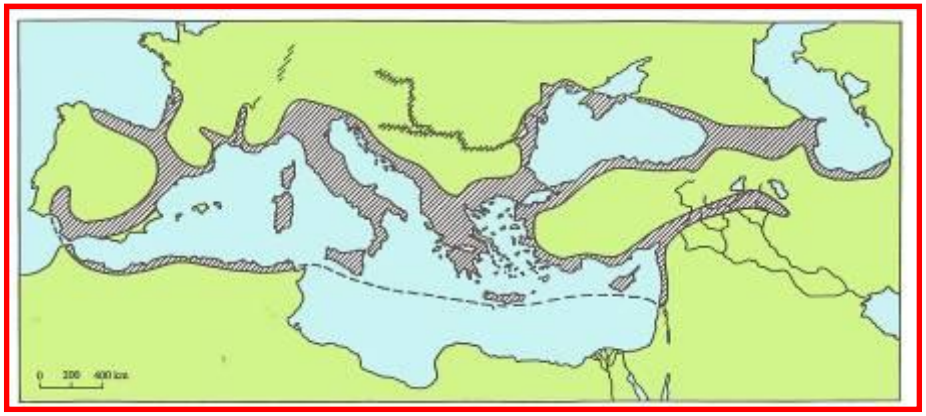
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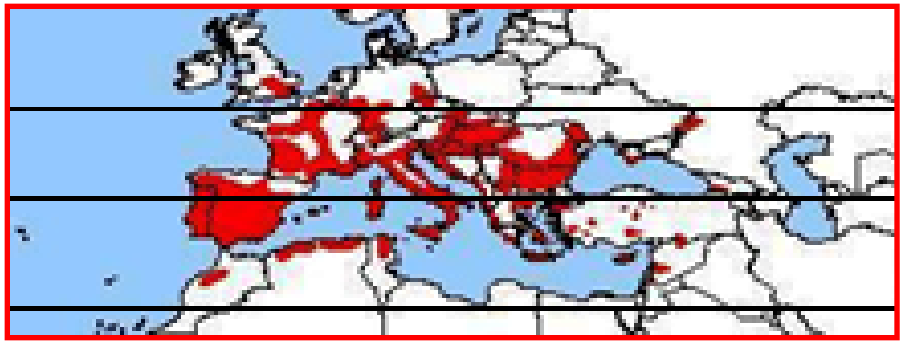
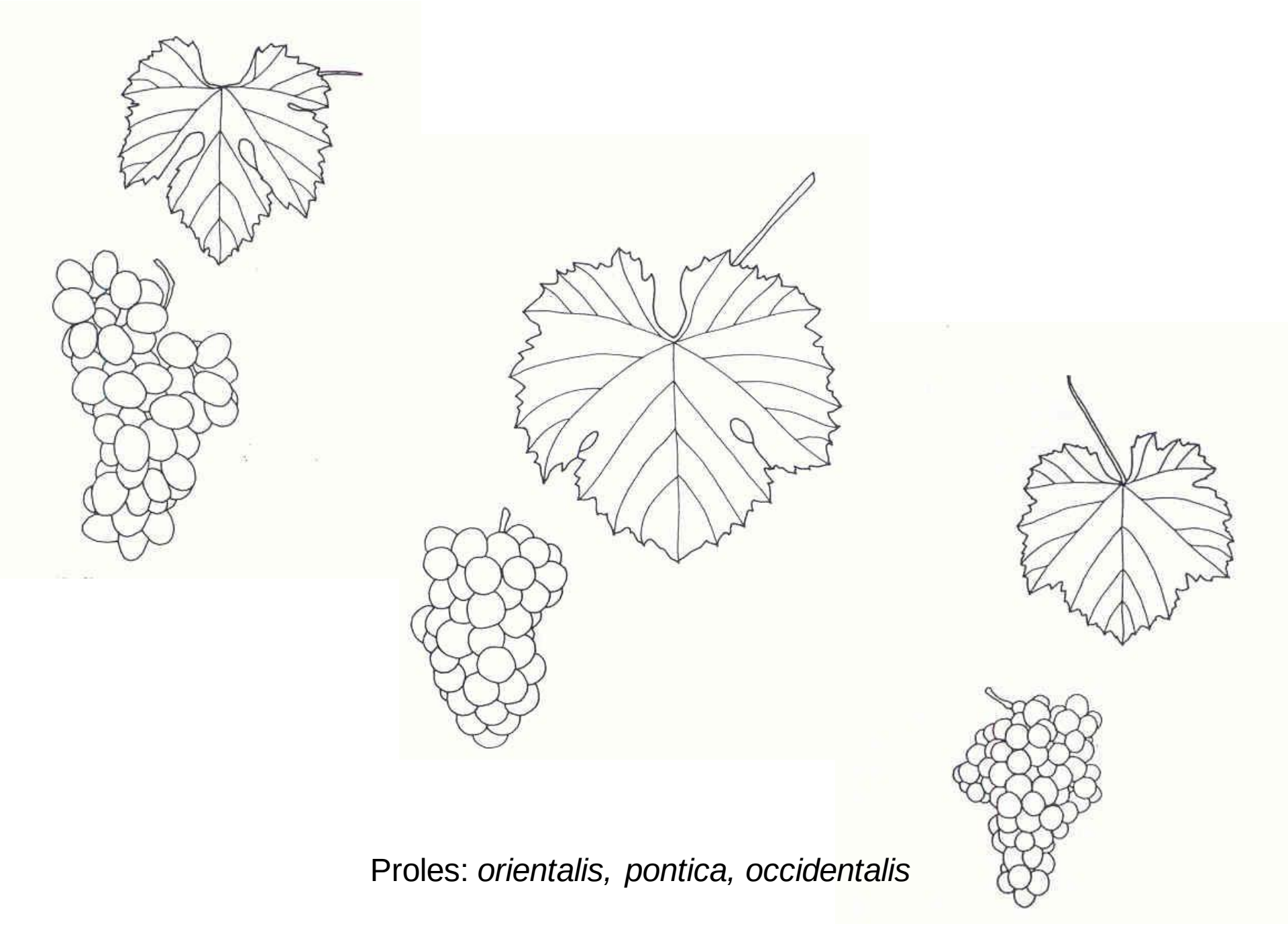


A. M. Negrul



Proles: *orientalis, pontica, occidentalis*

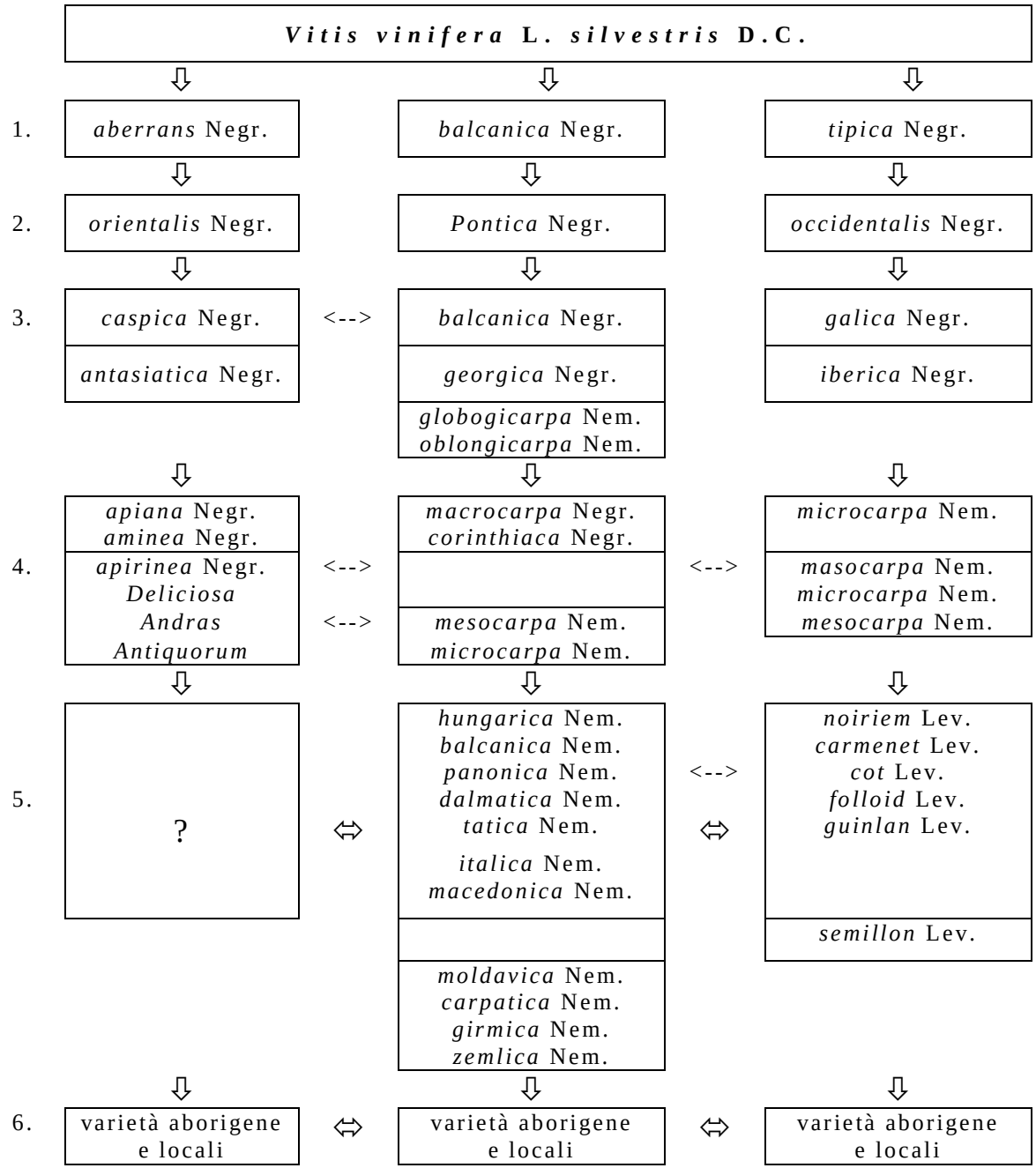
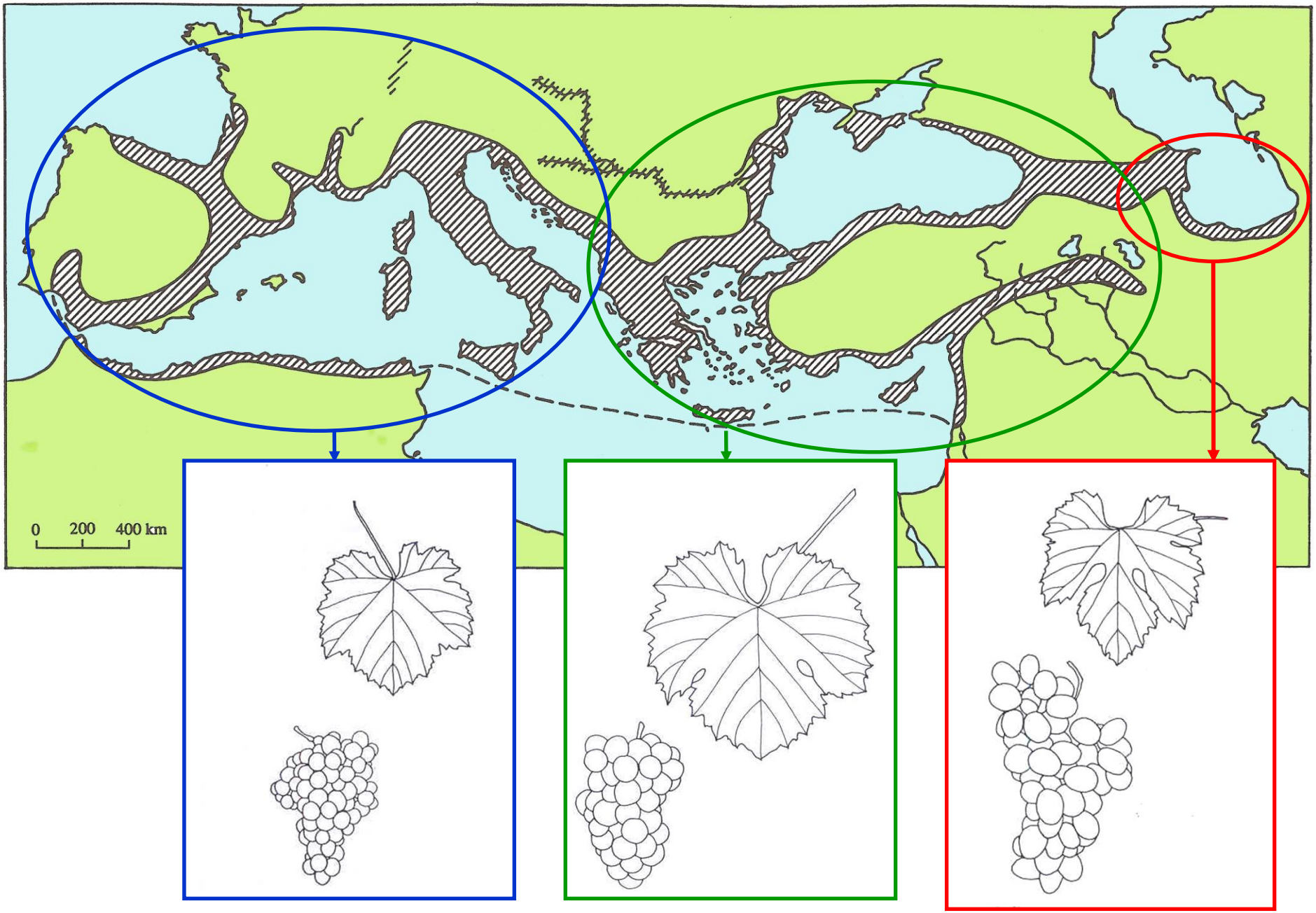
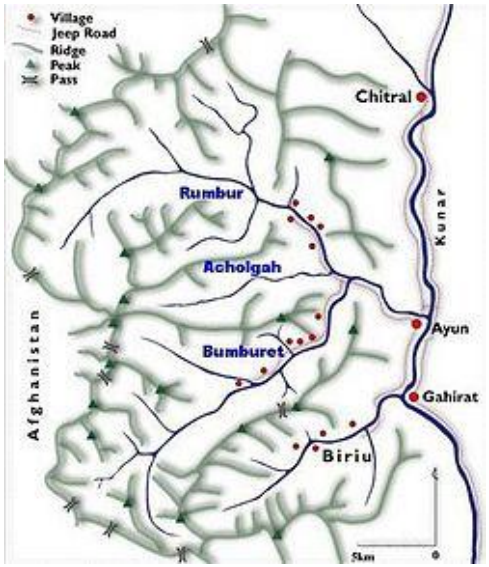

Vitis vinifera L. *silvestris* D.C.
1.
aberrans Negr.
balcanica Negr.
tipica Negr.
2.
orientalis Negr.
Pontica Negr.
occidentalis Negr.
3.
caspica Negr.
antasiatica Negr.
<-->
balcanica Negr.
georgica Negr.
globogicarpa Nem.
oblongicarpa Nem.
galica Negr.
iberica Negr.
4.
apiana Negr.
aminea Negr.
apirinea Negr.
Deliciosa
Andras
Antiquorum
<-->
<-->
macrocarpa Negr.
corinthiaca Negr.
mesocarpa Nem.
microcarpa Nem.
<-->
microcarpa Nem.
masocarpa Nem.
microcarpa Nem.
mesocarpa Nem.
5.
?
⇔
hungarica Nem.
balcanica Nem.
panonica Nem.
dalmatica Nem.
tatica Nem.
italica Nem.
macedonica Nem.
moldavica Nem.
carpatica Nem.
girmica Nem.
zemlica Nem.
<-->
⇔
noiriem Lev.
carmenet Lev.
cot Lev.
folloid Lev.
guinlan Lev.
semillon Lev.
6.
varietà aborigene e locali
⇔
varietà aborigene e locali
⇔
varietà aborigene e locali
1. Varietà di vite selvatica (*Varietas*)
2. Gruppi ecogeografici (*Proles*)
3. Sottogruppi ecogeografici (*Subproles*)
4. Tipi varietali (*Provarietas*)
5. Gruppi varietali (*Subprovarietas*)
6. Varietà aborigene e locali (*Convars*)
⇔ o ⇩ - parentela (rapporti) sicura;
<--> - parentela ipotetica e probabile

Tabella 1 – Principali caratteristiche distintive dei tre gruppi eco-geografici di *Vitis vinifera* domestica secondo Negrul.

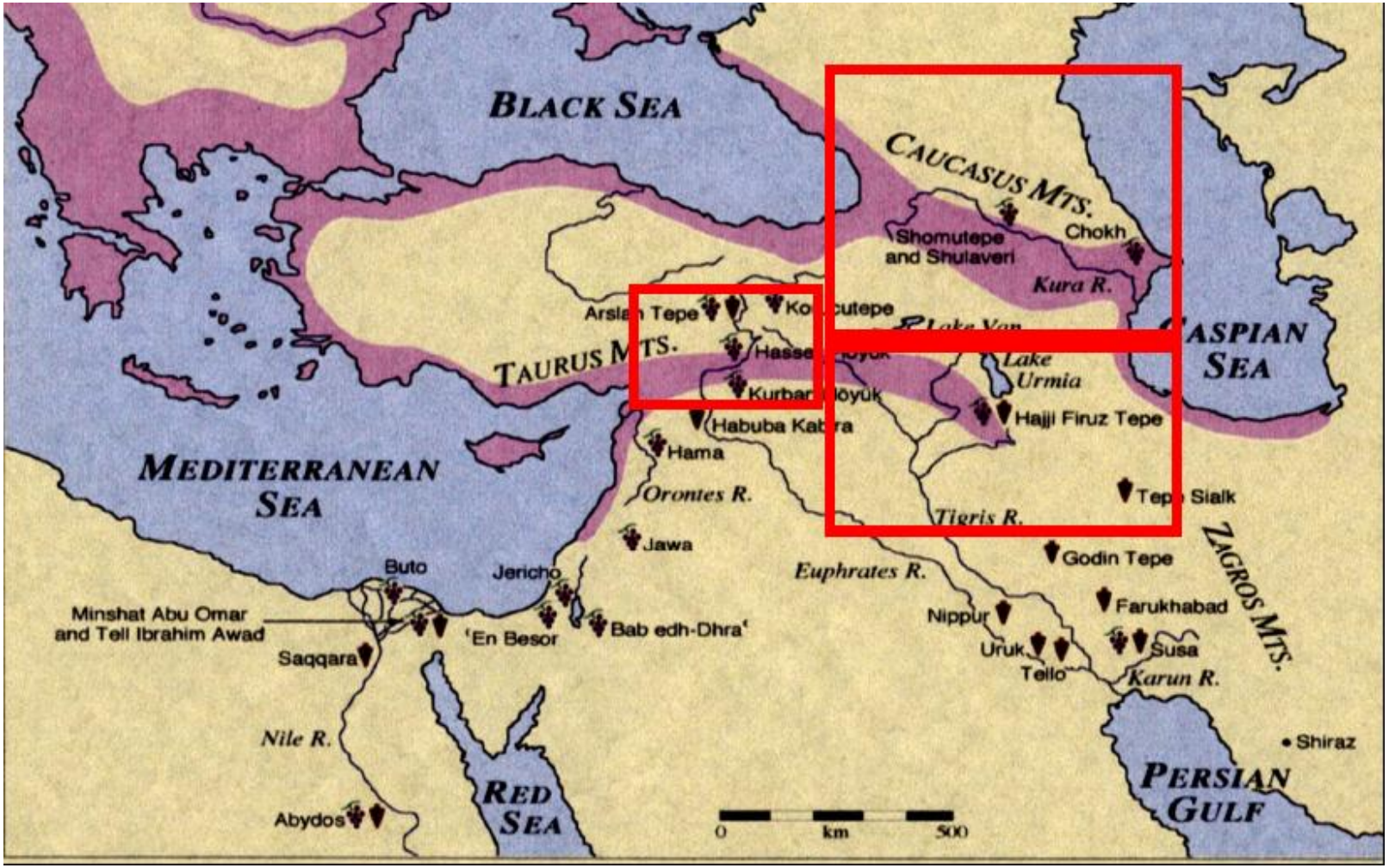
CARATTERISTICHE MORFOLOGICHE ED ECOLOGICHE	**PROLES**		
	OCCIDENTALE	**PONTICA**	**ORIENTALE**
Areali di origine	Dalla penisola italiana a quella iberica.	Dalla Georgia, attraverso l'Anatolia fino ai Balcani.	Afghanistan, Iran, Armenia, Azerbaigian
Apice del germoglio e foglioline apicali	Poco tomentosi	Tormentosi di colore grigio o bianco	Glabri e lucenti.
Foglia adulta	Pagina inferiore rivestita di peli aracnoidei, lembo ripiegato in basso	Pagina inferiore villoso aracnoidea e setolosa, lembo ripiegato irregolarmente	pagina inferiore rivestita di peli setolosi lembo ripiegato verso l'alto
Grappolo	Non grandi, compatti.	Medi, compatti, raramente spargoli.	Grossi, spargoli spesso ramosi.
Acino	Normalmente rotondo, raramente ovale, di grandezza media -piccola, polpa succosa: bianchi o neri.	Normalmente rotondi, raramente ovali, di media-piccola grandezza, polpa succosa: bianchi, neri, rosa in eguale proporzione.	Normalmente ovali o allungati, medi o grossi, polpa compatta e croccante: prevalentemente bianchi.
Vinaccioli	Piccoli con breve becco.	Piccoli, medi o grandi	Medi o grandi con lungo becco
Apirenia	Molto limitata, assenti vitigni completamente apireni.	Numerosi vitigni con parziale apirenia, o anche vitigni totalmente apirene.	Numerosi vitigni con parziale apirenia ed alcuni con totale apirenia.
Fertilità dei germogli	Elevata percentuale di fertilità, con due-tre grappoli di germoglio.	Elevata percentuale di germogli fertili.	Discreto numero di germogli fertili con basso numero di grappoli per germoglio.
Resistenza al freddo	Elevata.	Elevata.	Ridotta.

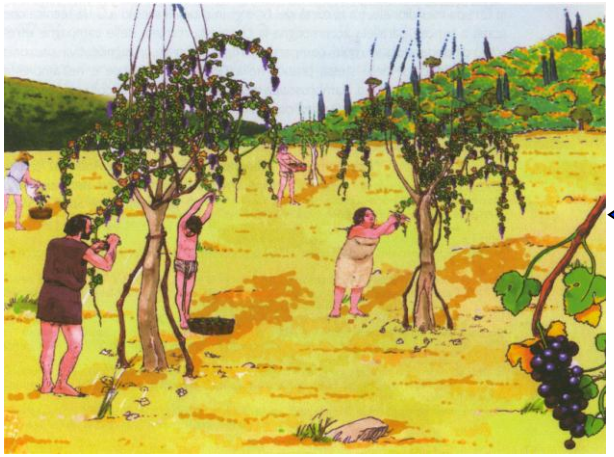

0 200 400 km
Proles occidentalis
Proles pontica
Proles orientalis

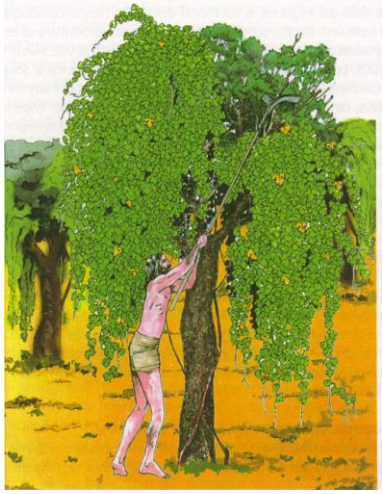
Etnia Kalash



Valle del Birir (Pakistan)


BLACK SEA
CAUCASUS MTS.
Shomutepe and Shulaveri
Chokh
Kura R.
Lake Van
CASPIAN SEA
Lake Urmia
Hajji Firuz Tepe
TAURUS MTS.
Arslan Tepe
Hassek Höyük
Kurban Höyük
Habuba Kabira
Hama
Orontes R.
MEDITERRANEAN SEA
Jawa
Tepe Sialk
Tigris R.
Godin Tepe
Euphrates R.
ZAGROS MTS.
Buto
Jericho
Minshat Abu Omar and Tell Ibrahim Awad
'En Besor
Bab edh-Dhra'
Saqqara
Nippur
Farukhabad
Uruk
Susa
Tello
Karun R.
Nile R.
Shiraz
PERSIAN GULF
RED SEA
Abydos
0
km
500





Domestic grapevines
Vitis vinifera sativa

Wild grapevines
Vitis vinifera silvestris

Biodiversity of Georgian Grapevine Germplasm

Total number of Georgian local varieties, listed in the ampelography of Georgia (1960), are 525.

414 varieties are described in the "Ampelography of the Soviet Union".

To this germplasm in the XX century was added breeding varieties and clones – so total number of local germplasm are more than 600 genotypes.

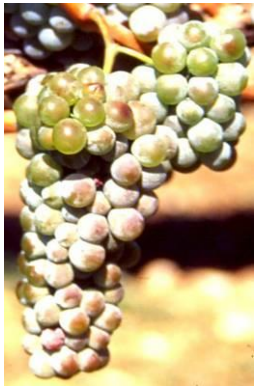


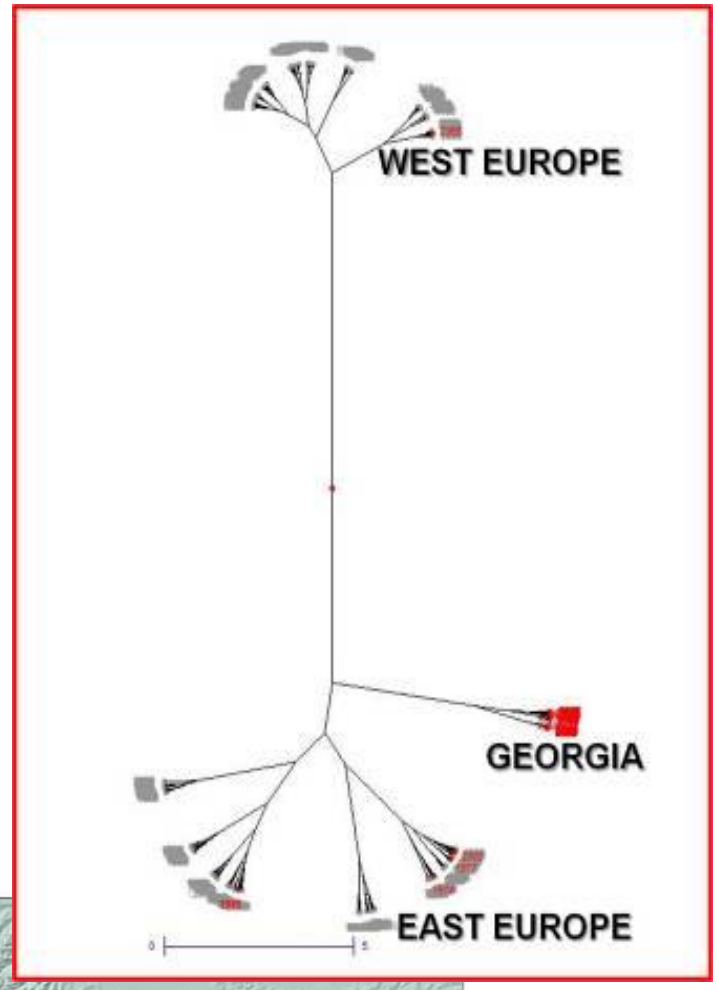


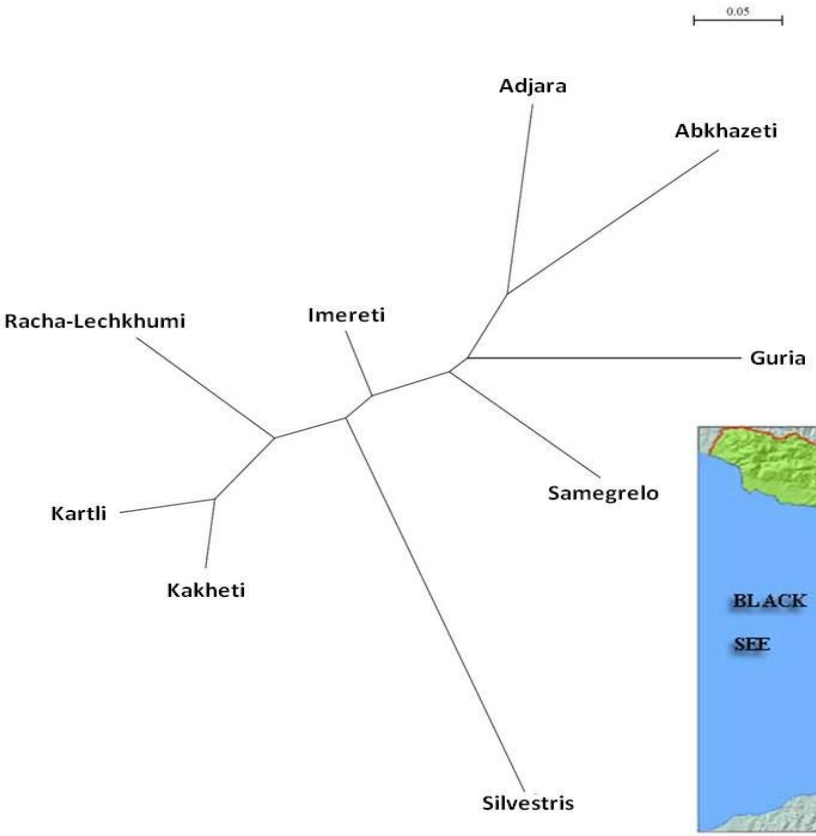







WEST EUROPE
GEORGIA
EAST EUROPE


0.05
Adjara
Abkhazeti
Racha-Lechkhumi
Imereti
Guria
Samegrelo
Kartli
Kakheti
Silvestris


Abkhazia
Svaneti
Racha-Lechkhumi
Miskheta-
Tianeti
BLACK
SEE
Samegrelo
Imereti
Shida
Kartli
Guria
Tbilisi
Kakheti
Adjara
Samtskhe-
Javakheti
Kvemo Kartli
TURKEY
ARMENIA
AZERBAIJAN

Wild samples from Georgia are closer to European grapevine cv than local wild grapes

Citando una recente rassegna bibliografica di Bouquet (2008):

Y a t'il eu on ou plusiers centres de domestication des la vigne?

La question n'est pas tranchée.

A short chronology

1988: Attilio Scienza and collaborators visit Georgia

1999: Attilio Scienza and Lucio Brancadoro are in Georgia again. They realize the serious state of abandoning of the germplasm collection and refer the situation to Bioversity Int. (former IPGRI).

2003: Thanks to the three years organizing efforts of Jozef Turok (past Director of Bioversity Int. - Regional Office for Europe) and the financial support of the government of Luxemburg, the project "*Conservation and sustainable use of grapevine genetic resources in the Caucasus and Northern Black sea region*" was launched.

2003: David Maghradze internship at UNIMI

2004-2009: The project involved Armenia, Azerbaijan, Georgia, Moldova, Russia, and Ukraine. The aims were: to ensure the long-term maintenance of *Vitis* genetic resources, including the cultivated traditional varieties and the wild resources. The activities consisted of identifying, collecting, characterizing, and conserving the diversity of grapevine genetic resources.

Was it a successfully story?

a) A wide number of local varieties of Azerbaijan, Armenia, Georgia, Moldova, Russia and Ukraine were effectively preserved in the collections thanks to constant financial support;

b) A successful collaborative network among institutions was organized, by this way the researchers from Eastern Europe could enlarge their scientific knowledge in the research centers of Western Europe;

c) Local varieties of grapevine and wild vines from the regions were involved in the joint investigation;

d) Information about the project, presented to a wide auditory, increased interest in the biodiversity of the local grapevine germplasm.

1283 autochthonous varieties (2600 accessions) have been registered in ten east European grapevine collections located in Armenia, Azerbaijan, Georgia, Moldova, Russian Federation and Ukraine.

It is estimated that 75% of them (= 952 varieties) were found solely in these ten collections¸ the remaining 25% are mainly distributed in grapevine collections of other east European countries. Out of the total number of the autochthonous varieties, about 740 varieties exist in one place only and are therefore considered to be threatened.

Objectives of the Cost action

To improve knowledge of the grapevine genetic diversity, which is essential for its long-term conservation and sustainable use.

To reduce the actual gap existing between the west and east European scientific communities working on grapevine genetics.

To analyze and share available information on grapevine genetic resources research (identification, characterization, evaluation).

To establish core collections and conduct association genetics studies for correlations between genetic diversity and important traits such as stress resistance and berry quality.

To develop a strategy with defined priorities for action for the long-term conservation and sustainable use of grapevine genetic resources.

Working groups

1: Identification and characterization of genetic resources (R. Töfler and E. Maul)

2: Development of phenotyping and genotyping methodologies (R. Bacilieri and P. This).

3: Phenotyping of core collections and association genetics research (S. Grando)

4: Strategy for conservation and sustainable use (M. Faltus and R. Ocete).

Results vs. Objectives

- Networks of institutions have been established.
- They are actively sharing plant material and analytical methods for genotyping germplasm accessions.
- Phenotyping trials to develop and test proper high-throughput methodologies are in progress.
- Concrete proposals to define proper strategies for sanitary quarantine for grapevine plant propagation material, for sustainable germplasm conservation, have been set.
- The networks involve a very wide range of countries including eastern European countries, both Cost and non Cost. For the first time a collaborative effort involve almost all the range of viticulture.

Significant Highlights in Science or Networking (1/2)

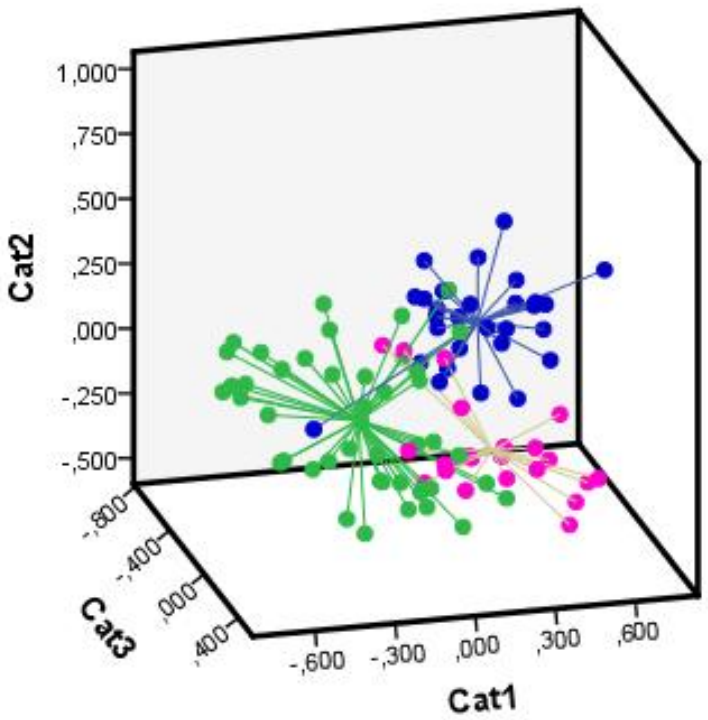
WG1: Identification and characterization of genetic resources

In the framework of the WG1 activity a network among members participating to the action has been organized.
The network involves 25 institutions from 20 countries (Armenia, Austria, Azerbaijan, Bosnia-Herzegovina, Bulgaria, Croatia, Cyprus, France, Georgia, Germany, Greece, Italy, Latvia, Moldova, Romania, Russia, Slovakia, Slovenia, Spain, Ukraine) involved in accession identification and characterization.

The summarized results are like follows.
Characterization will be carried out on 595 cultivars in 2012.
Leaves or cuttings of around 350 cultivars will be shipped to laboratories carrying out SSR-marker analysis.
19 laboratories will carry out SSR-marker analysis. Within the runtime of the project about 2700 genotypes could be fingerprinted.

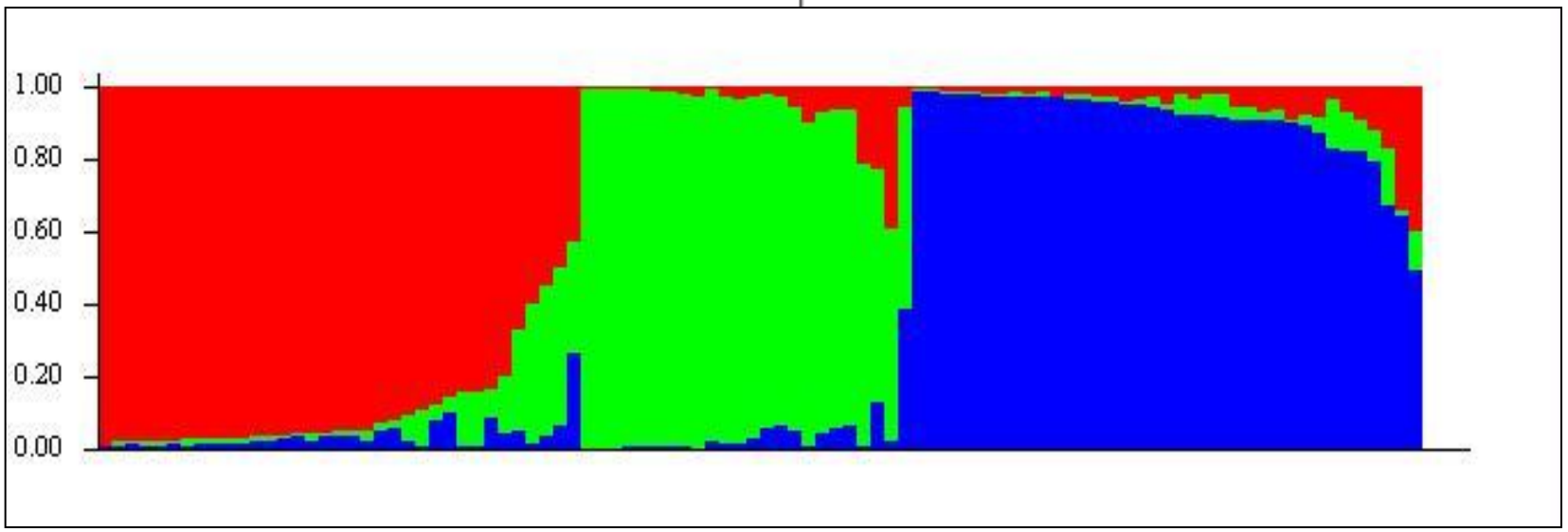
All the data are in progress to be uploaded in the European Vitis Data Base.

A neighboring example: Armenia



N. of accessions

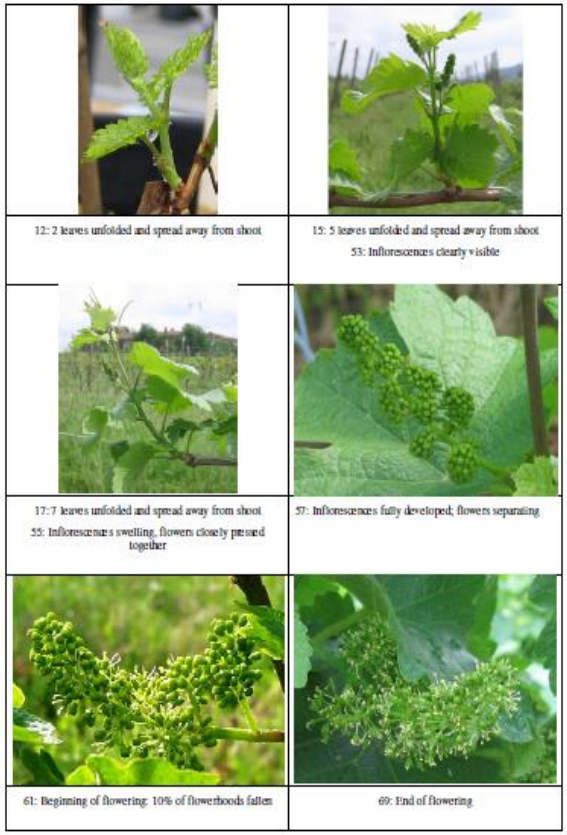
Armenia	**29**
Georgia	**44**
Moldova	**23**




http://www.eu-vitis.de/index.php
The European Vitis Database
ECP/GR
Users handbook
SQL table scheme
Public access
Descriptors/file formats
Institute codes
Important links
Contact
Disclaimer
Varieties registered in Europe
Home page
Login [Case sensitive!]
User name:
Password:
Login
The European Vitis Database
Genetic resources of grapes
Register for SSR-marker data admission via public access
The European Vitis Database is being maintained since 2007 by the
©Julius Kühn-Institut - Federal Research Centre for Cultivated Plants (JKI), Institute for Grapevine Breeding Geilweilerhof, Siebeldingen, Germany.
The establishment of the European Vitis Database with free access via Internet has been carried out in the scope of the European Project GenRes081.
The follow up and enlargement will be accomplished within GrapeGen06 and by the European Cooperative Programme for Crop Genetic Resources (ECPGR).
Members of the European Cooperative Programme for Crop Genetic Resources (ECPGR) Vitis Working Group ©JKI 2007
Last modified: June, 2012
GrapeGence
JKI

WG2: Geno & phenotyping methods

Protocols for high-throughput phenotyping



12: 2 leaves unfolded and spread away from shoot

15: 5 leaves unfolded and spread away from shoot
53: Inflorescences clearly visible

17: 7 leaves unfolded and spread away from shoot
55: Inflorescences swelling, flowers closely pressed together

57: Inflorescences fully developed; flowers separating

61: Beginning of flowering: 10% of flowerhoods fallen

69: End of flowering

Cost action FA1003: East-West Collaboration for Grapevine Diversity Exploration and Mobilization of Adaptive Traits for Breeding

PHENOTYPING TRIAL 2012

PROTOCOLS FOR PHENOTYPING BERRY ENOLOGICAL TRAITS

1. PRELIMINARY RECORDS AND ACTIONS

1.1 Evaluation of yield vs. leaf area balance and possible bunch thinning

For each accession plot, before veraison, make an estimation of the yield vs. leaf area ratio. Count the bunches and estimate the leaf area of the plot.

- Yield (Y) – n° of bunches x expected bunch weight (see OIV 502 descriptors for a guide)
- Leaf area (LA) – [canopy height (m) x plot length (m) x leaf layers] – canopy open space (m^2)

If the Y/LA exceed 1 kg / m^2 consider to remove a part of the bunches to lower it in the optimal range of less 1 kg of grapes per square meter of leaf area.

1.2 Evaluation of the proper bunch microclimate

For a proper grapes ripening:

- in cool climate bunches should be sun exposed, if not remove leaves;
- in warm climate bunches should be shaded by one leaf layer, if not please sample leaf shaded bunches.

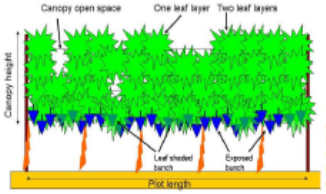


Fig. 1 - Around veraison the evaluation of the yield vs. leaf area balance and of the proper microclimate around the selected bunches for samplings should be done.

1.3 Early selection of representative bunches
At the end of veraison select at least 9 representative bunches among the ones fully developed in comparison to the expected varietal identity. Mark the bunches with a label.

1.4 Definition of ripening time
Follow weekly the sugar content by refractometric measures by collecting at least 50-100 berries from non selected bunches.
The full ripening should be defined when the concentration of sugars tends to reach a stable values and just the first berries, by visual and tactile assessment of firmness and consistency, show initial symptoms of dehydration. Sampling may be anticipated to commercial harvest in relation to specific grapes attitudes (e.g. table grapes) or in case of risk of grapes mold decay.

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http://www.dipnve.unimi.it/GRAPENET/index.php

Cost action FA1003: East-West Collaboration for Grapevine Diversity Exploration and Mobilization of Adaptive Traits for Breeding

3.2 Titratable acidity

In a baker put 7.5 ml of grape juice, then, add some distilled water and few drops of Bromothymol blue. Finally, proceed with the titration using NaOH 0.1 N until pH 7 (measured by pHmeter or by Bromothymol blue indicator change of color).

The ml of NaOH used for the titration correspond to the juice titratable acidity expressed in g/l of tartaric acid (due to the fact that the equivalent weight of tartaric acid is 75).

If you use the Bromothymol blue, you have just to add few drops. Because it is an indicator, an exact volume is not necessary. It is important to exactly measure the 7.5 ml, but to simplify the analysis, you can add pure water without any problem (for example, to allow the measurement with the pHmeter) after the sample measurement of 7.5 ml. Avoid the addition of too much water: a bigger volume need more time to stabilize the pH and complicates the analysis.

If you use the Bromothymol blue, your solution is at pH 7 when its color appear green. This indicator appear yellow at acidic pH and blue at basic pH.

Calibrating the visual detection of pH 7 by Bromothymol green color: If you do not have a pHmeter, the color can checked using a tartaric acid solution.

Prepare a 5 g/l solution of tartaric acid in pure water and titrate 7.5 ml. Adding 5 ml of NaOH 0.1N you will obtain a pH=7 and, thus, the reference "Bromothymol blue" green color. This method is valid also to check the NaOH concentration.

The anthocyanins presence make a little bit more difficult to detect the change in color, but after few samples, you will easily succeed.

3.3 Berry size, partition and analytical methods for phenolic content

Sample preparation: each replication of 10 berries should be analyzed separately.

Weight the 10 berries. With a calipers measure length and width of each berry.

Separate the 10 skins by squeezing the pulp in a baker by pressing the berry between thumb and index finger. Dry a little bit the skins using a soft laboratory paper without losing the anthocyanins.

Weight the 10 skins.

Info: Osvaldo.Failla@unimi.it, Laura.Rustioni@unimi.it
http://www.dipnve.unimi.it/GRAPENET/index.php

Significant Highlights in Science or Networking (2/2)

ACTION FA1003
East-West Collaboration for Grapevine Diversity Exploration
and Mobilization of Adaptive Traits for Breeding

ACTION FA0807
Integrated Management of Phytoplasma Epidemics
in Different Crop Systems

Phytoplasma and Virus Management in Grapevine Collections for Germplasm Conservation, Mobilization and Evaluation

8-9 May, 2012

SHERATON SOPHIA BALKAN HOTEL

SOFIA - BULGARIA

Practical aspects to be focused for the plant material transfer

- Material Transfer Agreement
- Authorization from the phytosanitary services
- Quarantine management

Azerbaijan 50 Armenia 40 Georgia 100

Moldova 21 Russia 50 Ukraine 45

An vast human patrimony that need to be described following the most advanced phenotyping and genotyping techniques

Phenology

Yielding profiling

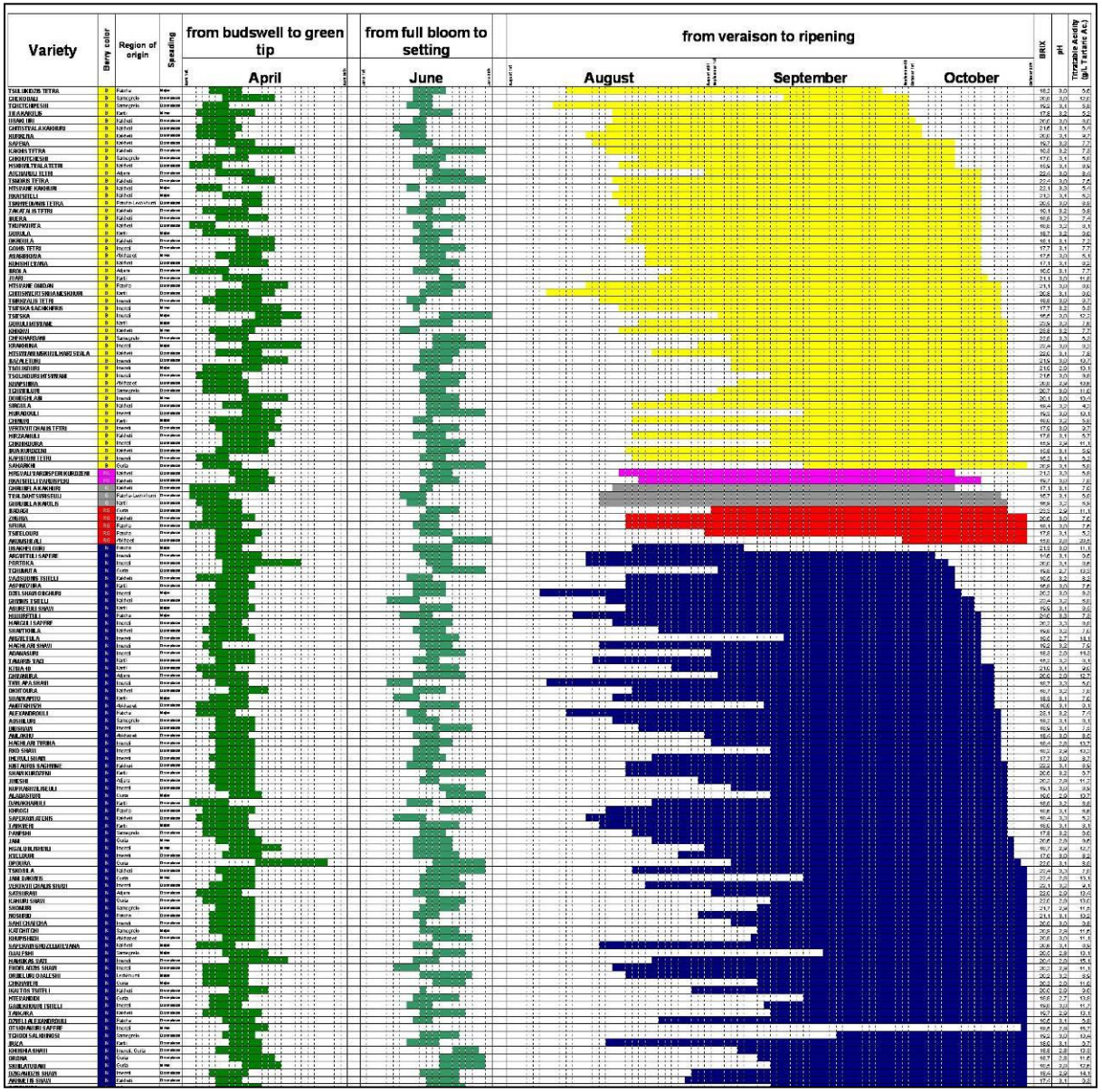
Ripening profiling

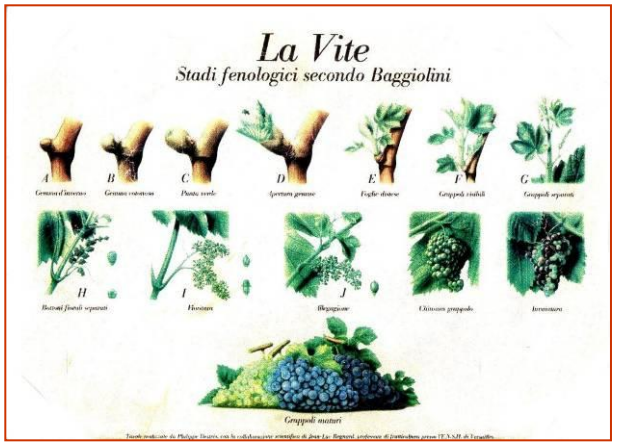
Tolerance to abiotic and biotic stresses

The wild grapevines genetic pools

Do they have evolved, during the last 150 years towards tolerance/resistance against American fungal diseases?

Phenology





	Average	St. Dev.	From	To	Range
Main phenological stages	Day of the year (date)				
Bud Swell	96 (6th Apr.)	2.15	92 (2nd Apr.)	102 (12th Apr.)	10
Flowering	161 (10th June)	1.84	156 (5th June)	166 (15th June)	10
Veraison	237 (25th July)	10.85	218 (6th July)	273 (30th Sept.)	55
Ripening	286 (13th Oct.)	5.63	248 (5th Sept.)	291 (18th Oct.)	43

Main ripening traits	Average	St. Dev.	From	To	Range
°B	19.5	2.02	14.6	24.0	9.4
pH	3.0	0.14	2.7	3.0	0.3
Titr. Ac. (g/L Tart. Ac.)	9.0	2.71	4.3	20.5	16.2

Gorizia collection: 150 acces.
Three years (2004-2006) data

Table 7. Classification of the Georgian cultivars according to their ripening timing and relative average ripening profiling

Period of maturation	Cultivar		°Brix		pH		Titratable acidity (g·L^{-1} tartaric acid)	
	No.	Name	Mean	S.D.	Mean	S.D.	Mean	S.D.
First ten-days of September	1 0.7%	Usakhelouri	21.3	-	3.00	-	11.1	-
Third ten-days of September	4 3%	Tita Kartlis, Tchetchipeshi, Tsulukidzis Tetra, Chekobali	19.0	1.3	3.08	0.96	7.4	3.1
First ten-days of October	17 12.7%	Chkhutcheshi, Chitistvala Kakhuri, Asuretuli Shavi, Ghvinis Tsiteli, Mrgvali Vardisperi Kurdzeni, Mskhviltvala Tetri, Kakhis Tetra, Ghrubela Kakhuri, Aspindzura, Sapena, Ubakluri, Vazisubnis Tsiteli, Dzelshavi Obchuri, Portoka, Argvetuli Sapere, Kurkena, Tchumuta	19.2	2.2	3.10	0.14	7.9	1.7
Second ten-days of October	112 83.6%	All others	19.6	2.0	3.04	0.14	9.2	2.8

...the importance of the epicuticular waxes...

1 ***OPTICAL PROPERTIES OF BERRY EPICUTICULAR WAXES IN FOUR***

2 ***GEORGIAN GRAPE CULTIVARS (Vitis vinifera L.)***

3 L. Rustioni[1], D. Maghradze[2], O. Failla[1]

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5 l'innovazione in Viticoltura ed Enologia, v ıly.

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11 Collaboration for Grapevine Diversity Exploratio for

12 Breeding". We thank Dr. Marina Fogarty for text r

Screening the Georgian germplasm for sources of *Plasmopora viticola* tolerance

July 2012

Data from A. Vercesi University of Milano

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Call: FP7-KBBE-2012-6, Activity 2.1. Agriculture, Forest, Fisheries and Aquaculture.
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Project title: Combining innovation in vineyard management and genetic diversity for a sustainable European viticulture.
Acronym : INNOVINE, Project ID : 311775

UE financial contribution: 5,999,990; duration 48 months

The project involves several members of the action MC, including Chair, Vice Chair, WG1 leader. A specific Work Package, devoted to "Exploiting the genetic diversity in grapevine" is strictly linked to the Cost action participant research activities.
At the moment the proposal is under final evaluation after the negotiation phase.


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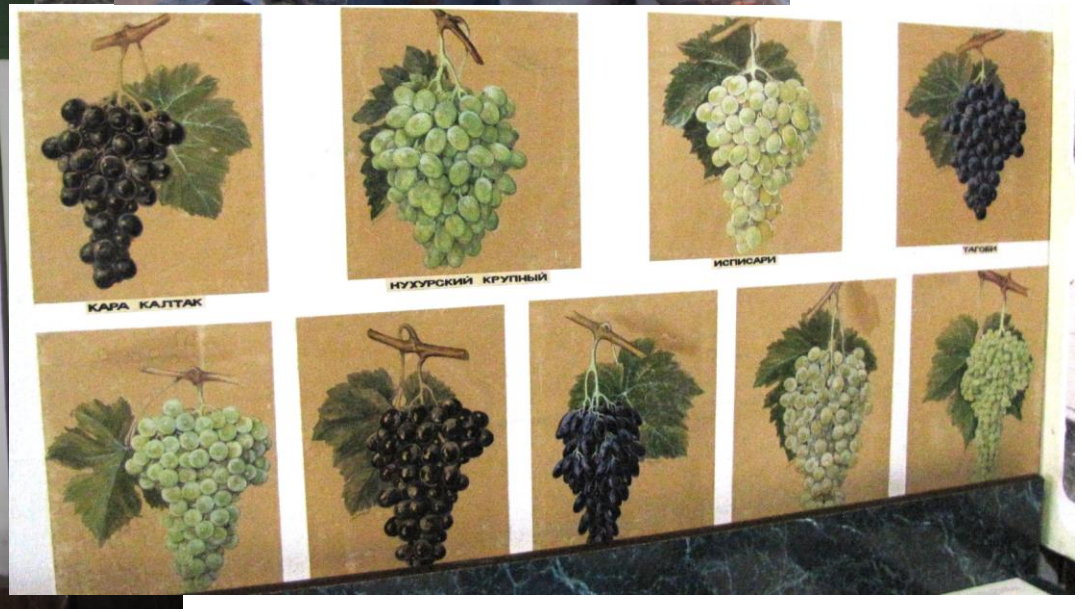
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АМПЕЛОГРАФИЯ
УЗБЕКИСТАНА
Caucasus and
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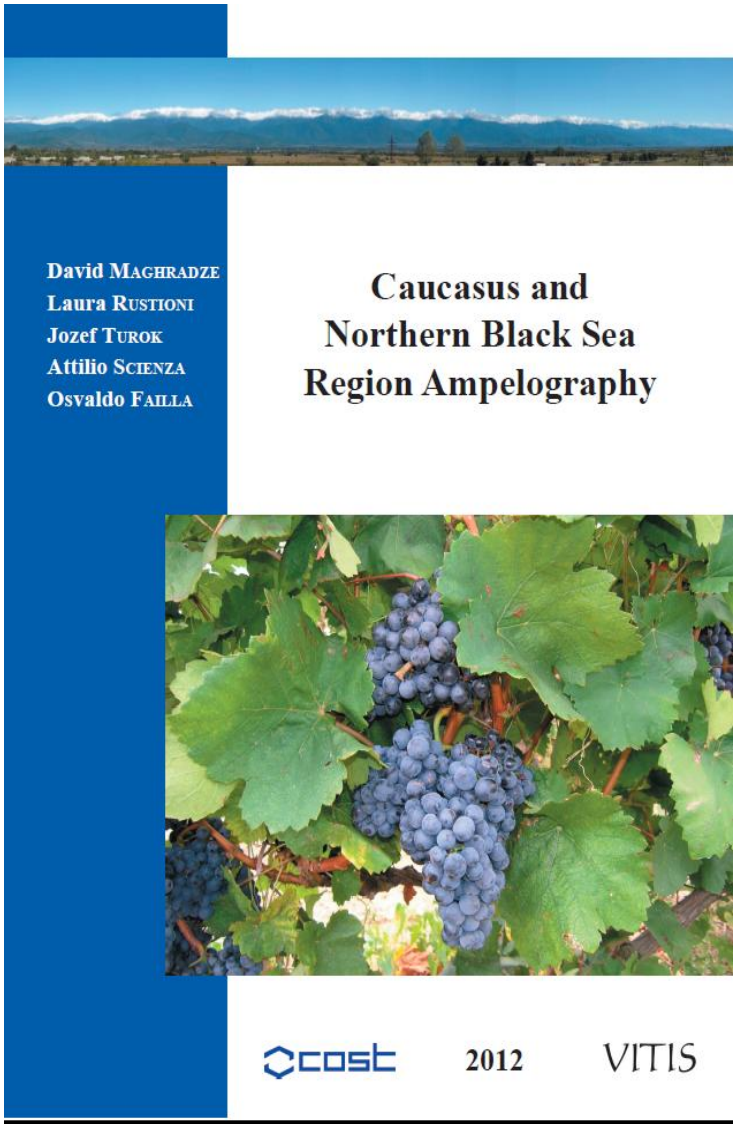
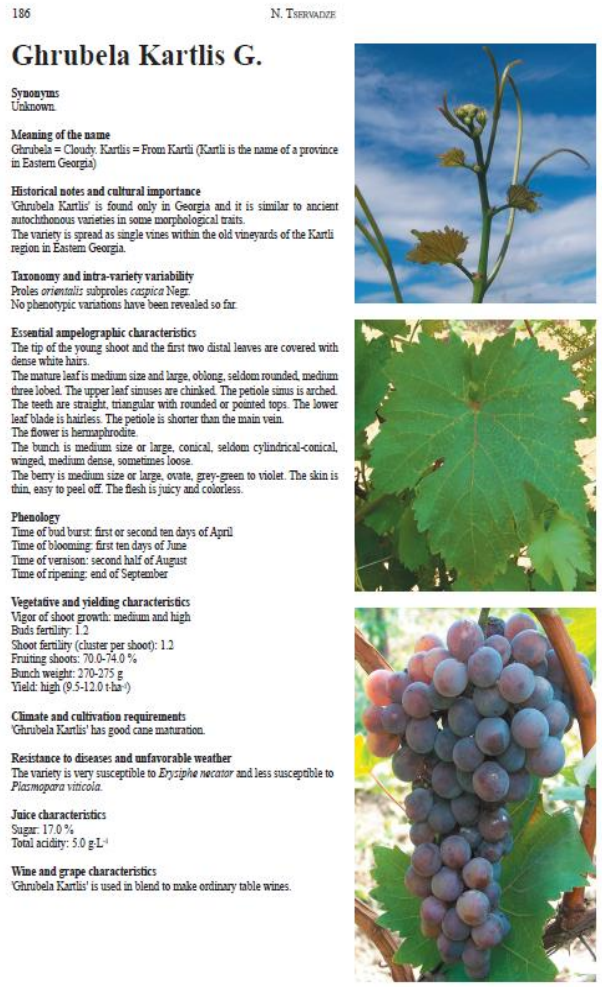
Region Ampelography



A large (489 pages) book (30 authors and collaborators) reporting the description of a sample of 268 elite grape cultivars selected from the native Caucasus and Black northern sea region is close to be published. The book will give large visibility to the Cost action and to the mobilization of the genetic resources.



186 N. Tservadze

Ghrubela Kartlis G.

Synonyms
Unknown.

Meaning of the name
Ghrubela = Cloudy. Kartlis = From Kartli (Kartli is the name of a province in Eastern Georgia)

Historical notes and cultural importance
'Ghrubela Kartlis' is found only in Georgia and it is similar to ancient autochthonous varieties in some morphological traits.
The variety is spread as single vines within the old vineyards of the Kartli region in Eastern Georgia.

Taxonomy and intra-variety variability
Proles *orientalis* subproles *caspica* Negr.
No phenotypic variations have been revealed so far.

Essential ampelographic characteristics
The tip of the young shoot and the first two distal leaves are covered with dense white hairs.
The mature leaf is medium size and large, oblong, seldom rounded, medium three lobed. The upper leaf sinuses are chinked. The petiole sinus is arched. The teeth are straight, triangular with rounded or pointed tops. The lower leaf blade is hairless. The petiole is shorter than the main vein.
The flower is hermaphrodite.
The bunch is medium size or large, conical, seldom cylindrical-conical, winged, medium dense, sometimes loose.
The berry is medium size or large, ovate, grey-green to violet. The skin is thin, easy to peel off. The flesh is juicy and colorless.

Phenology
Time of bud burst: first or second ten days of April
Time of blooming: first ten days of June
Time of veraison: second half of August
Time of ripening: end of September

Vegetative and yielding characteristics
Vigor of shoot growth: medium and high
Buds fertility: 1.2
Shoot fertility (cluster per shoot): 1.2
Fruiting shoots: 70.0-74.0 %
Bunch weight: 270-275 g
Yield: high (9.5-12.0 t·ha^{-1})

Climate and cultivation requirements
'Ghrubela Kartlis' has good cane maturation.

Resistance to diseases and unfavorable weather
The variety is very susceptible to *Erysiphe necator* and less susceptible to *Plasmopara viticola*.

Juice characteristics
Sugar: 17.0 %
Total acidity: 5.0 g·L^{-1}

Wine and grape characteristics
'Ghrubela Kartlis' is used in blend to make ordinary table wines.

Meaning and methods of this book: A guide for the reader

D. Maghradze[1)], L. Rustioni[2)], A. Scienza[2)], J. Turok[3)], O. Failla[2)]

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This book is an ampelography of selected native grape varieties of the six countries involved in the project 'Conservation and sustainable use of grapevine (*Vitis vinifera* L.) genetic resources in the Caucasus and Northern Black Sea region', coordinated by the European Office of the International Plant Genetic Resources Institute 'Bioversity International' (former IPGRI) in 2004-2008. The project aimed at the identification, collection, characterization and conservation of the rich diversity of grapevine genetic resources throughout the Caucasus and the Northern Black Sea region, as a basis to improve local viticulture and winemaking industry. The six partners of the project are Azerbaijan, Armenia, Georgia, Moldova, Russia and Ukraine.

Among the many activities developed in the framework of the project, whic
chapter, it was decided to publish a regional ampelography of selected local v
with the object to provide the highest information about the range of biodiversit
assortments.

Different criteria were used in order to select the varieties. Priority was give
in the past local viticulture, but which are now endangered. Moreover, according
local varieties less endangered, as well as minor accessions with an unclear his
breeding activities, could be included. This assessment was taken to allow each
according to its specificity. For practical reasons, the number of varieties per cou

Another criterion to be respected by the authorship was to include only the va
tions maintained by the institutions involved in the project. Moreover, the variety
to be original and derived from the specimens in the collections, most of which w

Project of Bioversity International on conservation and sustainable use of grapevine genetic resources in the Caucasus and northern Black Sea region: Activities and results

D. Maghradze[1)], J. Turok[2)]

[1)] Institute of Horticulture, Viticulture and Oenology, Tbilisi, Georgia
[2)] Bioversity International. Regional Office for Europe, Maccarese, Roma, Italy

Abstract

Conservation of grapevine biodiversity in the Caucasus and northern Black Sea Region is particularly urgent because of: 1) the large number of traditional local varieties out of cultivation; 2) the relevance of these resources for the development of European modern cultivars; 3) the financial difficulties in the countries; 4) the occurrence of *Vitis vinifera* ssp. *sylvestris* throughout the region; 5) wine production as a major potential source of income for the local population in the region. In 2004-2008, significant progress has been made within a collaborative project, financially supported by the government of Luxembourg, aimed at strengthening the capacity of the countries of the region (Armenia, Azerbaijan, Georgia, Moldova, Russia, and Ukraine) to ensure the long-term maintenance of *Vitis* genetic resources, including the cultivated traditional varieties and the wild resources. The activities include identifying, collecting, characterizing, and conserving the diversity of grapevine genetic resources as a basis to improve local viticulture and winemaking industry.

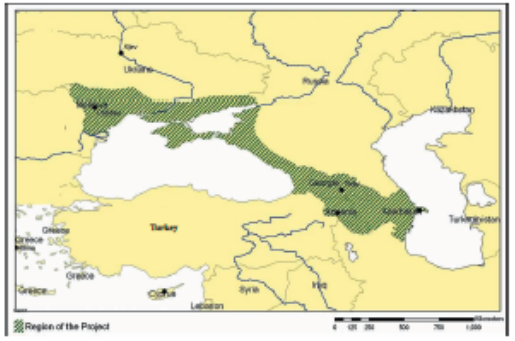

Fig. 1: The map of project area covering Armenia, Azerbaijan, Georgia, Russia, Moldova and Ukraine.

Introduction

The origin of "Old World" viticulture

G. FORNI

Lombard Museum of History of Agriculture, Sant'Angelo lodigiano, Lodi, Italy

How was grapevine domesticated?

The role of ethology and ethnology in the documentation of the processes of agro-viticultural genesis: The best way to understand the importance of a certain agricultural activity is to focus on all its aspects, on its cosmo-ecologic traits, story and origins. This is precisely what we will do in this contribution.

The general habit of considering just archaeology and palaeontology when studying the birth and the first evolution of a culture is completely unjustified. All data provided by these sciences, as by scientific research in general, are inherently provisional, as further researches will always correct and improve the previous ones. This is why knowledge about the origin of viticulture will always be improving in space and time.

The comparative use of different disciplines gives more solid results. In this view, the inductions derived from the analysis of the ethologic relationship man-grapevine in its primordial stage are particularly useful. Despite the evolution of the behaviours of *Homo sapiens* and *Vitis vinifera*, change is much slower and it depends on the evolution of each species. Change, in fact, occurs on the paleontological time scale, which is much bigger than the archaeological one (FORNI 2004 a, 2008).

Obviously, all ethologic documentation must be crossed with any available ethnological documentation, creating even more solid basis made of interdisciplinary and/or multidisciplinary arguments. The adoption of the 'dump heap model' is a typical example of this approach: it is based on the instinctive behaviour, confirmed by ethnographic observation and historical documentation, of the human nomad groups who threw their rubbish and defecated away from their camps. The fact that dump heaps are the optimal habitat for the wild grapevine is a very solid starting point for the study of the origins of viticulture.

Eventually, it becomes clear that while a purely archaeological/paleontological analysis can only offer partial results, the etho/ethno/archaeological approach offers a more complete reconstruction. In our perspective, such reconstruction must begin on the basis of an even more global study upon the origin of alcoholic drinks in general.

MCGOVERN (2003) can only conclude that in that territory at that time there was at least the habit of picking grapes from protected wild grapevines, and of making wine without having to plant or cultivate a vineyard. The latter activities were possible, but not documented.

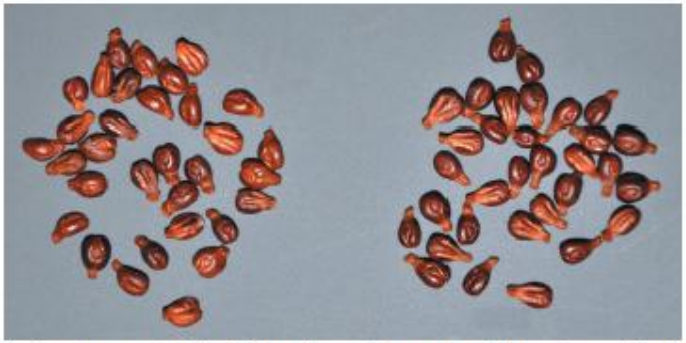

Fig. 4: The seeds of the domestic grapevine (to the right) are longer and more pointy, wild grapevine seeds (to the left) are larger and rounder. On this basis, Stummer elaborated a morphometric index for classifying fossil seeds.

Viticulture and winemaking in Georgia

N. Chkhartishvili, D. Maghradze

Institute of Horticulture, Viticulture and Oenology, Tbilisi, Georgia

Introduction

Georgia is a country of 69,700 km^2, located in the Southern Caucasus between 41°07'-43°35' latitude and 40°05'-46°44' longitude. It borders on Russia to the north and northeast, on Azerbaijan to the east and southeast, on Armenia and Turkey to the south and on the Black Sea to the west.

With the exception of the fertile plain of the Kolkheti Lowland, Georgia is largely mountainous and more than one third is covered by forest or brushwood. The remarkable variety of landscapes ranges from the subtropical Black Sea shores to the snowy Caucasian crest line. To the north there are the high Caucasian mountains, to the south we find the Trialeti Mountains. The Likhi Mountains, from north to south, split the Country in two (Eastern and Western Georgia). The main rivers are Mtkvari Kura, Alazani, Rioni and Enguri.

The soils where the main commercial vineyards grow are cinnamonic, meadow cinnamonic, grey cinnamonic (chestnut), raw humus calcareous black, meadow black forest, cinnamonic forest and alluvial soils with their sub-types. Cinnamonic soils guarantee the best winemaking: this is where famous wines like Tsinandali, Vazisubani, Akhasheni, Gurjaani, Manavi and Kardanakhi orginate from. Other soils with good winemaking features are raw humus calcareous (mainly limestone and carbonate rocks - in Racha-Lechkhumi), brown forest, red soils, yellow soils, alluvial, meadow alluvial and porzols are spread in the main viticultural regions in Western Georgia.

Western Georgia has a humid subtropical, maritime climate, while Eastern Georgia has a very wide range of climates: at different altitudes, during the same season, climate varies from humid subtropical to alpine; on the peaks, snow and ice are present all year round.

The Caucasian barrier to the north protects Georgia from cold air intrusions and the Black Sea is a source of warm air and humidity. Annual rainfall spans from 1,000-2,800 mm in the West to 300-800 mm in the East. Average annual temperature is 11-12 °C. The average temperature in July for Eastern Georgia is 24-25 °C at 450 m a.s.l. and 22-23 °C in Western Georgia at the same altitude. The sum of active temperature (base 0 °C) in the viticultural regions of the country is 3200-4500 GDD.

History of viticulture and winemaking

The 7th millennium BC is considered to be the age of the first human settings in Georgia. Palaeobotanical and archaeological data from this period are evident on the sites of "Shulaveri" belonging to the "Shulaveri-Shomu tepe" culture period (6000-4000 BC). Among these remains, grapevine seeds are very important, as they are the nearest sign of

Fig. 1: Clay jar 'Dergi' (Khramis didi gora, VI-V mil. BC.) with relief image of a grape bunch belonging to the Shulaveri-Shomu tepe culture (VI-IV mill. BC). This is one of the oldest archaeological evidences of winemaking on the territory of Georgia.

Fig. 2: Seeds of grape from Dangreuli gora, VI-V mil. BC, having characteristics of cultivated grapevines. This, together with pottery artifacts, is an evidence of grapevine cultivation (Rusishvili 2007).

Georgia: native varieties of grapevine

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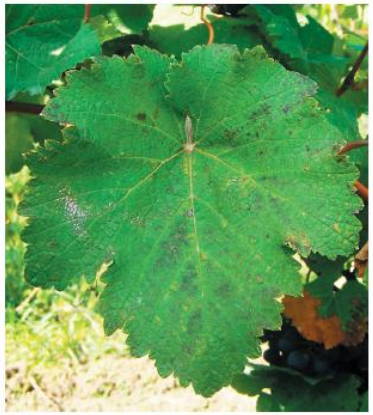
Authors of the photos: D. Maghradze, I. Mdinaradze and R. Chipashvili, Institute of Horticulture, Viticulture and Oenology, Tbilisi, Georgia

English translation: V. Gurasashvili and T. Vakhtangadze, Institute of Horticulture, Viticulture and Oenology, Tbilisi, Georgia

1. Aladasturi N.
2. Alexandrouli N.
3. Asuretuli Shavi N.
4. Budeshuri Tetri B.
5. Budeshuri Tsiteli Rg.
6. Buera B.
7. Chinuri B.
8. Chitistvala Bodburi B.
9. Dzelshavi N.
10. Ghrubela Kartlis G.
11. Ghvinis Tsiteli Rg.
12. Gorula B.
13. Goruli Mtsvane B.
14. Grdzelmtevana B.
15. Ikaltos Tsiteli N.
16. Jani Bakhvis N.
17. Jineshi R.
18. Khikhvi B.
19. Krakhuna B.
20. Kumsi Tetri B.
21. Kundza B.
22. Mgaloblishvili N.
23. Mkhargrdzeli B.
24. Mtevandidi N.
25. Mujuretuli N.
26. Ojaleshi N.
27. Okhtoura N.
28. Otskhanuri Sapere N.
29. Paneshi N.
30. Partala Shavi N.
31. Rkatsiteli B.
32. Rkatsiteli Vardisperi R.
33. Saperavi N.
34. Saperavi Atenis N.
35. Saperavi Budeshuriseburi N.
36. Sapena B.
37. Satsuravi N.
38. Shavkapito N.
39. Sirgula B.
40. Skhilatubani N.
41. Tavkveri N.
42. Tavkveri Saperaviseburi N.
43. Tchvitiluri B.
44. Tsirkvalis Tetri B.
45. Tsitska B.
46. Tskhvedianis Tetra B.
47. Tsolikouri B.
48. Tsulukidzis Tetra B.

Notes: N-Noir (black), B-Blanc (white), Rg-Rouge (red), G-Gris (gray), R-Rose (pink).

Aladasturi N.



Synonyms
Unknown.

Meaning of the name
Distributed in the village of Aladast.

Historical notes and cultural importance
Before the arrival of the American fungal diseases and of *Phylloxera*, 'Aladasturi' was wide spread within the Guria province, especially in the village of Amaghleba (Chokhatauri district) and in Lower Imereti. 'Aladasturi' was grown on a high training system. 'Aladasturi' is included in the official list of grapevine varieties recommended for cultivation in Western Georgia.

Taxonomy and intra-variety variability
Proles *pontica* subproles *georgica* Negr. provar *tomentosae* Tserts.
No phenotypic variations have been revealed so far.

Essential ampelographic characteristics
The tip of the young shoot and the first distal leaves are covered with white hairs.
The mature leaf is large, pentagonal, five lobed or almost entire. The upper leaf sinuses are open, lyre-shaped. The petiole sinus is lyre-shaped. The teeth are straight on both sides and sharp on the end. The lower leaf side is covered with felt hairs. The petiole is as long as the main vein.
The flower is hermaphrodite.
The bunch is medium size and large, cylindrical or cylindrical–conical and medium dense.
The berry is medium size, ovate or oblong, rounded at the end and dark blue. The skin is thick. The flesh is firm.

Phenology
Time of bud burst: middle of April
Time of blooming: beginning of June
Time of veraison: third ten days of August
Time of ripening: third ten days of October

Vegetative and yielding characteristics
Bud fertility: 1.3
Bunch weight: 200 g
Yield per vine: 2.0 kg
Yield: 8.0-9.5 t·ha^{-1}

Climate and cultivation requirements
'Aladasturi' is a high yield variety. It is generally trained in the double side Georgian free training system with two fruity canes. It prefers well-aired soils, low hill-slopes, and soils with a sufficient lime content.

Resistance to diseases and unfavorable weather
The variety has low resistance to *Erysiphe necator* and sufficient resistance to *Plasmopara viticola*.

Juice characteristics
Sugar: 19.0 %
Total acidity: 8.5 g·L^{-1}

Wine and grape characteristics
'Aladasturi' table wine is light, harmonious, with 10 % alcohol. The grape is good for fresh consumption and it can be stored for a long time.