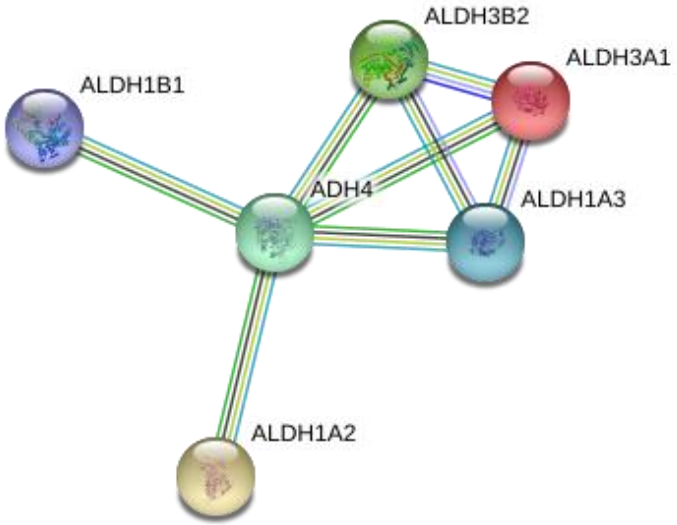
ALLA RICERCA DELL'ANFORA PERDUTA

Le origini della viticoltura e dell'enologia

Osvaldo Failla
MULSA e UNIMI

ADH4: una storia di 13-21 milioni di anni fa

Non offrite ad un orango un bicchiere di vino, offritelo ad un gorilla



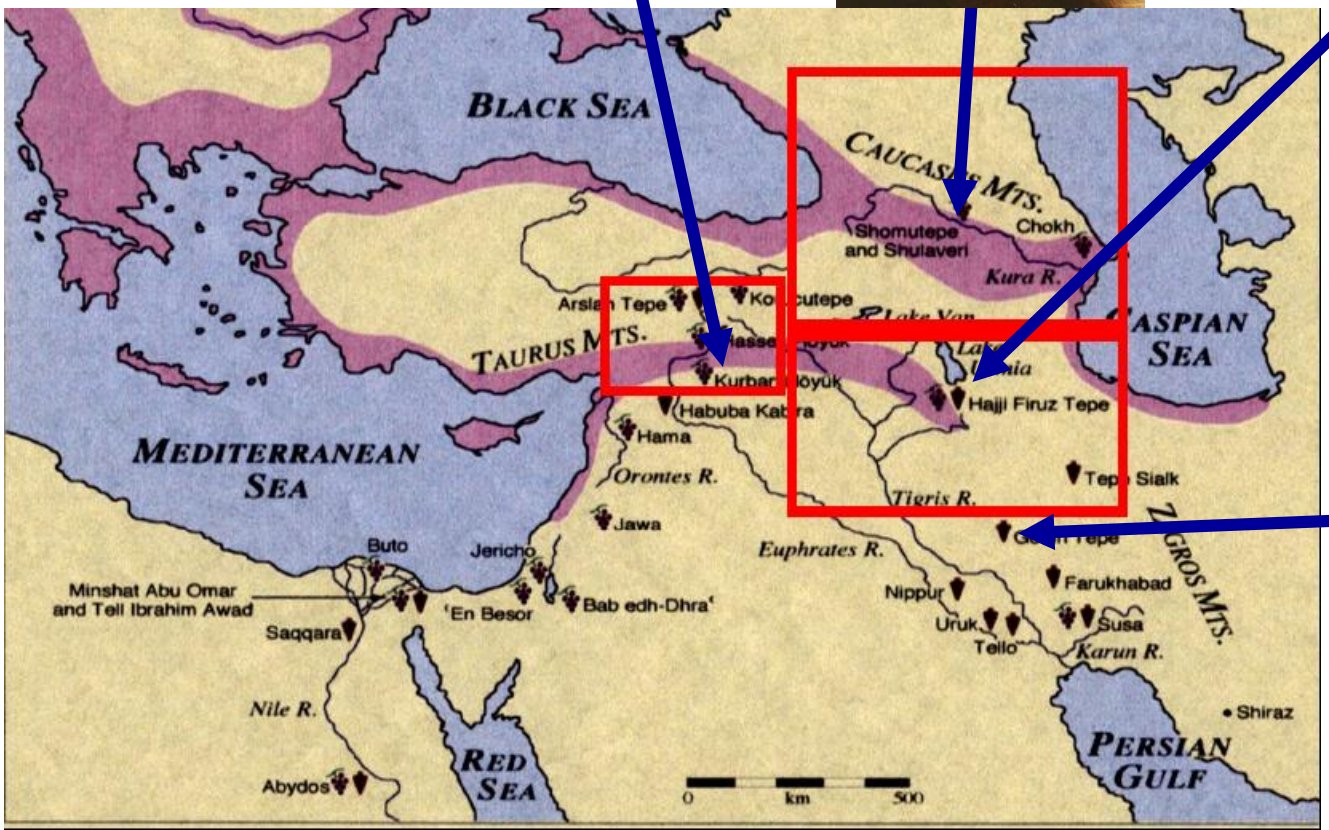
BLACK SEA
CAUCASUS MTS.
Shomutepe and Shulaveri
Chokh
Kura R.
CASPIAN SEA
Arslan Tepe
Korucutepe
Lake Van
TAURUS MTS.
Hassek Höyük
Kurban Höyük
Lake Urmia
Hajji Firuz Tepe
Habuba Kabira
Hama
MEDITERRANEAN SEA
Orontes R.
Tepe Sialk
Tigris R.
ZAGROS MTS.
Jawa
Godin Tepe
Buto
Jericho
Euphrates R.
Minshat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

The domestication of grapevine: the origin of a success

VI-V millennium BC large clay vessel decorated with grapes bunches

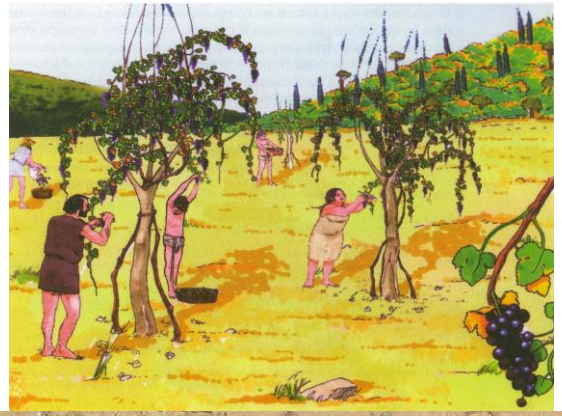
Since VIII millennium BC abundant seed (wild) remains deposits

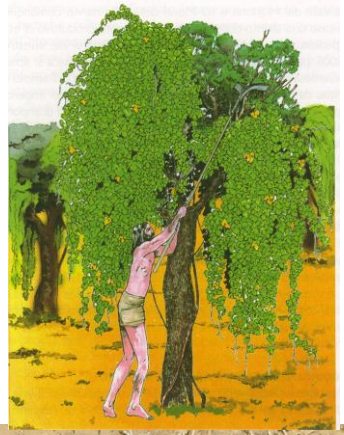
VI millennium (5400-5000 BC) clay vessel with tartaric acid traces



IV millennium (3500-3100 BC) clay vessel with tartaric acid traces

La domesticazione della vite: l'origine del successo





Vite domestica
Vitis vinifera sativa

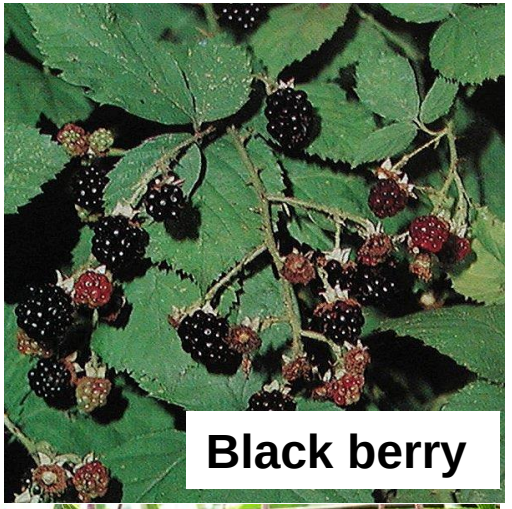
Vite selvatica
Vitis vinifera silvestris

Sorb tree

crab apple

Cornelian cherry,

Raspberry



Black berry

Wild grapes

Elder berry

Honeyberry tree

Un frutto enologico unico: ricco di succo, zuccheri, acidi organici con una buccia sottile ma piena di polifenoli e precursori di aroma

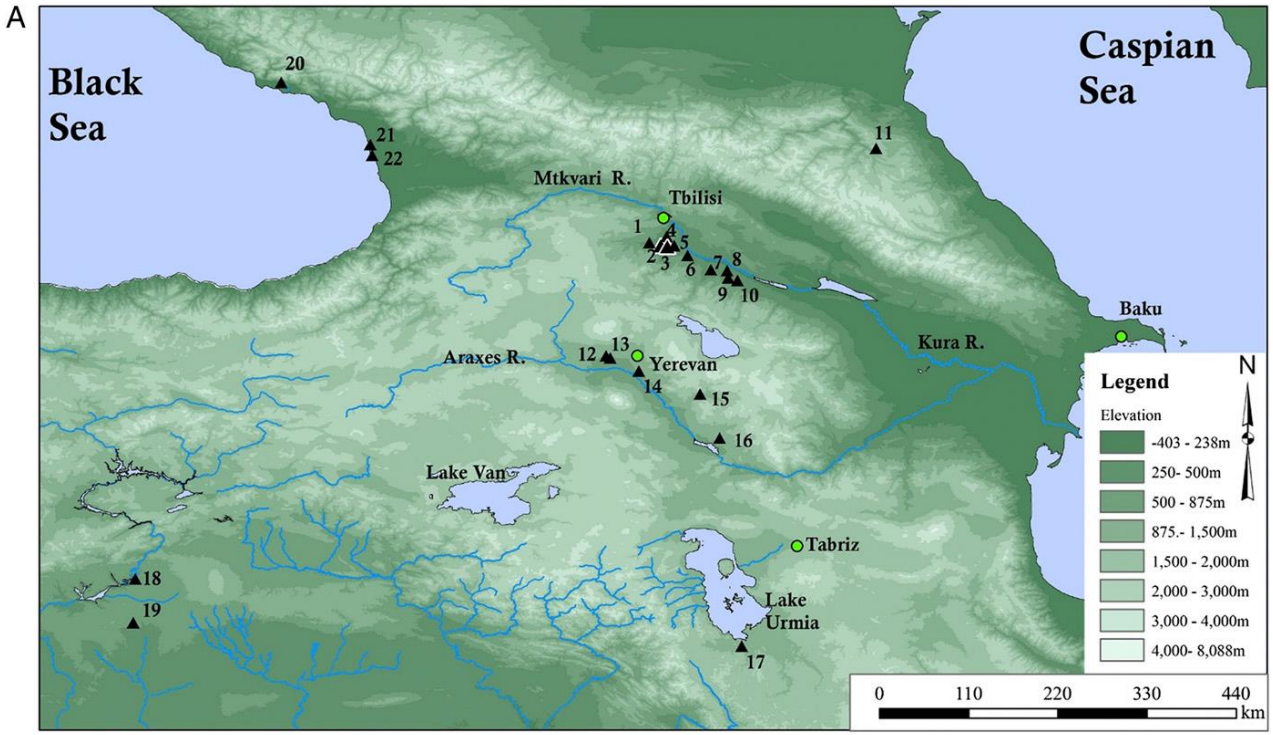
La necessità di un approccio scientifico

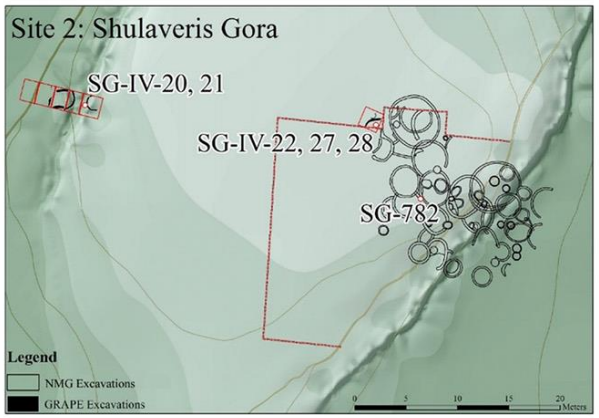
La nascita dell'istruzione superiore viticola ed enologica

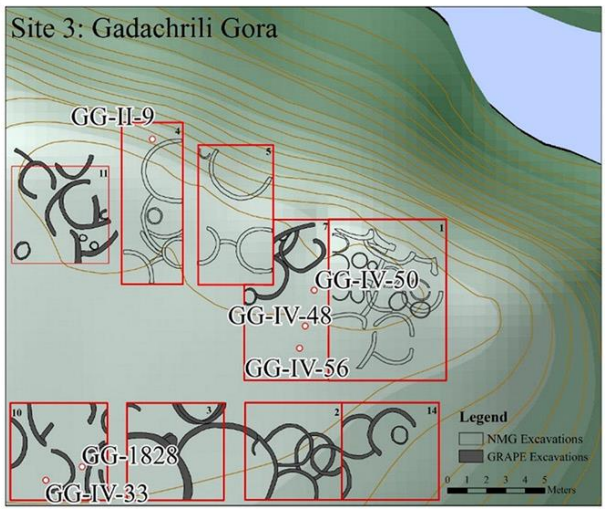
The Ancient Wine Academy of Ikalto (Telavi - Georgia)

Fondata agli inizi del 12° secolo. Gli studenti studiavano teologia, retorica, astronomia, filosofia, geografia, geometria, canto e abilità pratiche come la lavorazione della ceramica, la lavorazione dei metalli, la farmacologia, la viticoltura e la vinificazione.

Shulaveri-Shomutepe Culture 5900–5000 BC







Early Transcaucasian Culture 3500 - 1600 BC

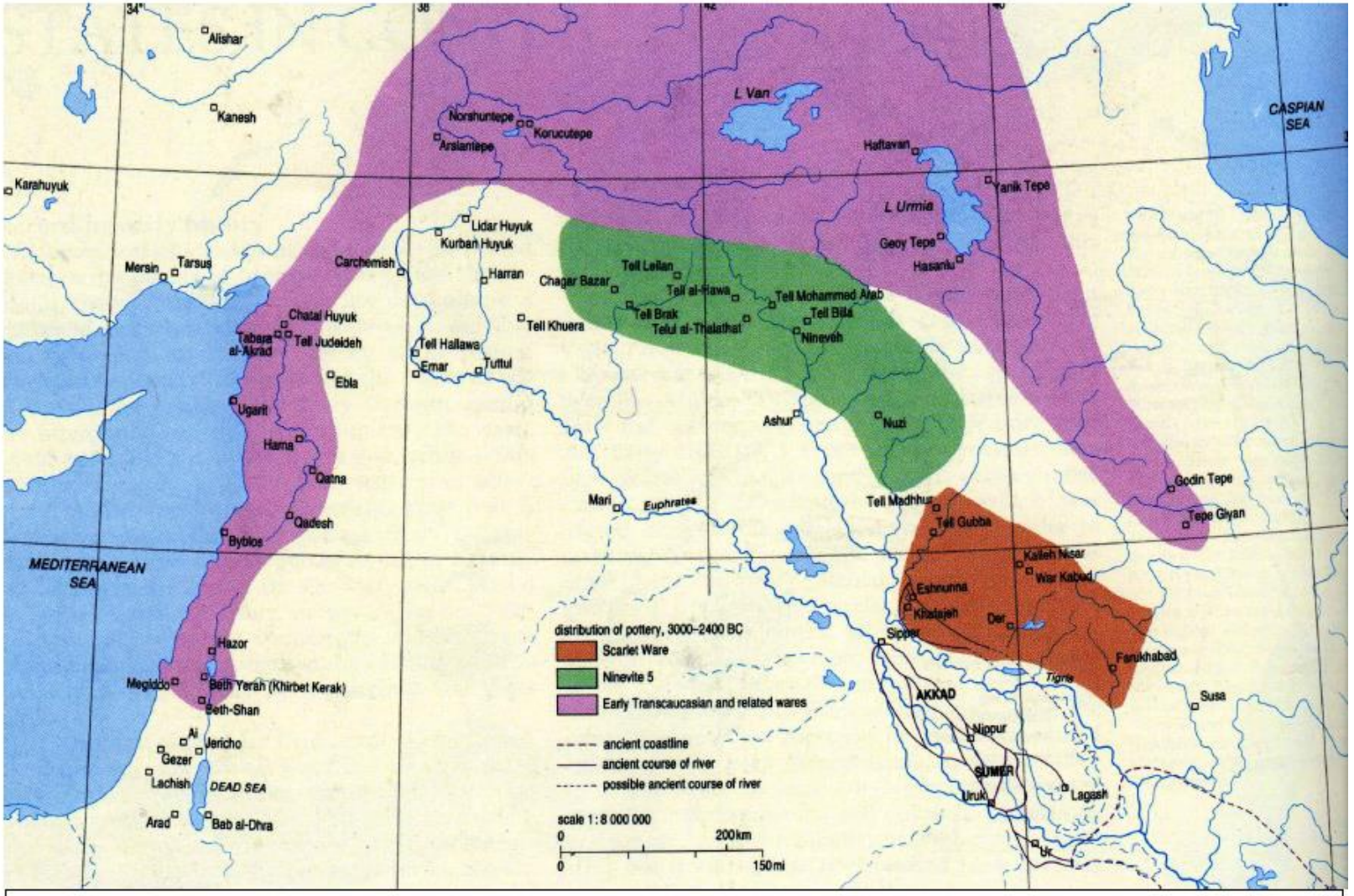
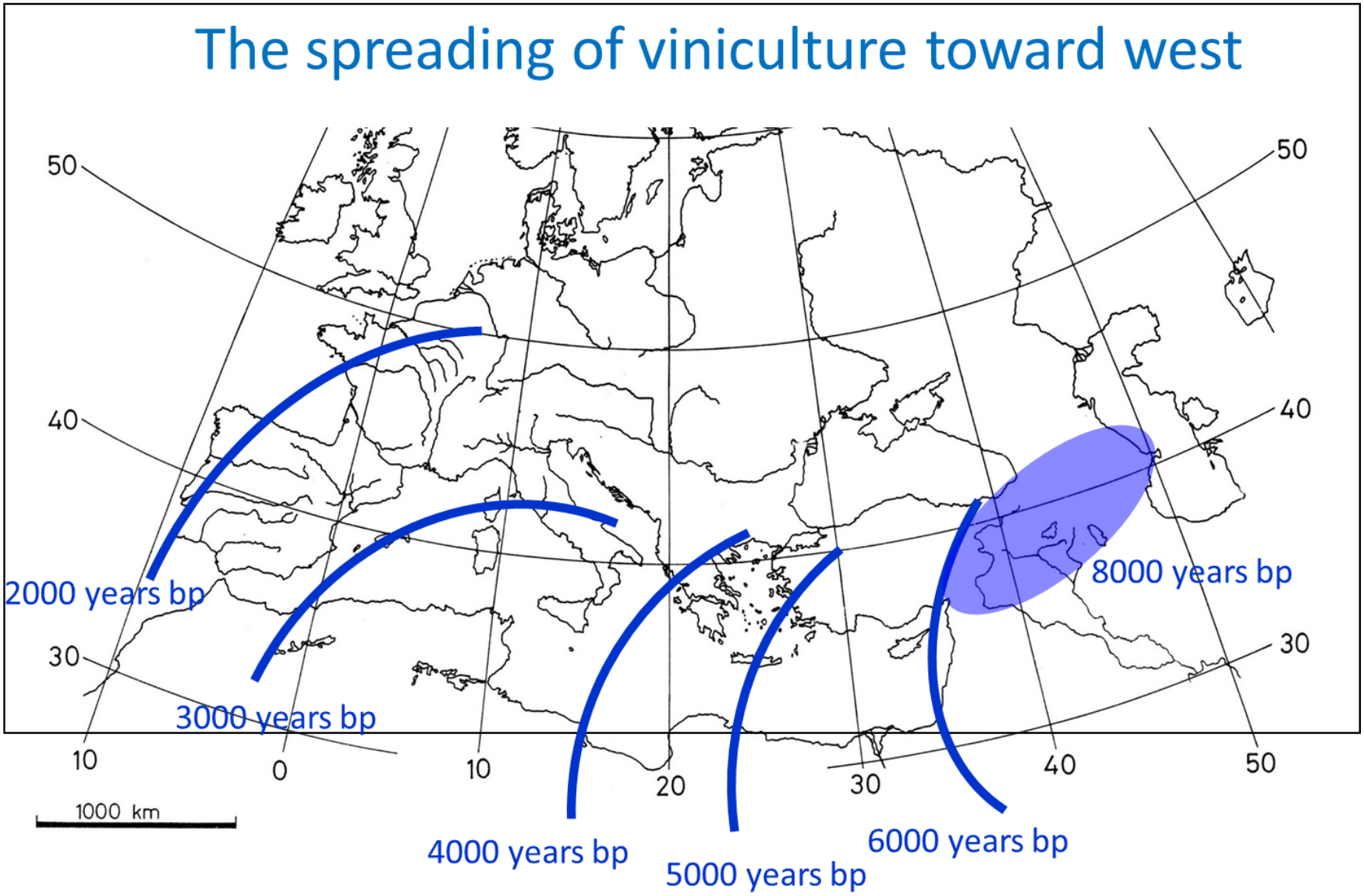


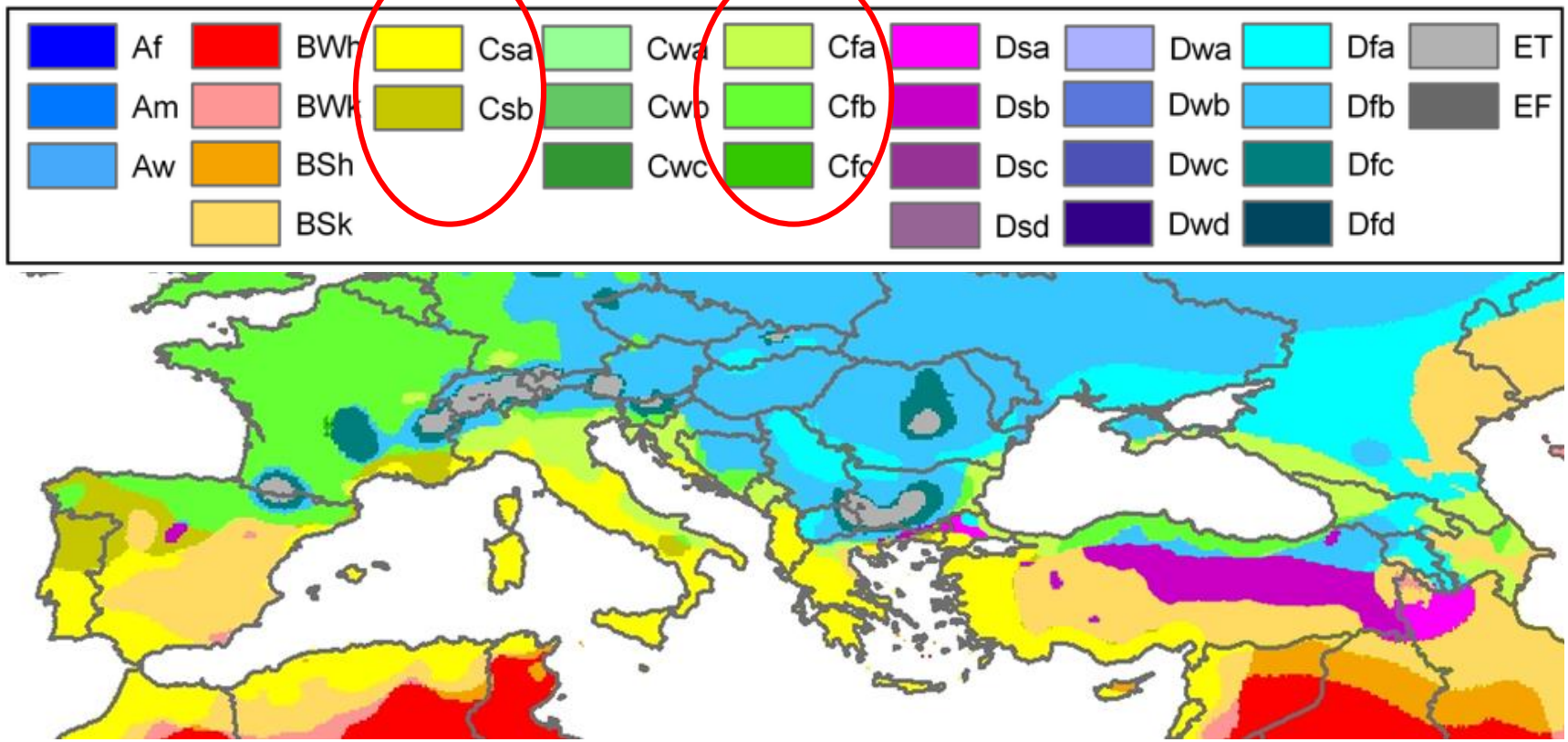
Fig. 1 Distribution zone of ETC and related wares in the Near East (Adapted from Roaf 1990:80)

The birth of the vinicultural industry

FROM: http://www.balage4art.com/Webpages/detail.np/detail-16.html

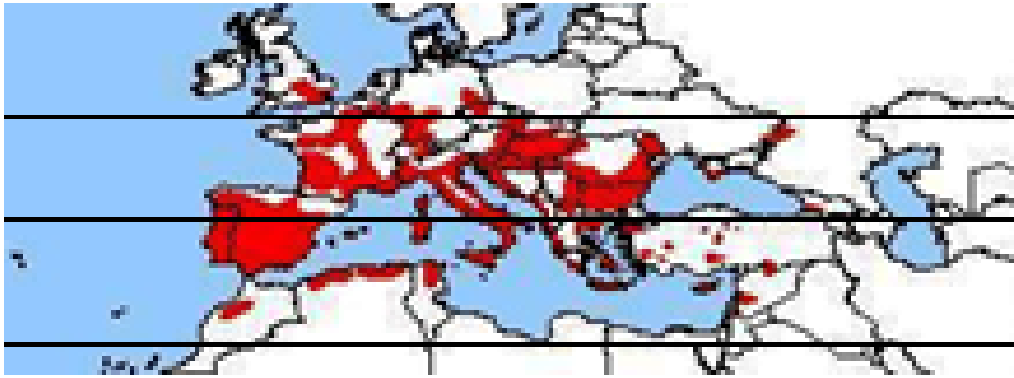
The spreading of viniculture toward west





Range of viticulture

in Europe is mainly cultivated in Köppen – Geiger Cs (summer dry) and Cf (fully humid) climates.

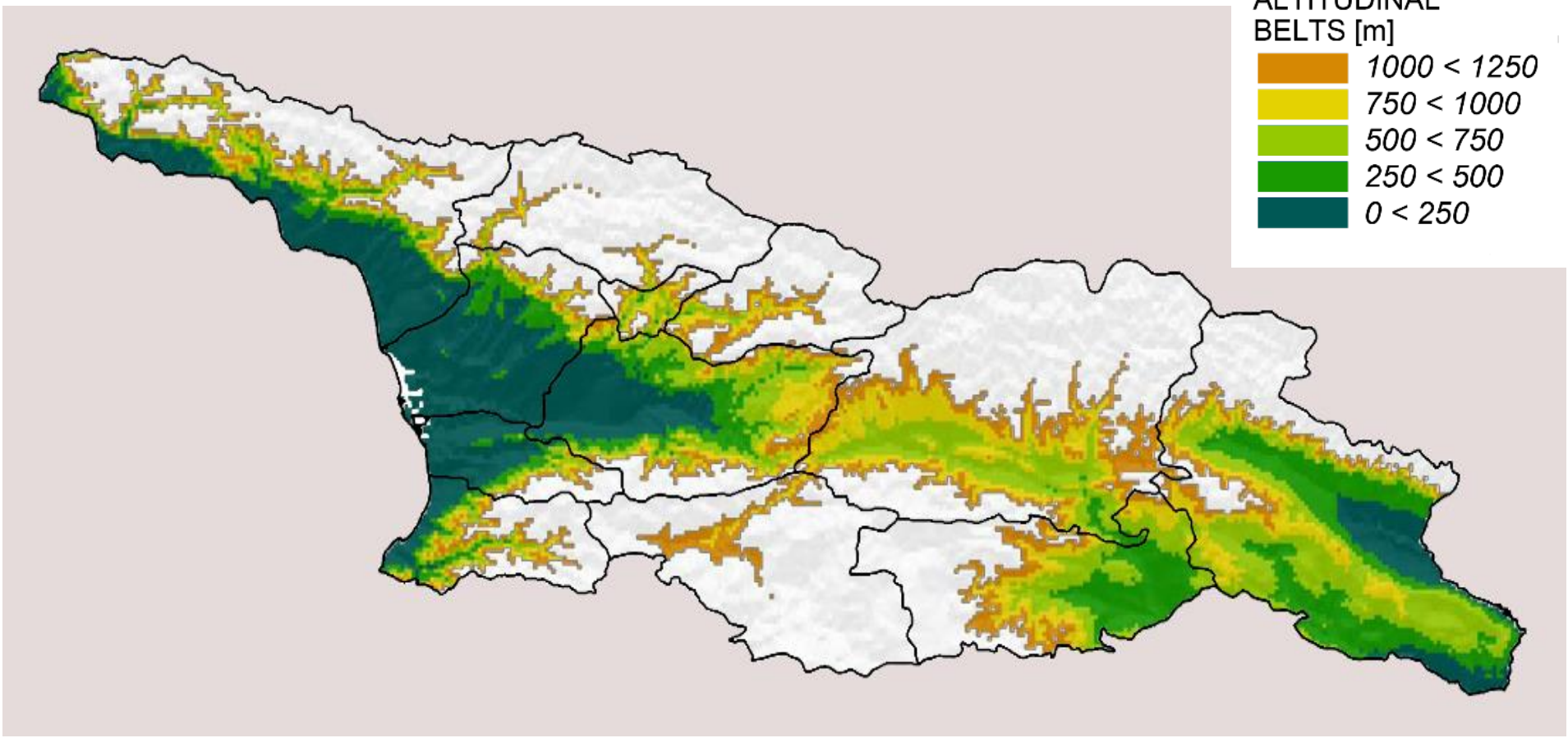


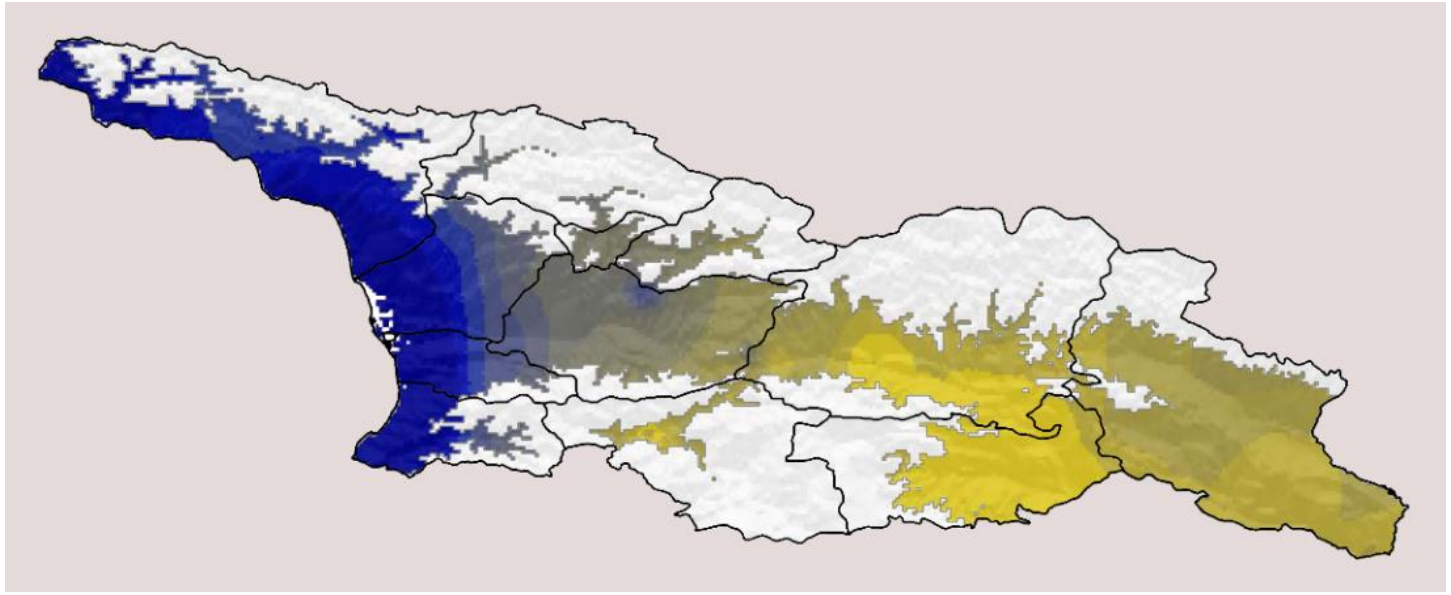
Köppen Geiger Classification

Köppen Geiger Classification (1974-2013)

The Köppen Geiger Climate Classification System is one of the most widely used systems for classifying the world's climates. Its is based on the annual and monthly averages of temperature and precipitation (Köppen, 1936, Geiger, 1954) and classifies the Georgian areas in the following types:

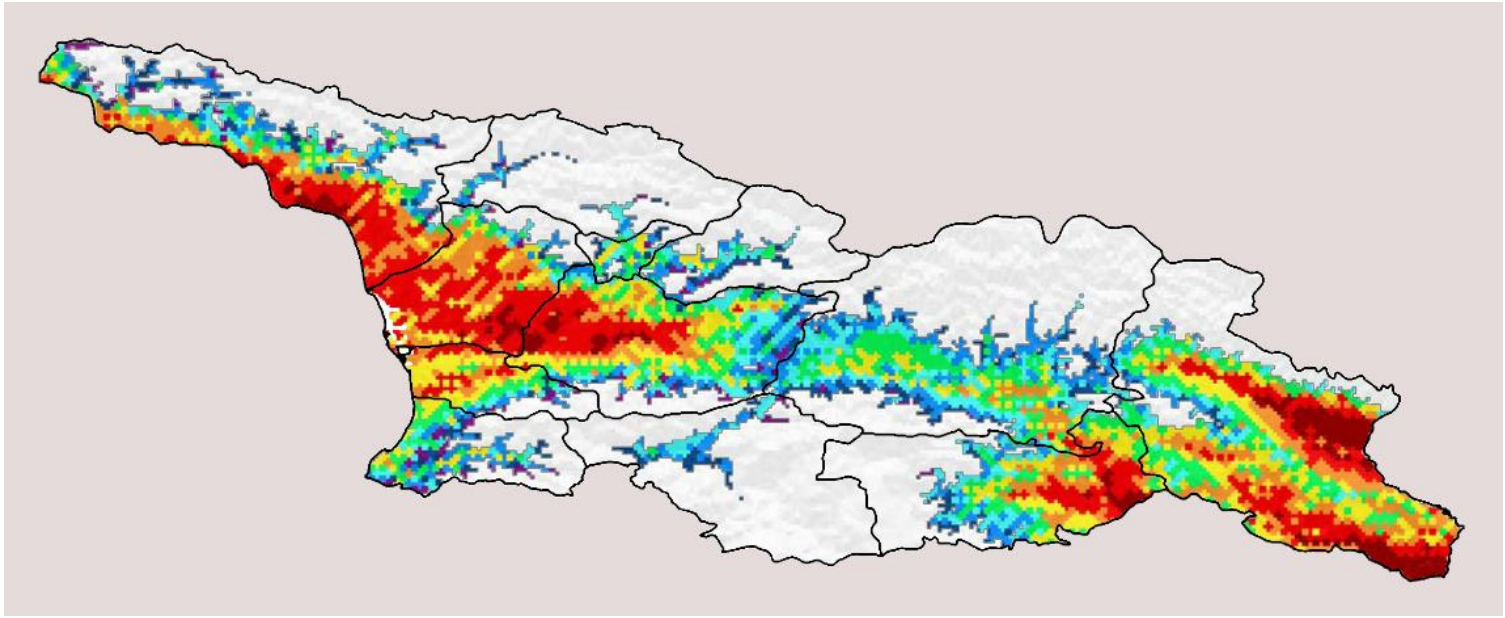
- ET – Polar and Alpine climate
- Dfa – Continental fully humid climate with a hot summer
- Dfb - Continental fully humid climate with a warm summer
- Dfc - Continental fully humid climate with a cool summer
- Cfa – Warm temperature fully humid climate with a hot summer
- Cfb - Warm temperature fully humid climate with a warm summer
- Cfc - Warm temperature fully humid climate with a cool summer
- Bsk – Arid steppe cold climate


ALTITUDINAL
BELTS [m]
1000 < 1250
750 < 1000
500 < 750
250 < 500
0 < 250



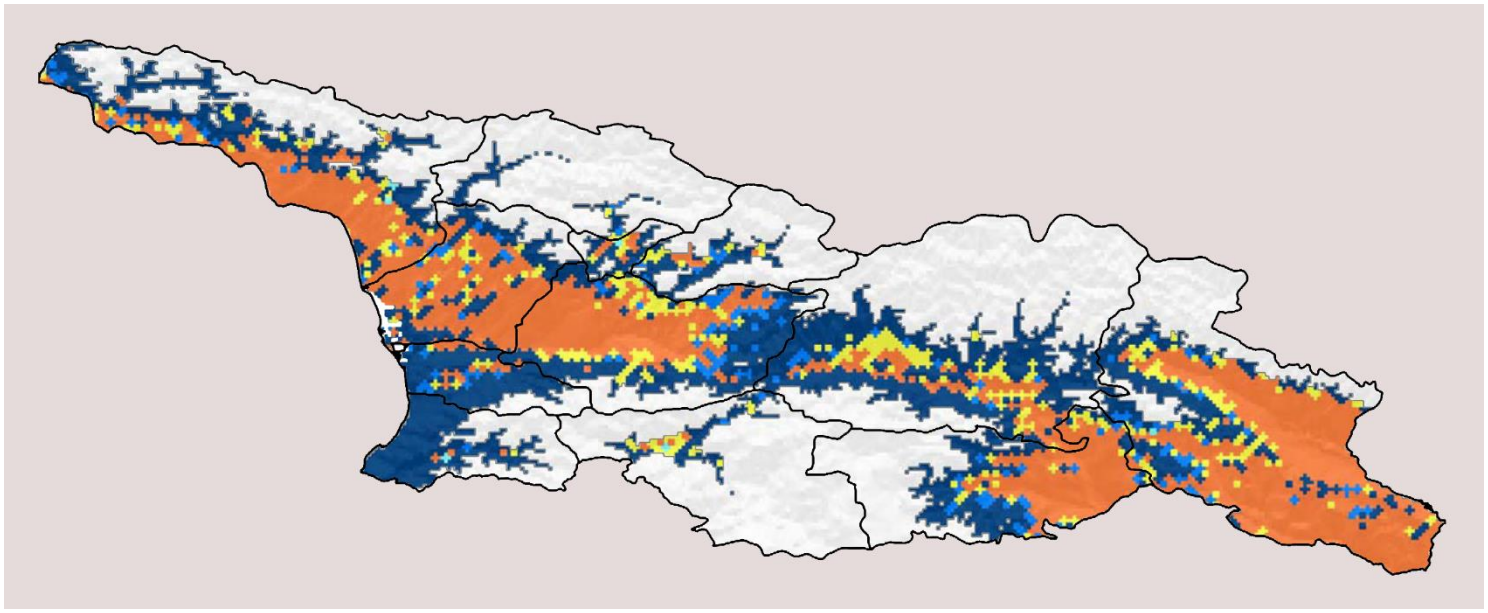
YEARLY PRECIPITATION
[mm]

- 1900 – 2000
- 1800 – 1900
- 1700 – 1800
- 1600 – 1700
- 1500 – 1600
- 1400 – 1500
- 1300 – 1400
- 1200 – 1300
- 1100 – 1200
- 1000 – 1100
- 900 – 1000
- 800 – 900
- 700 – 800
- 600 – 700
- 500 – 600
- 400 – 500



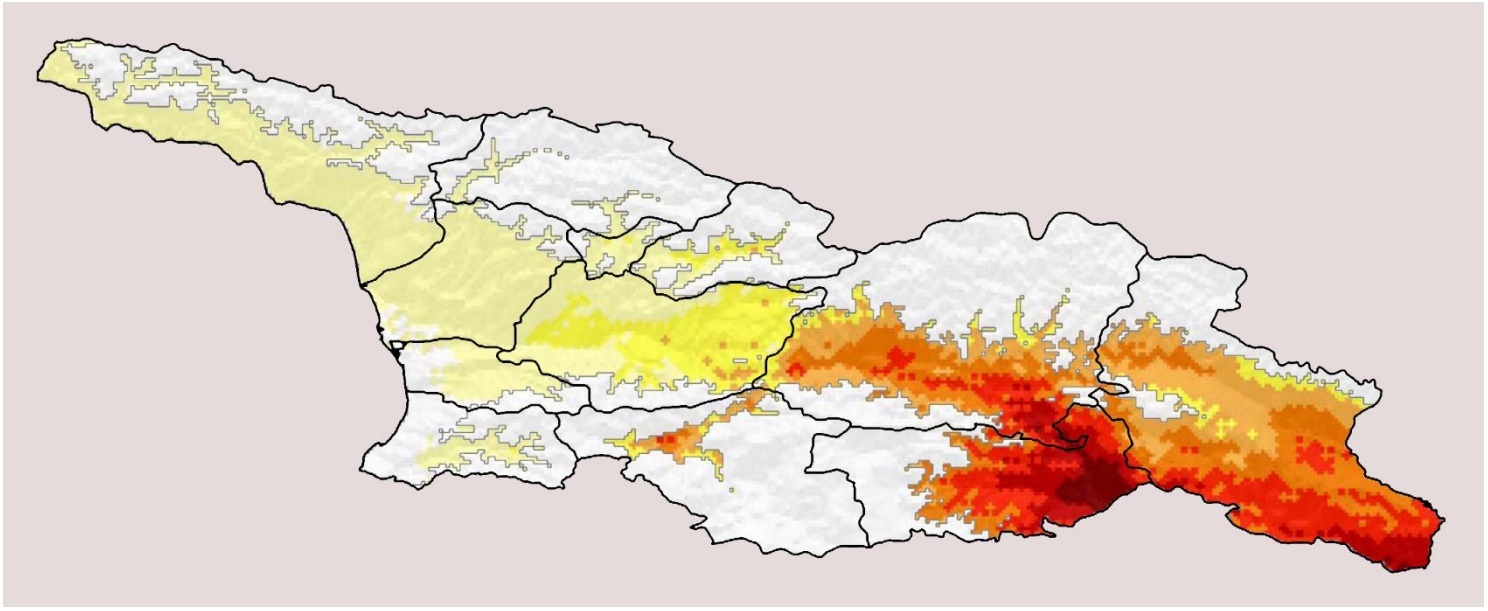
WINKLER INDEX

- >2600
- 2350-2600
- 2100-2350
- 1850-2100
- 1600-1850
- 1350-1600
- 1100-1350
- 850-1100
- <850



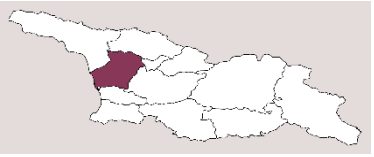
SUMMER STRESS RISK

- very high
- high
- medium
- low
- very low

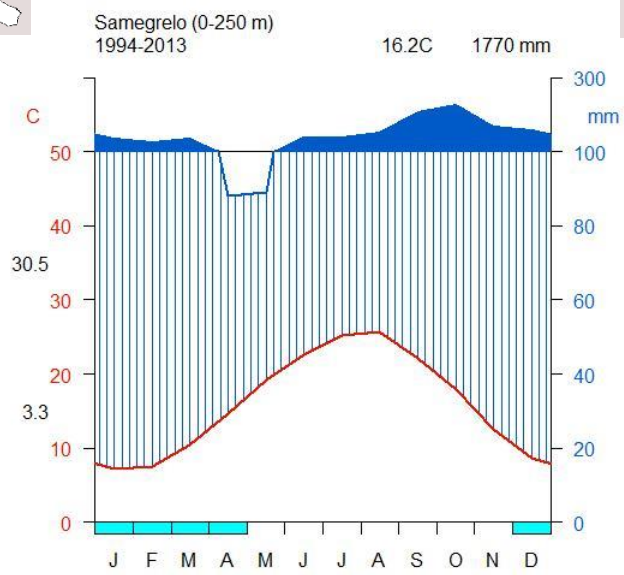


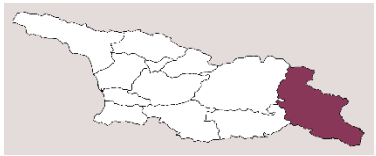
Water Shortage(awc=100) [days]

- 0
- >90
- 75-90
- 60-75
- 45-60
- 30-45
- 15-30
- 1-15

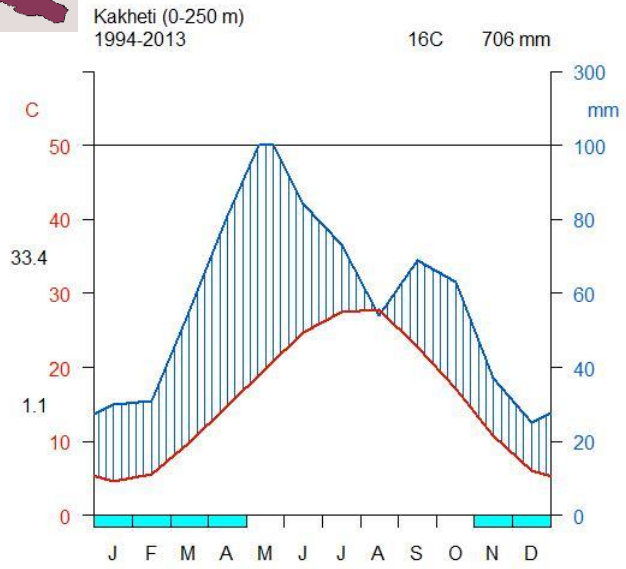


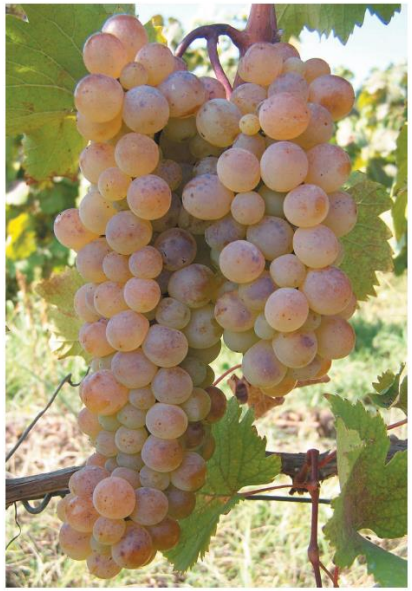
SAMEGRELO



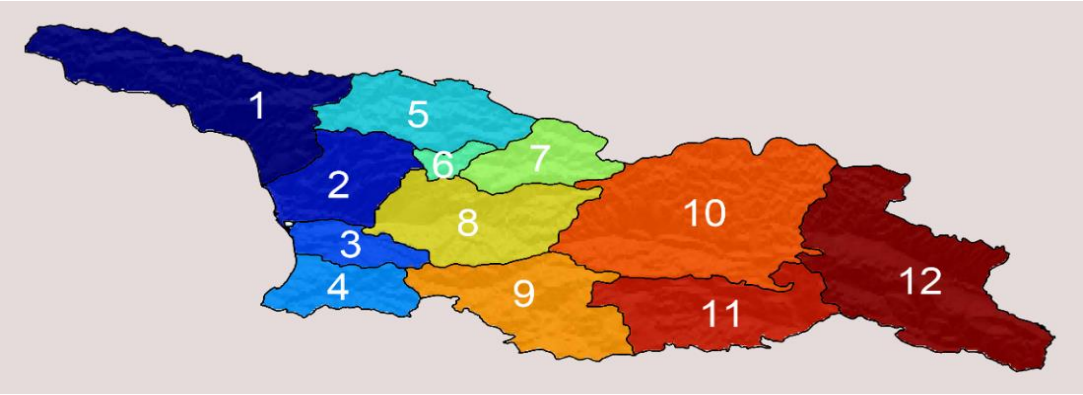


KAKHETI





VITICULTURAL AREAS	RECOMMENDED VARIETIES	
	COLORED	WHITE
1 – Abkhazeti 5 - Svaneti	Amlakhu N Kaghighi N Absuaj N Lakoaj N Ojaleshi N Chkhaveri N	Avasikhva B Agshibi B Akabuli B Khapshira B Khunaliji B Tsolikouri B Krakhuna B
2 - Samegrelo	Ojaleshi N Godaaturi N Chvitiluri N	Chechipeshi B
3 - Guria	Chkhaveri N Jani N Mtevandidi N Skhilatubani N	Sakmiela B
4 - Adjara	Mekrenchkhi N Burdzghala N Jineshi N Satsuri N Batomura N	Brola B Khopaturi B Klarjuli B Kviristava B Shvashura B
7 – Racha 6 - Lechkhumi	Alexandrouli N Mujurtetuli N Orbeluri Ojaleshi N Usakhelouri N Rachuli Dzelshavi N	Tsulukidzis tetra B Tsolikouri B
8 - Imereti	Aladasturi N Dzelshavi N Otskhanuri sapere N Argvetuli Sapere N Rko N Adanasuri N Bzvanura N Dondghlabi shavi N Vani N Chkhaveri N	Goruli mtsvane B Krakhuna B Tsolikouri B Tsitska B Kvishkhuri B Dondghlabi B Bazaleturi B Kundza tetri B Tklapa B



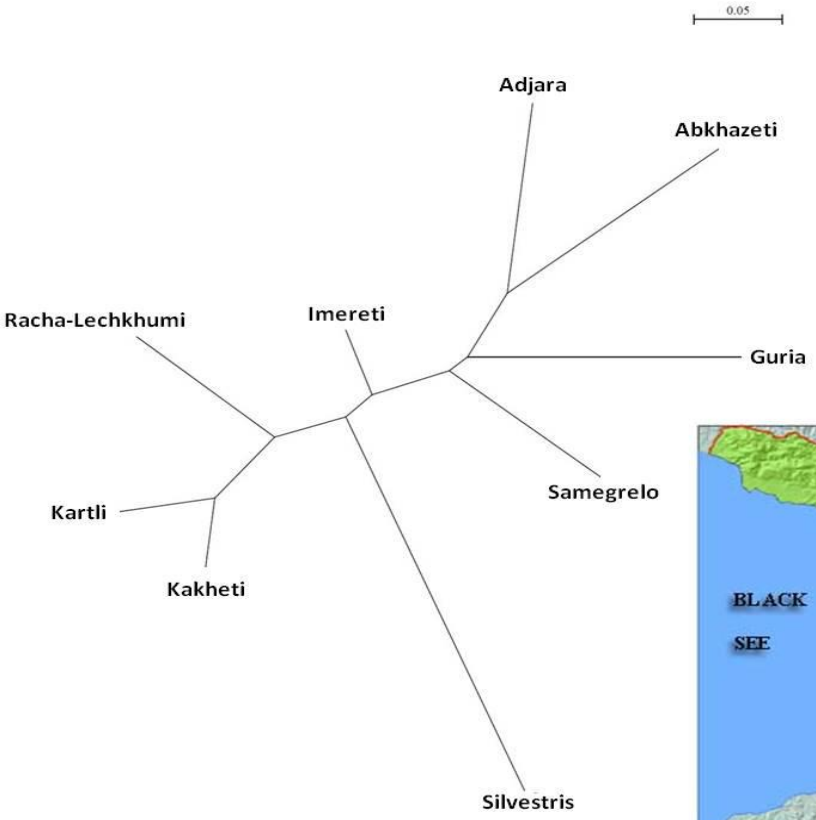
VITICULTURAL AREAS	RECOMMENDED VARIETIES	
	COLORED	WHITE
9 10 11 - Kartli	Tavkveri N Asuretuli shavi N Shavkapito N Saperavi budeshuriseburi N Saperavi N Dzelshavi N	Chinuri B Goruli mtsvane B Rkatsiteli B Budeshuri B Jvari B Adreuli B Aragvispiruli B Grdzelmtevana B Melikuda B Chrola kartlis B Kharistvala B
12 - Kakheti	Saperavi N Tavkveri N Budeshuri tsiteli N Ikaltos tsiteli N	Rkatsiteli B Kisi B Mtsvane kakhuri B Khikhvi B Muskaturi rkatsiteli B Chinuri B Mtsvivani kakhuri B Sapena B Kunsi tetri B

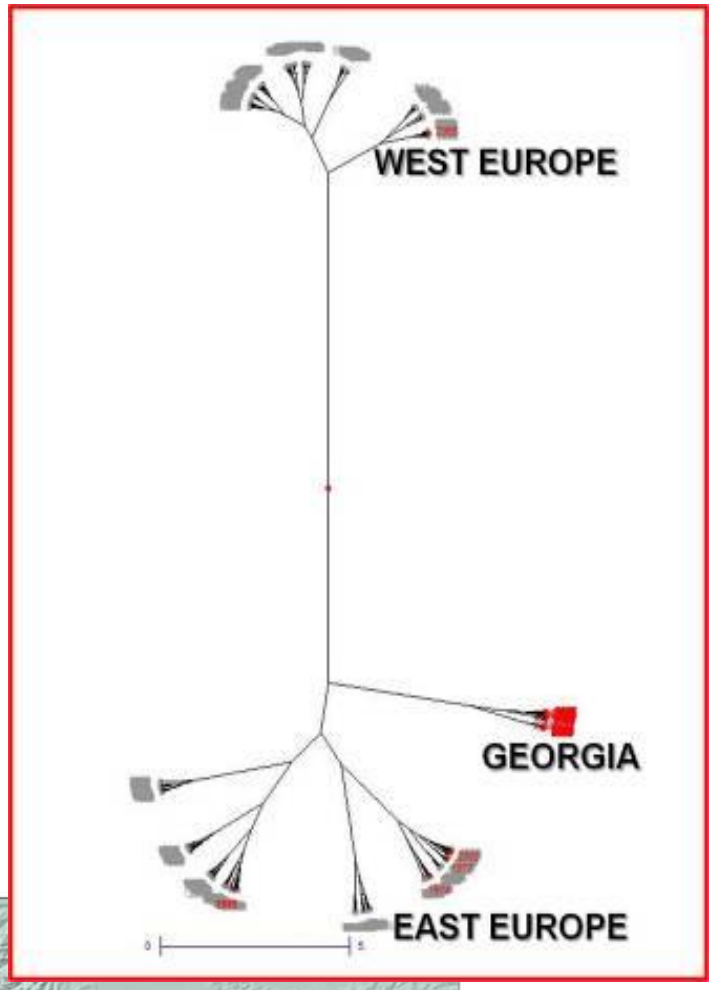
Tree Genetics & Genomes
DOI 10.1007/s11295-013-0597-9

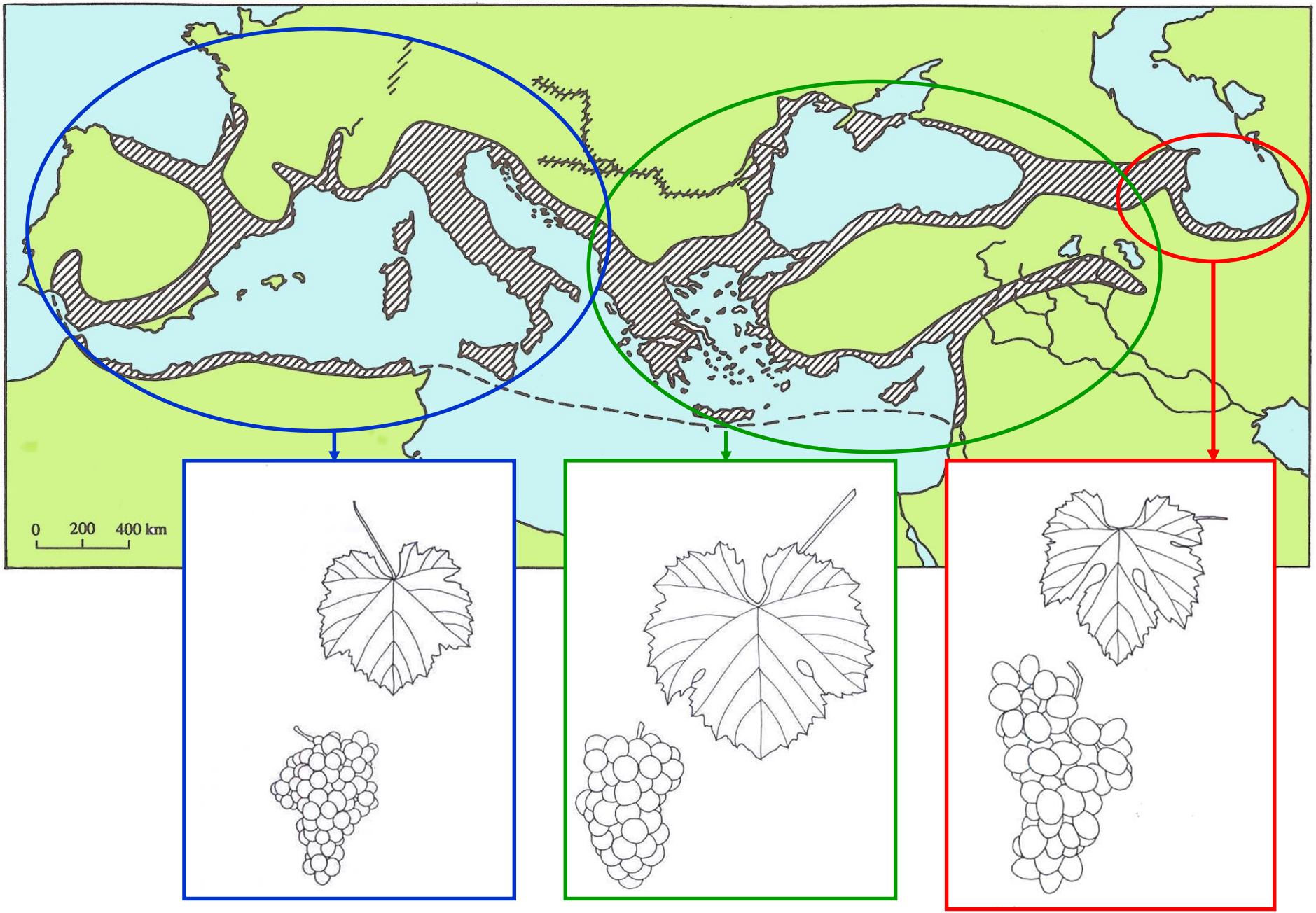
OPINION PAPER

From the cradle of grapevine domestication: molecular overview and description of Georgian grapevine (*Vitis vinifera* L.) germplasm

Serena Imazio · David Maghradze · Gabriella De Lorenzis · Roberto Bacilieri · Valérie Laucou · Patrice This · Attilio Scienza · Osvaldo Failla






0 200 400 km
Proles occidentalis
Proles pontica
Proles orientalis

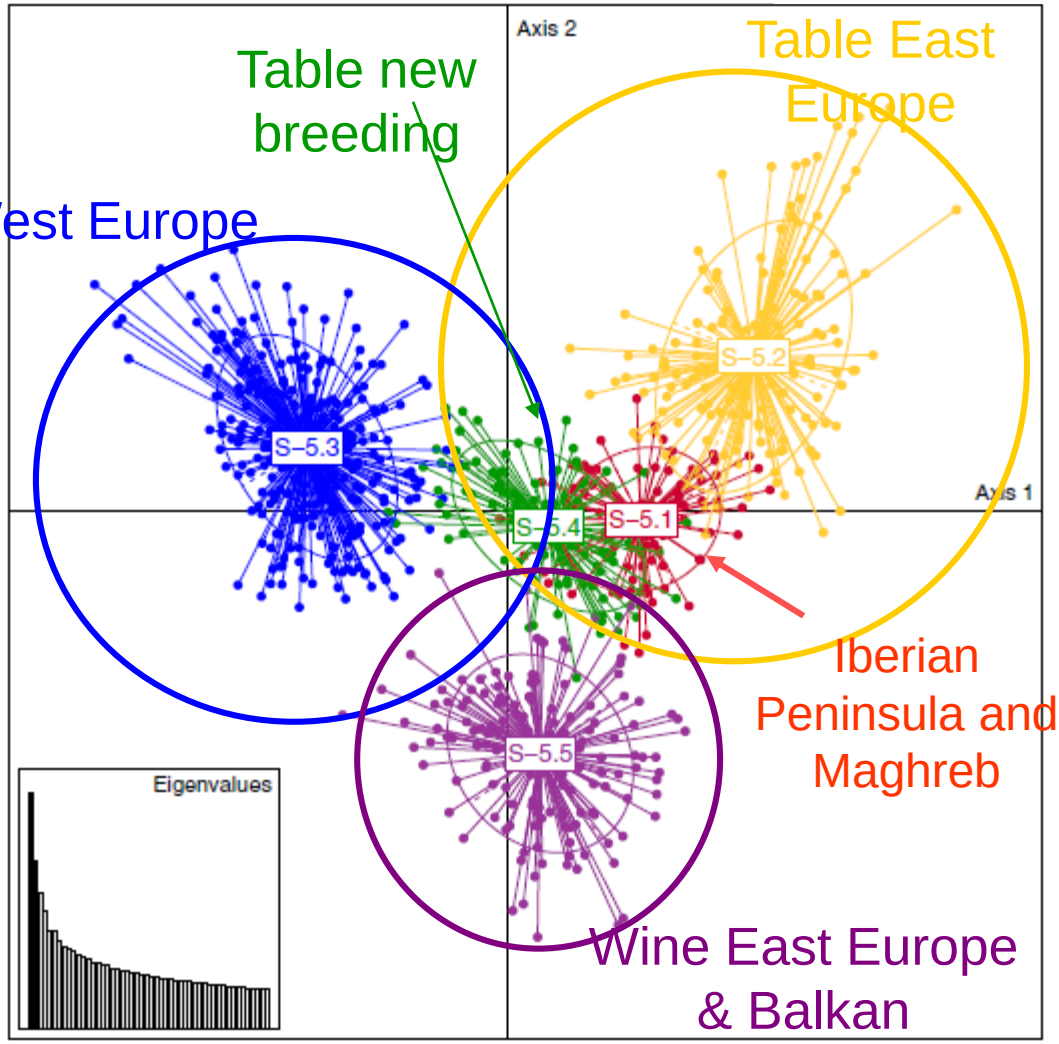
Bacilieri et al. BMC Plant Biology 2013, 13:25
http://www.biomedcentral.com/1471-2229/13/25

BMC Plant Biology

RESEARCH ARTICLE Open Access

Genetic structure in cultivated grapevines is linked to geography and human selection

Roberto Bacilieri[1*], Thierry Lacombe[1,2], Loïc Le Cunff[3], Manuel Di Vecchi-Staraz[1], Valérie Laucou[1], Blaise Genna[2], Jean-Pierre Péros[1], Patrice This[1] and Jean-Michel Boursiquot[4]



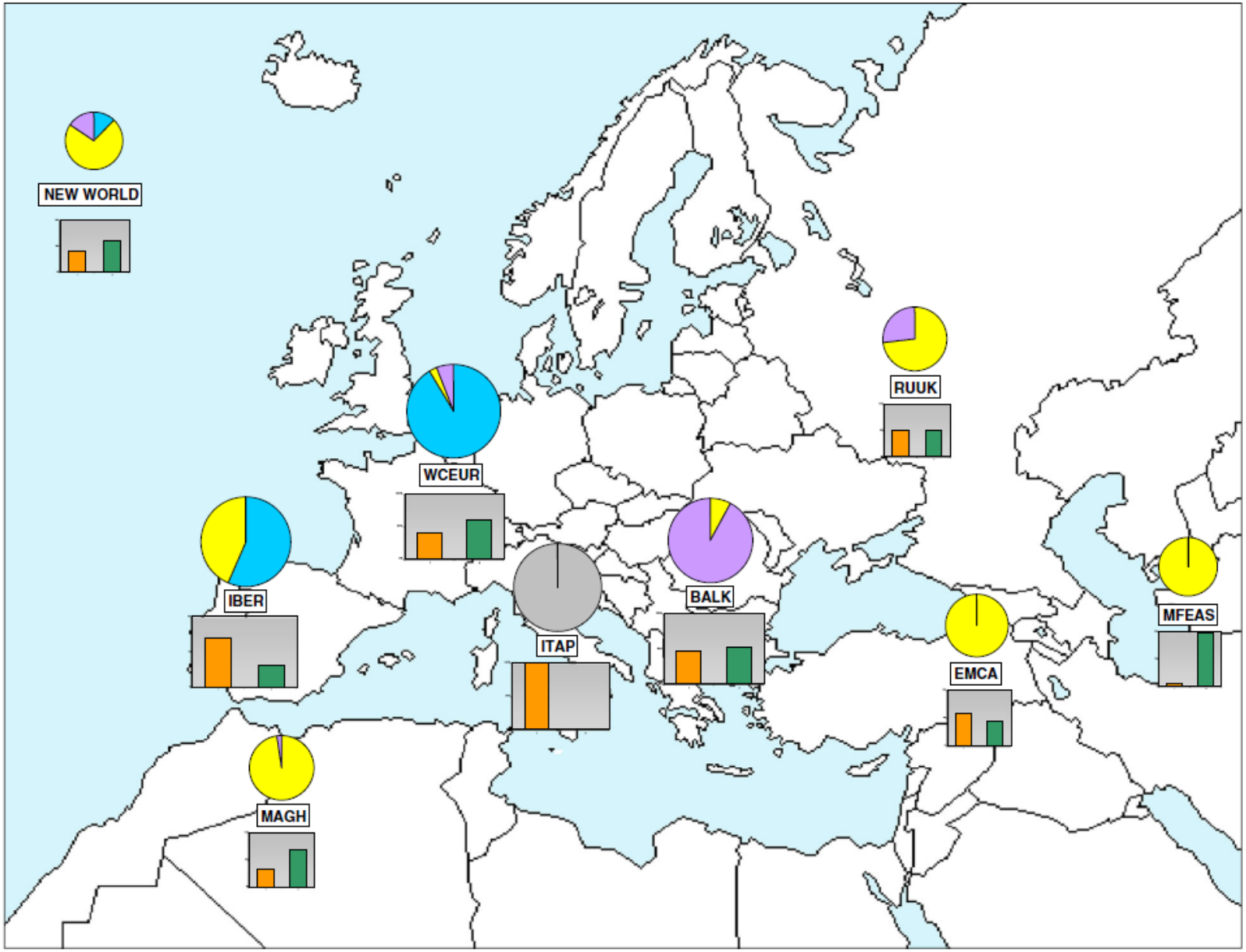
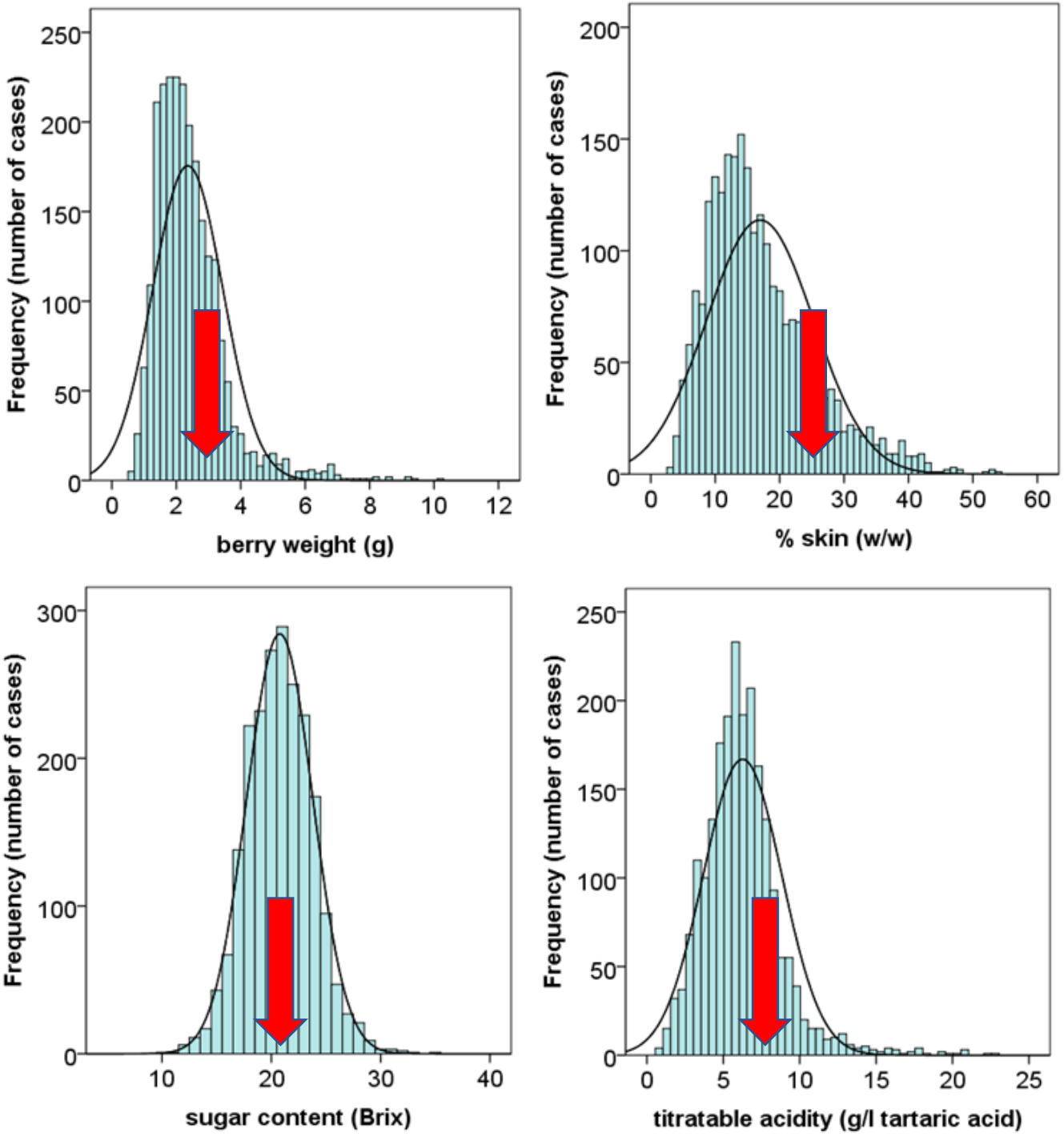


Figure 3 Genetic composition of the geographic groups. Genetic composition of the geographic groups for the Ks = 3 of STRUCTURE. For the detailed country list, see Table 1. The histograms represent the percentage of non-admixed (green) versus admixed (orange) genotypes. For the non-admixed cultivars, the pies represent the proportion of each cluster in each region: Table / East (yellow); Wine / Balkans and East-Europe (violet); Wine / West and Central Europe (blue). As 100% of the Italian genotypes are admixed, the ITAP pie is empty (grey).

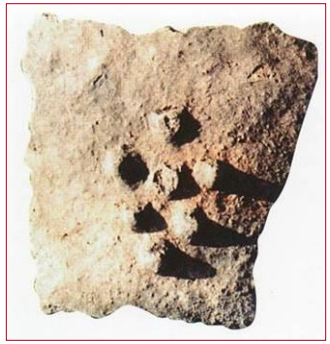

Frequency (number of cases)
250
200
150
100
50
0
0
2
4
6
8
10
12
berry weight (g)
Frequency (number of cases)
200
150
100
50
0
0
10
20
30
40
50
60
% skin (w/w)
Frequency (number of cases)
300
200
100
0
10
20
30
40
sugar content (Brix)
Frequency (number of cases)
250
200
150
100
50
0
0
5
10
15
20
25
titratable acidity (g/l tartaric acid)

Perché i vitigni georgiani?

- Centro primario di domesticazione (6° millennio a.C.)
- Oltre 500 vitigni noti e descritti
- Pool genetico chiaramente differenziato da est ed ovest Europa.
- Ampia variabilità interna.
- Assenza di relazioni di parentela stretta tra le cvs.

Tratti di interesse per una viticoltura sostenibile:

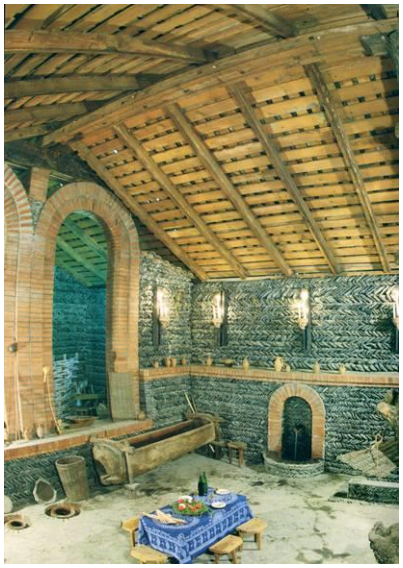
- ✓ maturazione tardiva
- ✓ buona acidità
- ✓ zuccheri medi
- ✓ antociani medi o elevati
- ✓ tannini “maturi”
- ✓ tolleranza / resistenza agli stress estivi
- ✓ tolleranza / resistenza alle malattie

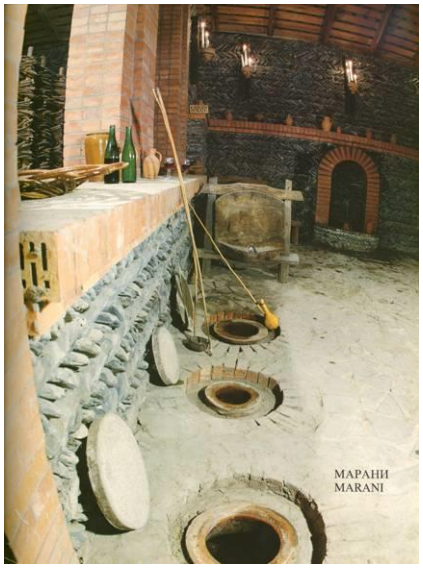


Khramis didi gora (6-5° millennio a.C)

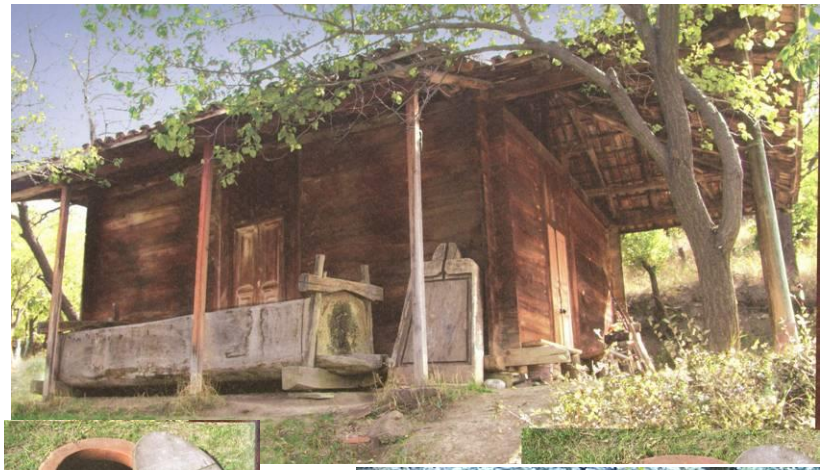
MARANI: la cantina georgiana

Marani in pietra

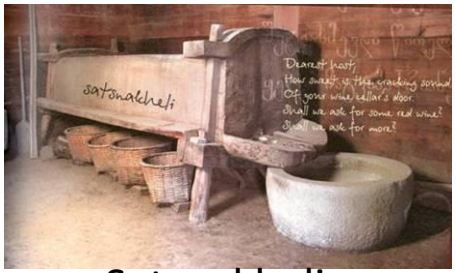




Marani in legno



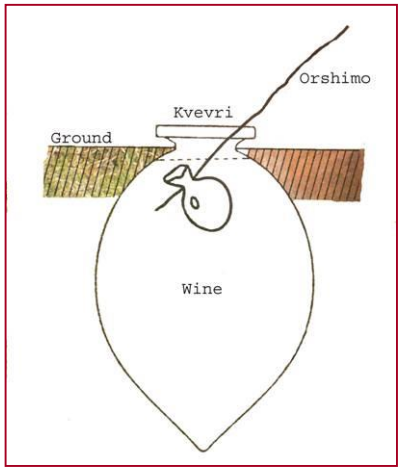
Scavi di Marani-Urbnisi. 4° sec. a.C



Satsnakheli

Kvevri (*Tchuri*) – il vaso vinario tradizionale in terracotta per la vinificazione e la conservazione del vino

Prima dell'interramento nel suolo



Dopo l'interramento

Rustavi (7° sec. a.C.)

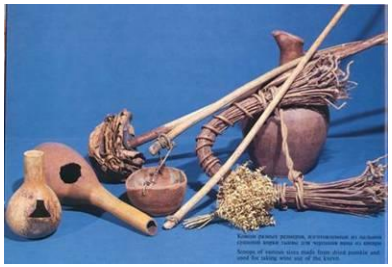
7° sec. d.C.

Fabbricazione del *Kvevri*

Kvevri (Sinonimo '*Tchuri*') è un vaso tradizionale conico per la vinificazione e la conservazione del vino che si è mantenuto nel corso della storia.

Interrato consente di fermentare il mosto a temperatura quasi costante (14-15^{0}C).

La fermentazione dura 3-4 mesi.



Strumenti per la vinificazione e la pulizia del *Kvevri*

Tecnologie tradizionali di vinificazione

Per vino biancho

processi	metodo kakhetiano	metodo imeretiano	metodo europeo
Fermentazione in	Kvevri	Kvevri	tino
Vinacce nel mosto (%)	100	4-6	0
Contatto con le vinacce	3-4 mesi	3-4 mesi	0
Contenuto in alcol	11-13	10,5-12,5	11-12
Acidità, g/l	4.0-5.5	6.8-8.0	
Colore del vino	The scuro	Miele	Giallo chiaro
Carateristiche del vino	tannico	Acido ma equilibrato	Meno acido, più delicato

Vino frizzante naturale "Atenuri" *– 0.1-0.2% di vinacce. Fermentazione a bassa temperatura in Kvevri. Conservazione con un livello di zuccheri del 1-2%. Bianco.*

Vini semi dolci naturali *- Fermentazione a bassa temperatura di mosti molto zuccherini (23-26%). Zuccheri residui 3-5%. Filtrazione e imbottigliamento pastorizzazione e conservazione e trasporto a freddo.* ***Kindzmarauli, Khvatchkara, Ojaleshi, Akhasheni, Tvishi, Chkhaveri, Usakhelouri.***