ADAPTATION OF VINE PROPAGATION MATERIALS: TRENDS AND EVOLUTION IN ITALY

Paris April, 1st 2022

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ITALIAN VITICULTURE: REFERENCE CONTEXT

671.000 Hectares

16,2 % Bio surface

+ 245% Bio surface in 20 years

42-55 MM/hl produced

14ML/€ value of national wine production

310.000 companies

20,5 MM/hl Export

1,2 MM occupied

78 DOCG

7.000 labels

7.500 wineries

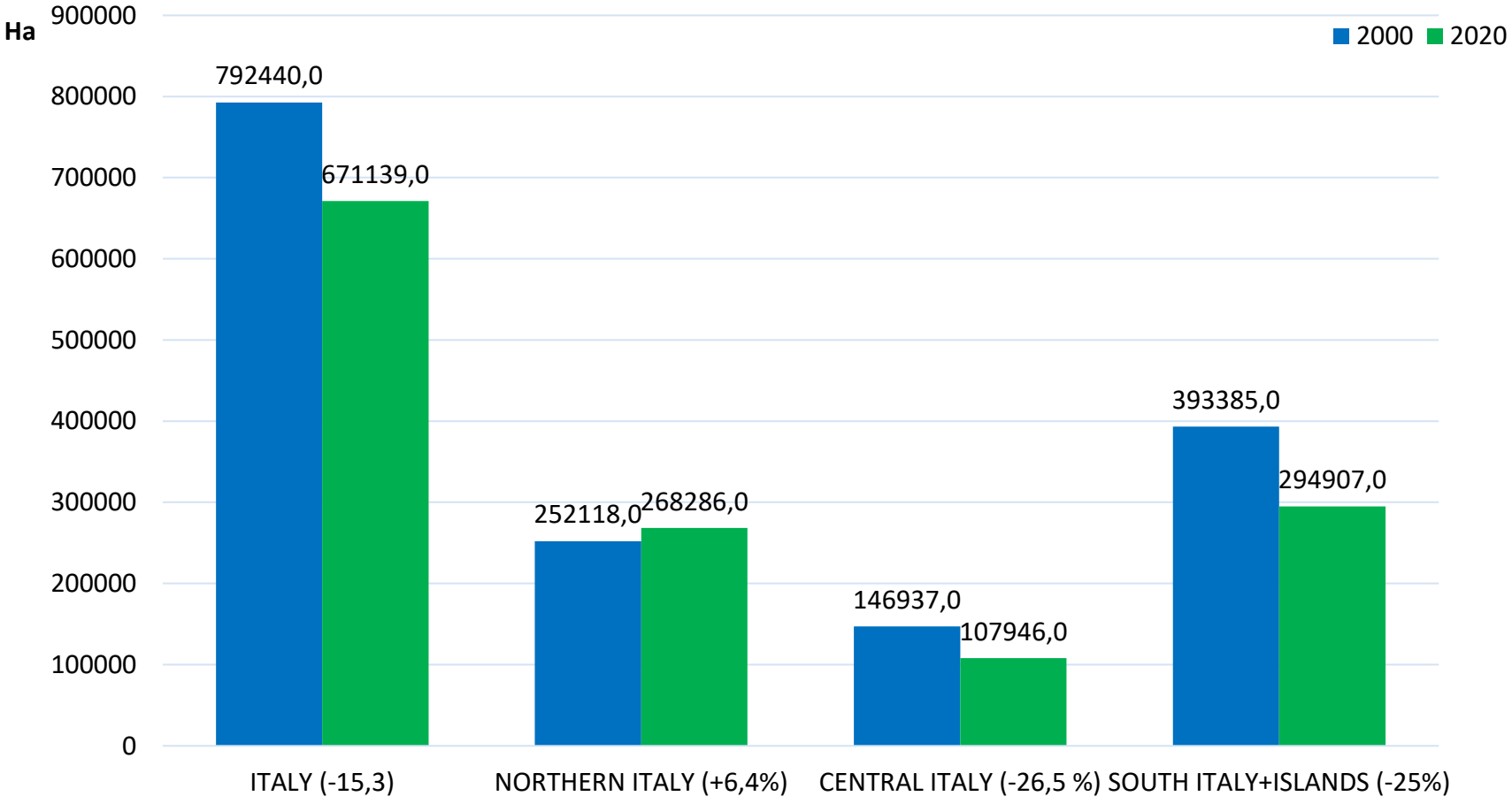
341 DOC

-12% consumption in 10 years

-15,3 % surface in 20 years

118 IGT

TREND OF VINEYARD SURFACE IN ITALY (Ha)



NURSERIES

400 nurseries

130/140 MM yearly production of grafted vine plants

2,3 MM of hybrid grafted vine plants

80 MM of VCR grafted vines per year

30/40 MM export

646 propagated varieties (60 table and 586 wine)

162 foreign

484 local Italian and international

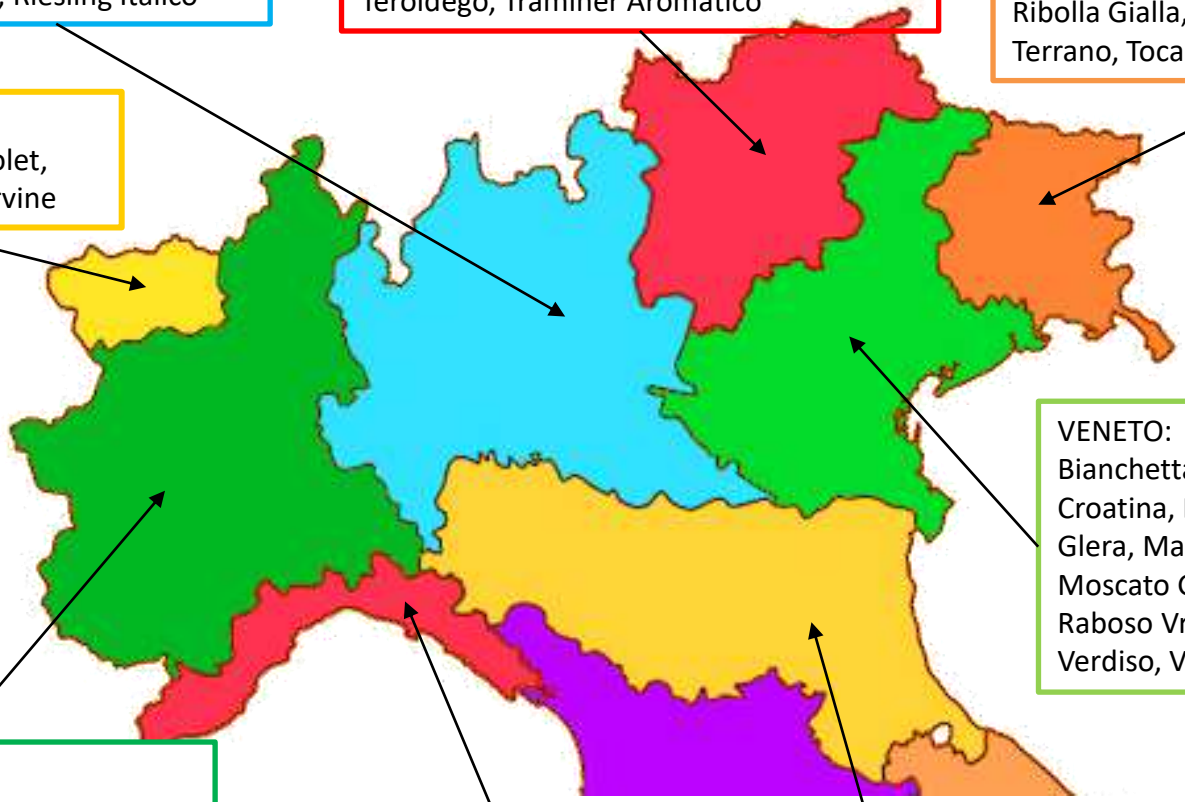
VINE CULTIVARS OF ITALY: The North

LOMBARDY:
Bonarda, Groppello, Lumassina, Riesling Italico

TRENTINO ALTO-ADIGE:
Lagrein, Marzemino, Moscato Rosa, Muller Thurgau, Rebo, Schiava Gentile, Sylvaner, Teroldego, Traminer Aromatico

FRIULI V.G.:
Malvasia Istriana, Picolit, Pignolo, Refosco, Ribolla Gialla, Schioppettino, Tazzelenghe, Terrano, Tocai Friulano, Verduzzo Friulano

AOSTA VALLEY:
Cornalin, Fumin, Mayolet, Petit Rouge, Pertite Arvine



VENETO:
Bianchetta, Boschera, Corvina Vr., Croatina, Dorona, Durella, Garganega, Glera, Manzoni Bianco, Verdicchio, Moscato Giallo, Oseleta, Raboso P., Raboso Vr., Rondinella, Tocai Rosso, Verdiso, Vespaiola, Verduzzo Tv.

PIEDMONT:
Albarossa, Arneis, Barbera, Brachetto, Cortese, Dolcetto, Erbaluce, Favorita, Freisa, Gamba Rossa, Grignolino, Moscato bianco, Nebbiolo, Ruché, Timorasso

LIGURIA:
Albarola, Bosco, Granaccia, Pigato, Rossese

EMILIA-ROMAGNA:
Albana, Ancellotta, Famoso, Fortana, Lambrusco Salamino, Lambrusco di Sorbara, Malbo Gentile, Malvasia Aromatica di Candia, Ortrugo, Pignoletto

VCR
VIVAI COOPERATIVI RAUSCEDO

VINE CULTIVARS OF ITALY: The Centre

MARCHE:
Bianchello, Garofanata, Lacrima di Morro d'Alba, Maceratino, Verdicchio

UMBRIA:
Grechetto Orvieto, Sagrantino, Trebbiano Spoletino

TUSCANY:
Aleatico, Canaiolo, Ciliegiolo, Colorino, Foglia Tonda, Malvasia del Chianti, Mammolo, Pugnitello, Sangiovese, Vernaccia di San Gimignano

LATIUM:
Abbuoto, Bellone, Bombino Bianco, Cesanese, Malvasia del Lazio, Maturano, Moscato di Terracina, Nero Buono

VINE CULTIVARS OF ITALY: The South

MOLISE:
Tintilia

APULIA:
Bombino Nero, Malvasia Nera, Negroamaro, Primitvo, Susumaniello, Nero di Troia

ABRUZZO:
Cococciola, Passerina, Pecorino, Trebbiano Toscano, Montepulciano

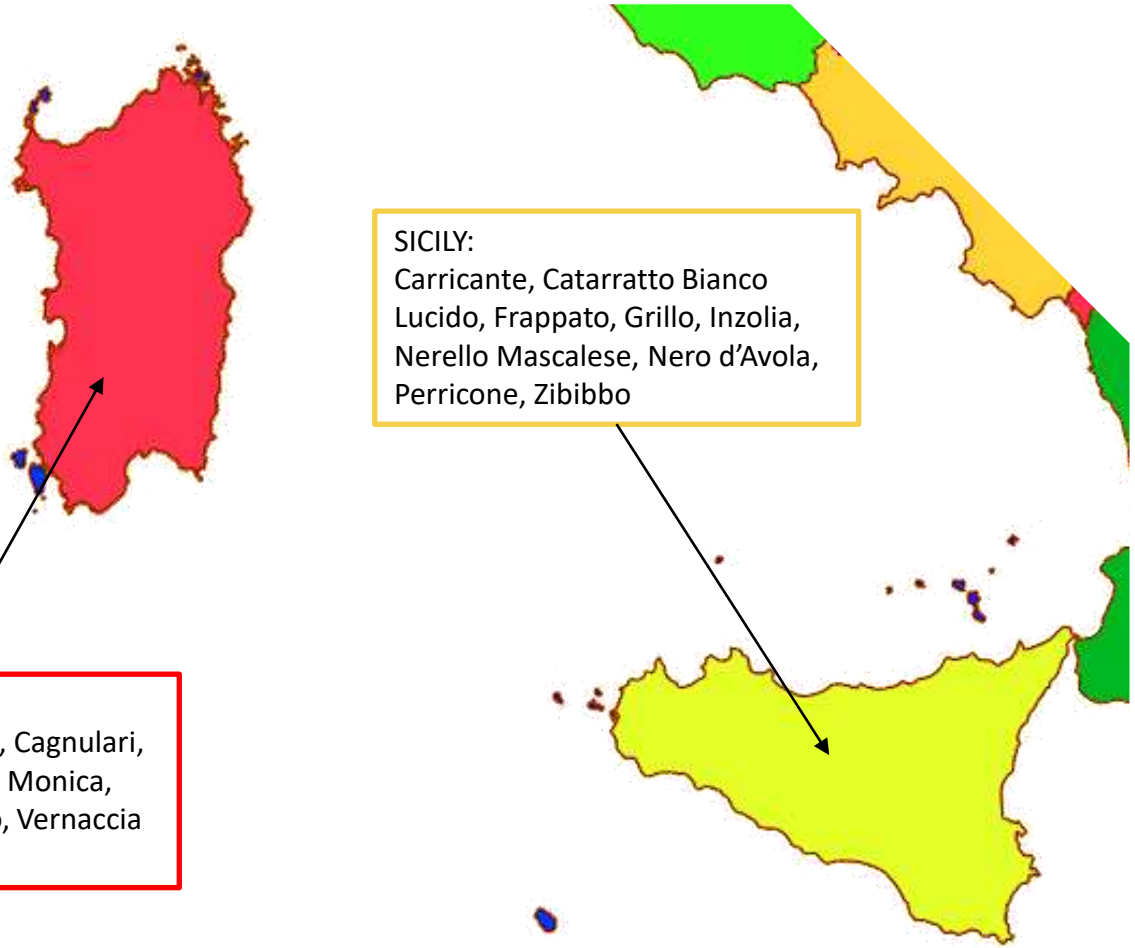
BASILICATA:
Aglianico del Vulture

CAMPANIA:
Aglianico del Taburno, Asprinio, Biancolella, Casavecchia, Coda di Volpe, Falanghina, Fiano, Greco di Tufo, Pallagrello Bianco, Pallagrello Nero, Piedirosso

CALABRIA:
Gaglioppo, Greco Bianco, Greco Nero, Magliocco, Montonico Bianco, Pecorello

VCR
VIVAI COOPERATIVI RAUSCEDO

VINE CULTIVARS OF ITALY: The Islands



SICILY:
Carricante, Catarratto Bianco Lucido, Frappato, Grillo, Inzolia, Nerello Mascalese, Nero d'Avola, Perricone, Zibibbo

SARDINIA:
Barbera Sarda, Bovale, Cagnulari, Cannonau, Carignano, Monica, Nieddera, Vermentino, Vernaccia di Oristano

DIVERSITY VITICULTURE: Grafted vines used in Italy (MM)

VARIETY	TOP TEN 2016/17	TOP TEN 2021/22	±	±%
Glera	15,7	5,6	-10,1	-64,3
Pinot Grigio	13,0	4,9	-8,1	-62,3
Sangiovese	8,0	7,2	-0,8	-10
Primitivo	3,9	7,5	+3,3	+78,6
Chardonnay	2,6	3,5	+0,9	+35
Barbera	2,5	3,3	+0,8	+32
Trebbiano T. (Ugni Blanc)	1,8	2,4	+0,6	+26
Merlot	2,0	3,6	+1,6	80
Montepulciano	2,0	2,1	+0,1	+5
Vermentino	2,0	2,5	+0,5	20
Total TOP TEN	53,5 MM (60,8%)	42,6 (54,6%)	-10,9	-20,4%
Other varieties	34,5 MM (39,2%) 450 varieties	35,4 MM (45,4%) 484 varieties	+0,9	+2,6%
Total plants used in italy	88 MM	78 MM	-10	-11,4

Fig.1

INTERNATIONAL RED VARIETIES (Bi MM)

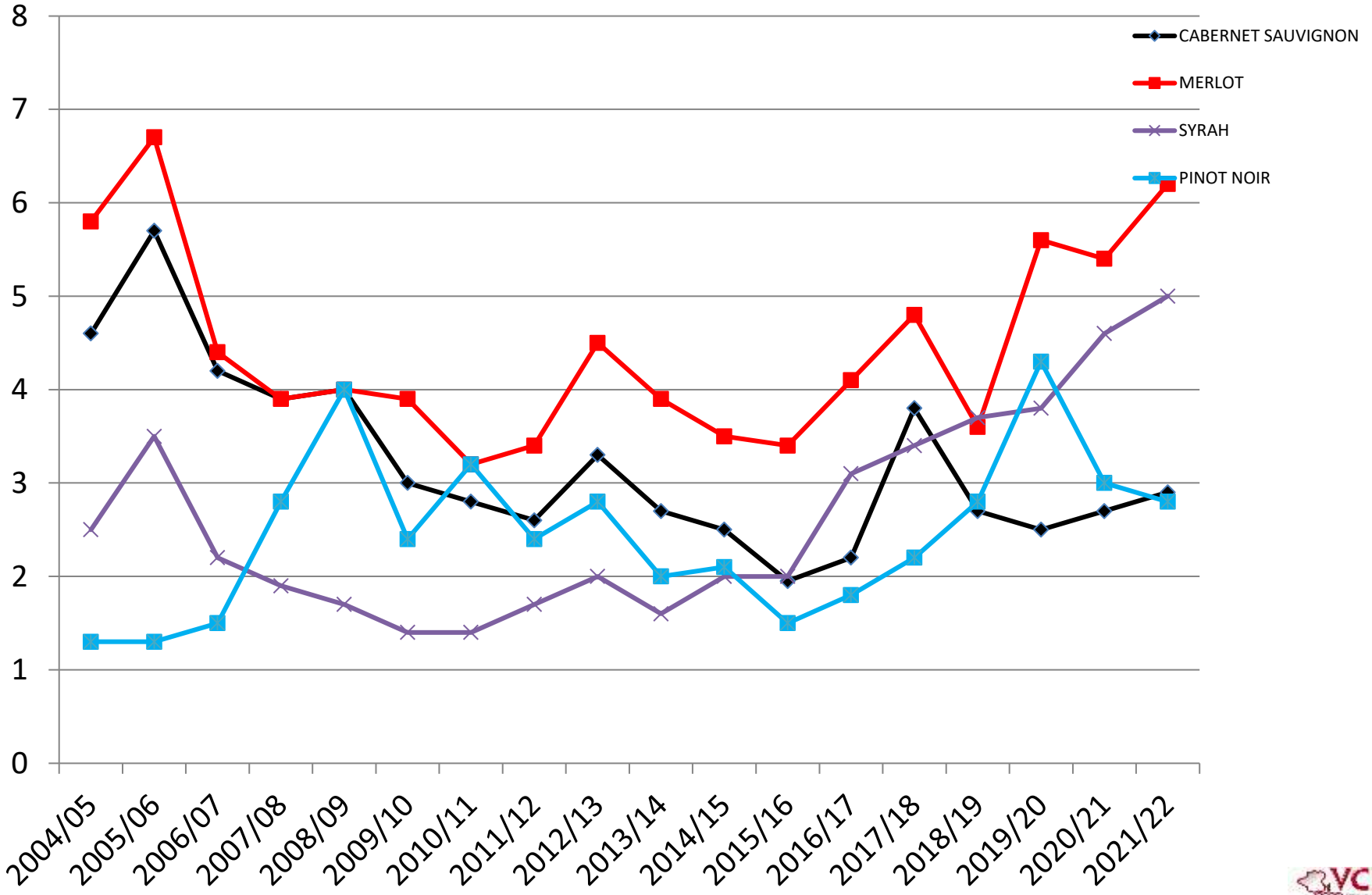
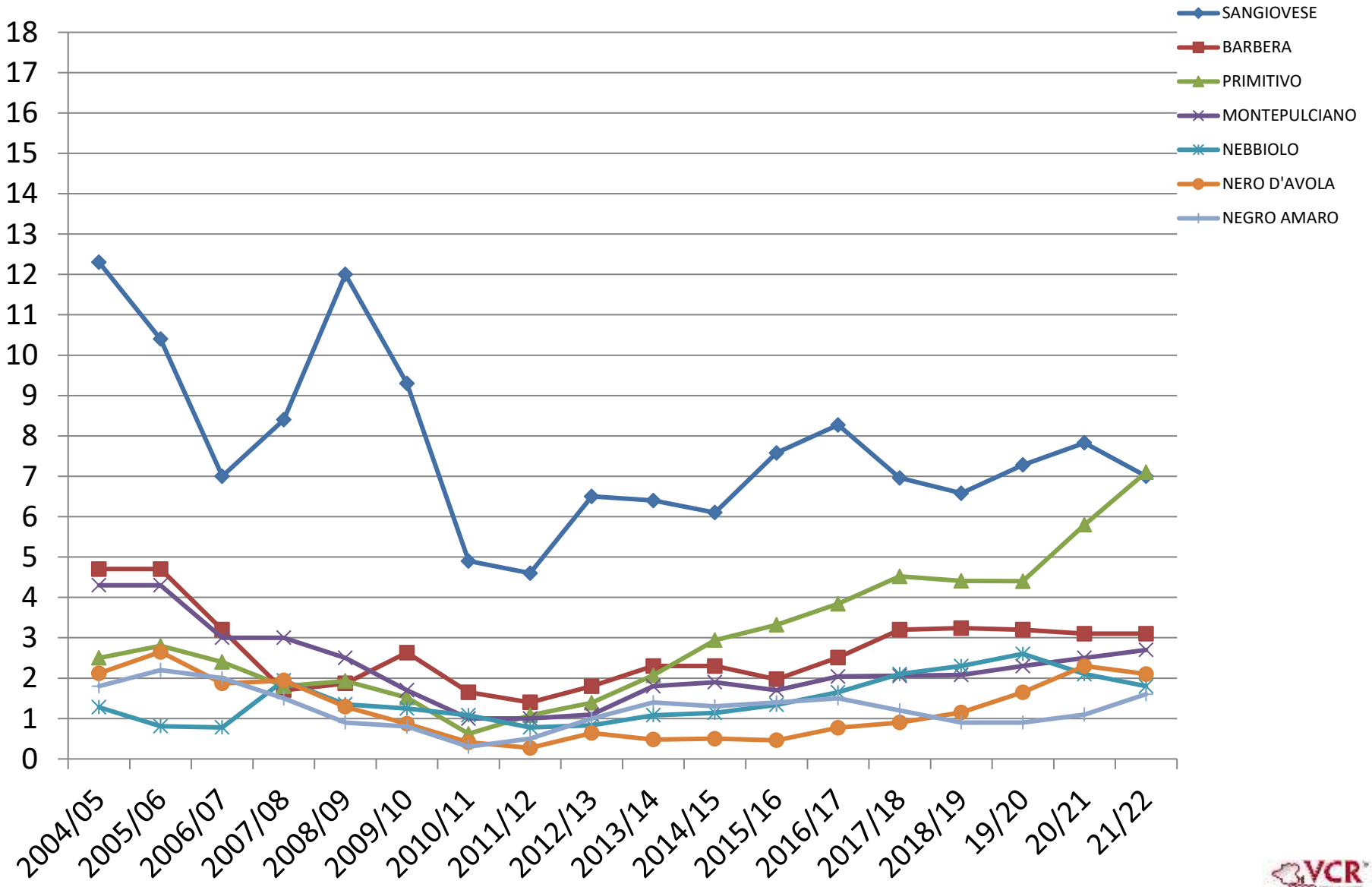


Fig.6

ITALIAN RED VARIETIES (Bi MM)



TRENDS IN THE USE OF RED VARIETIES

- PREFERENCE FOR HIGHER FERTILITY VARIETIES ENSURING GREATER PRODUCTION POTENTIAL
- INCREASING INTEREST IN LATE RIPENING VARIETIES WITH A HIGH DEGREE OF RESILIENCE TO HIGH TEMPERATURES (E.G. CABERNET SAUVIGNON, CARIGNANE, AGLIANICO)

- USE OF MERLOT, REFOSCOES, CARMENERE IN NORTH-EASTERN ITALY: WITH INCREASED AVERAGE TEMPERATURES THEY ARE ABLE TO PRODUCE MUCH SOFTER AND LESS HERBACEOUS WINES THAN IN THE PAST

- IN CENTRAL AND SOUTHERN ITALY, THE INFLUENCE OF CLIMATE CHANGE ON THE CHOICE OF VARIETIES IS ACCENTUATED: E.G. USE OF MERLOT INSTEAD OF SANGIOVESE IN TUSCANY FOLLOWING VERY HOT SUMMERS; WITHDRAWAL FROM MERLOT IN SICILY DUE TO EXCESSIVE GROWING DEGREE DAYS; USE OF NERO D'AVOLA OR SYRAH IN SICILY TO CORRECT EXCESSIVE TANNINS AND ALCOHOL CONTENT IN NERO D'AVOLA

- USE OF LESS SENSITIVE VARIETIES TO SUN BURNING, E.G. SANGIOVESE/CORVINA IN VALPOLICELLA

WATER STRESS AND SUNBURN DAMAGE

SUNBURN, DEHYDRATION OF THE GRAPES AND WATER STRESS ARE MAJOR PROBLEMS IN HILLY AREAS.
EVEN DRIP IRRIGATION HAS, IN MANY CASES, FAILED TO COMPENSATE FOR THE STRONG EVAPORATION AND TRANSPIRATION WHICH, DUE TO THE VERY HIGH TEMPERATURES IN JULY AND AUGUST, HAS LED ALMOST ALL VINEYARDS INTO MORE OR LESS SERIOUS WATER STRESS.

Fig.2

INTERNATINONAL WHITE VARIETIES (grafted vines MM)

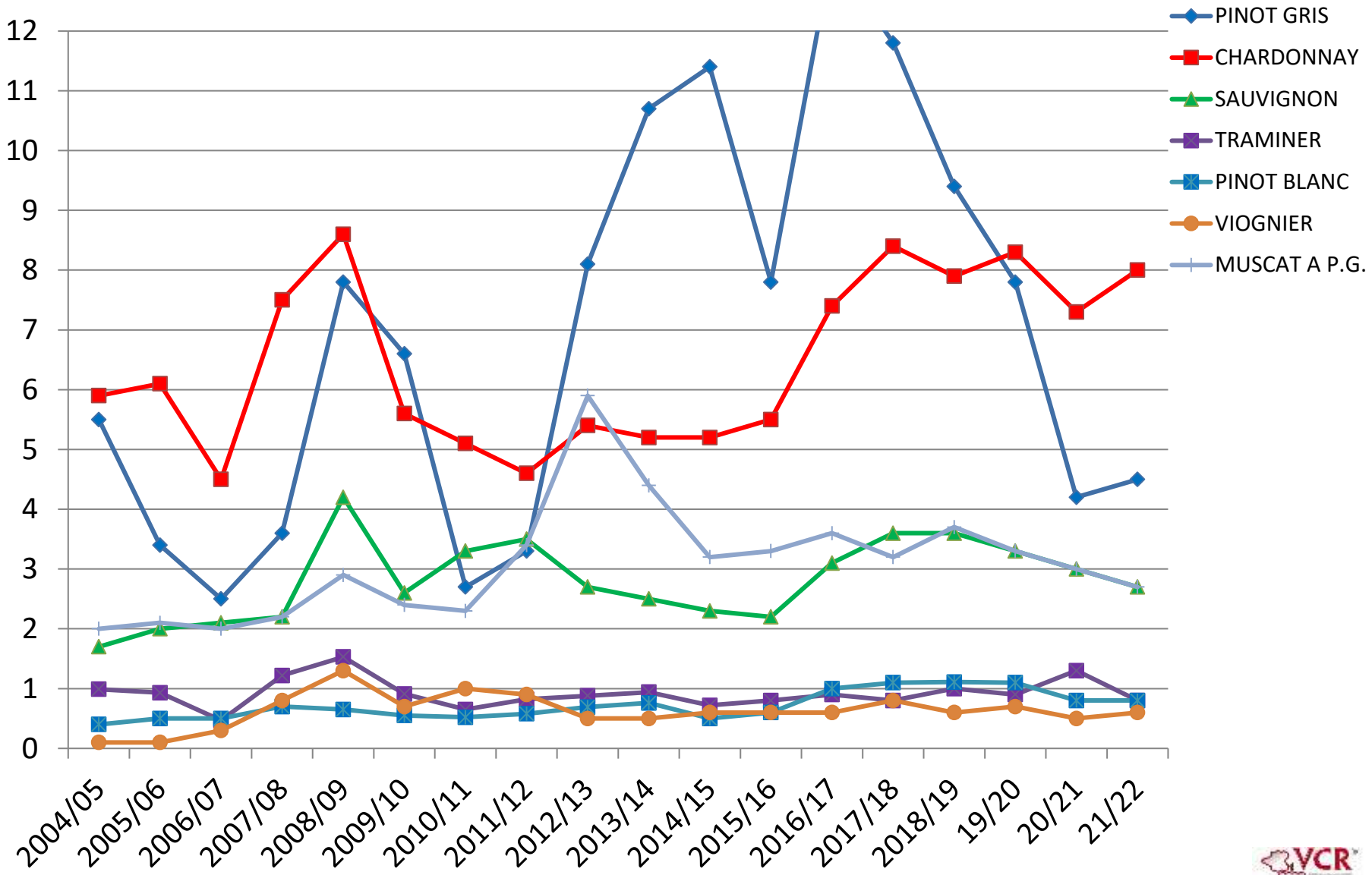


Fig.3

ITALIAN WHITE VARIETIES

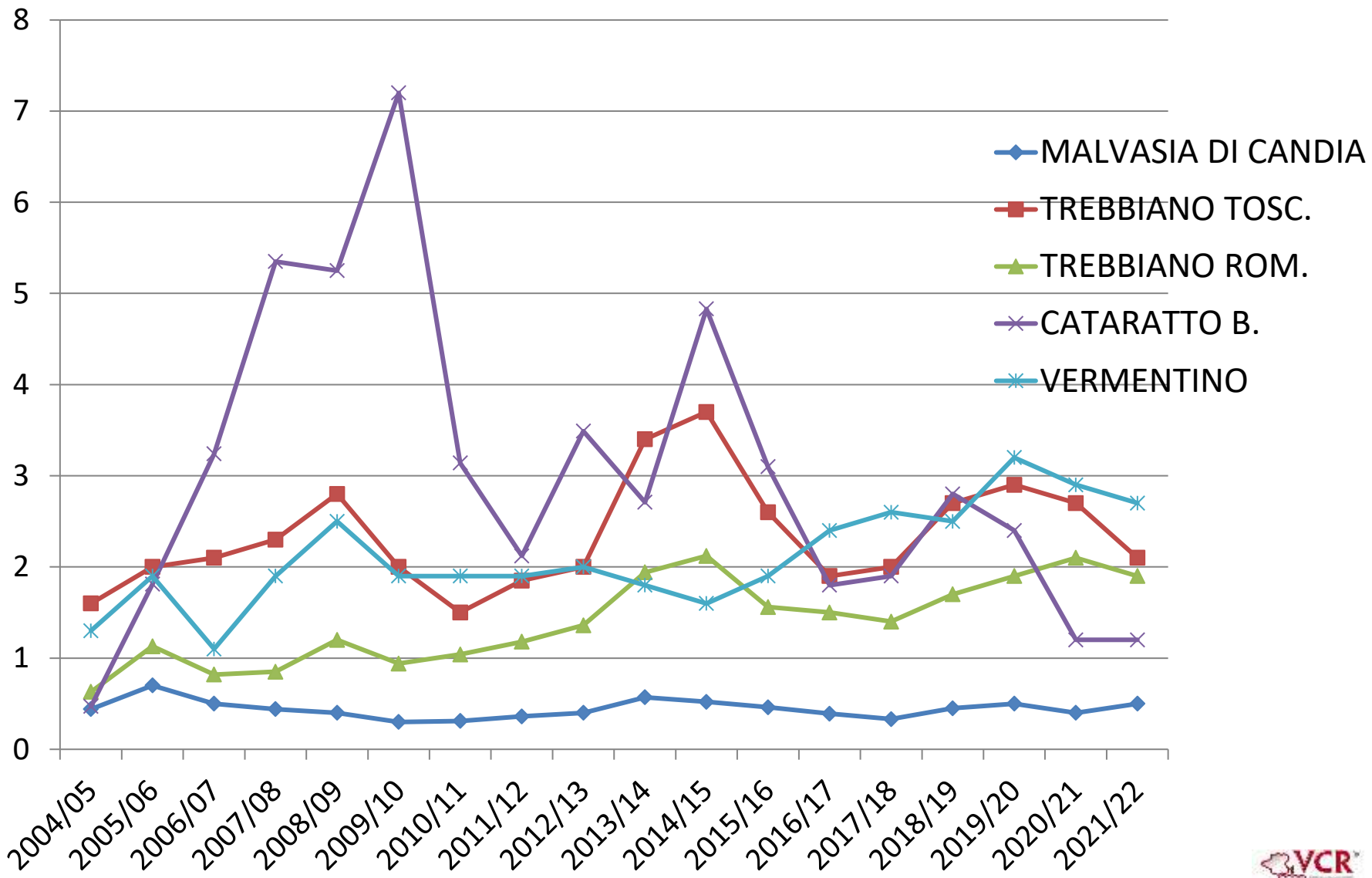
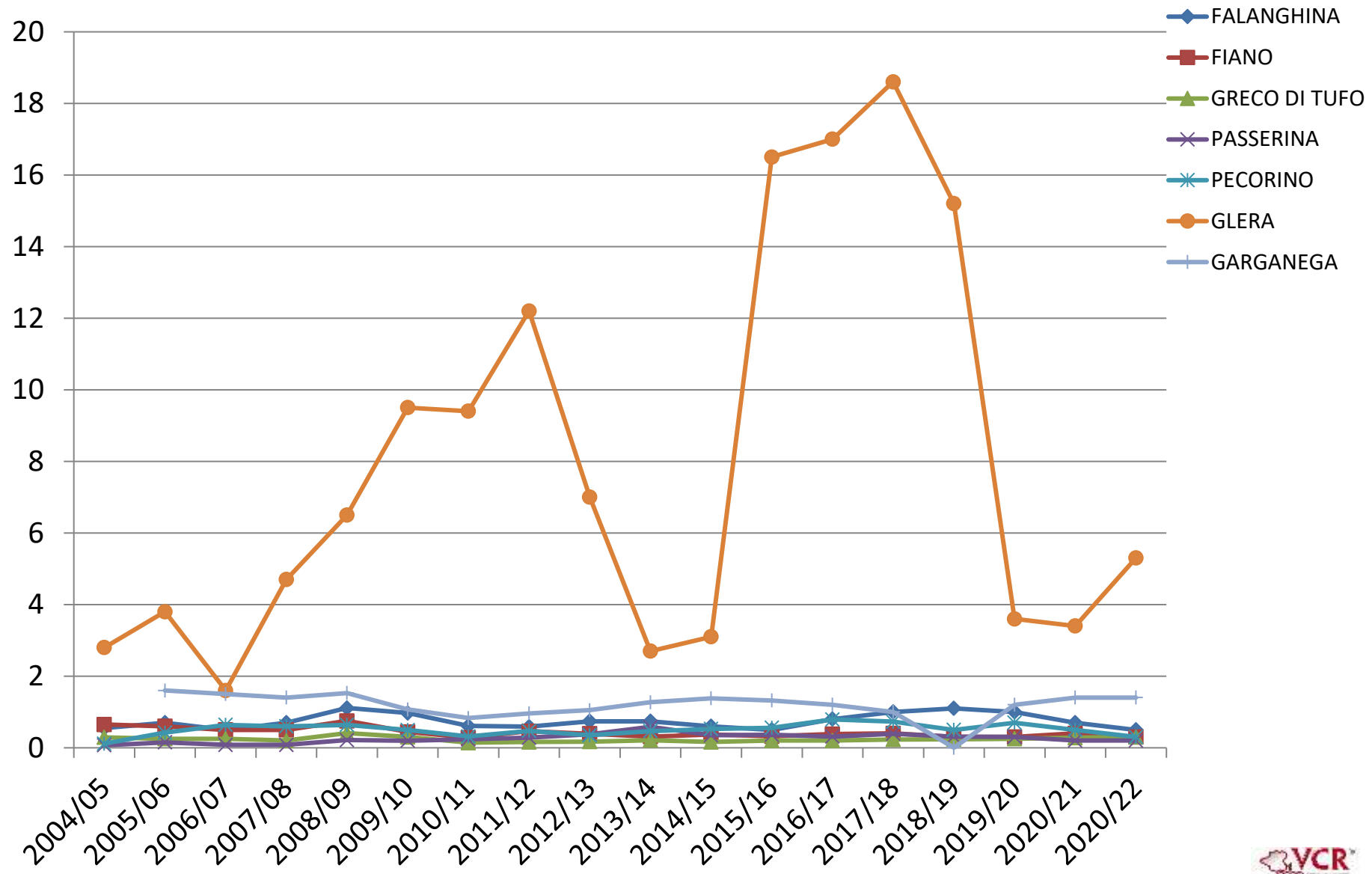


Fig.4

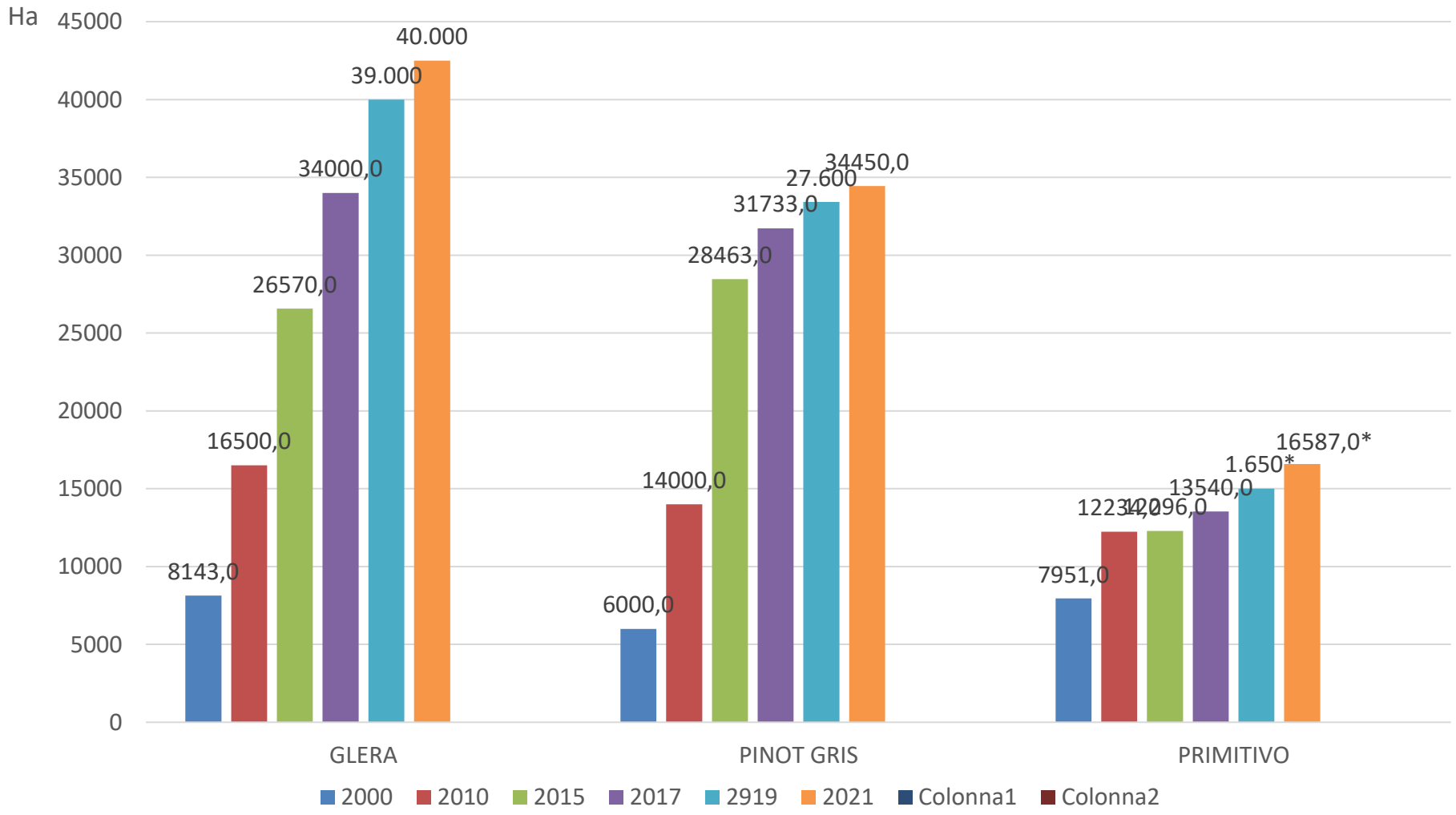
AUTOCHTHONOUS WHITE VARIETIES (Bi MM)



TRENDS IN THE USE OF WHITE VARIETIES

- SHIFT TOWARDS LATER RIPENING VARIETIES WITH HIGH ACIDITY AND WIDE AROMATIC PROFILE (E.G. VERMENTINO, VIOGNIER, GRILLO)
- SEARCH FOR LONG-CYCLE VARIETIES WITH VERY HIGH ACIDITY (E.G. PECORINO, DURELLA)
- DECREASE OF EARLY-RIPENIING LOCAL VARIETIES WITH WEAKER AROMATIC COMPOUNDS AND COMPACT CLUSTER
- DECREASE OF HIGH TEMPERATURE-SENSITIVE VARIETIES (E.G. TOCAI FRIULANO)
- USE OF “TENDONE” TRAINING SYSTEM FOR SUN-BURN SENSITIVE VARIETIES (E.G. PECORINO IN ABRUZZO)

GLERA (PROSECCO), PINOT GRIS, PRIMITIVO



PROSECCO, PINOT GRIS, PRIMITIVO

- THESE CULTIVARS GIVE WINES THAT MEET THE REQUIREMENTS OF MODERN (ESPECIALLY YOUNG) CONSUMERS

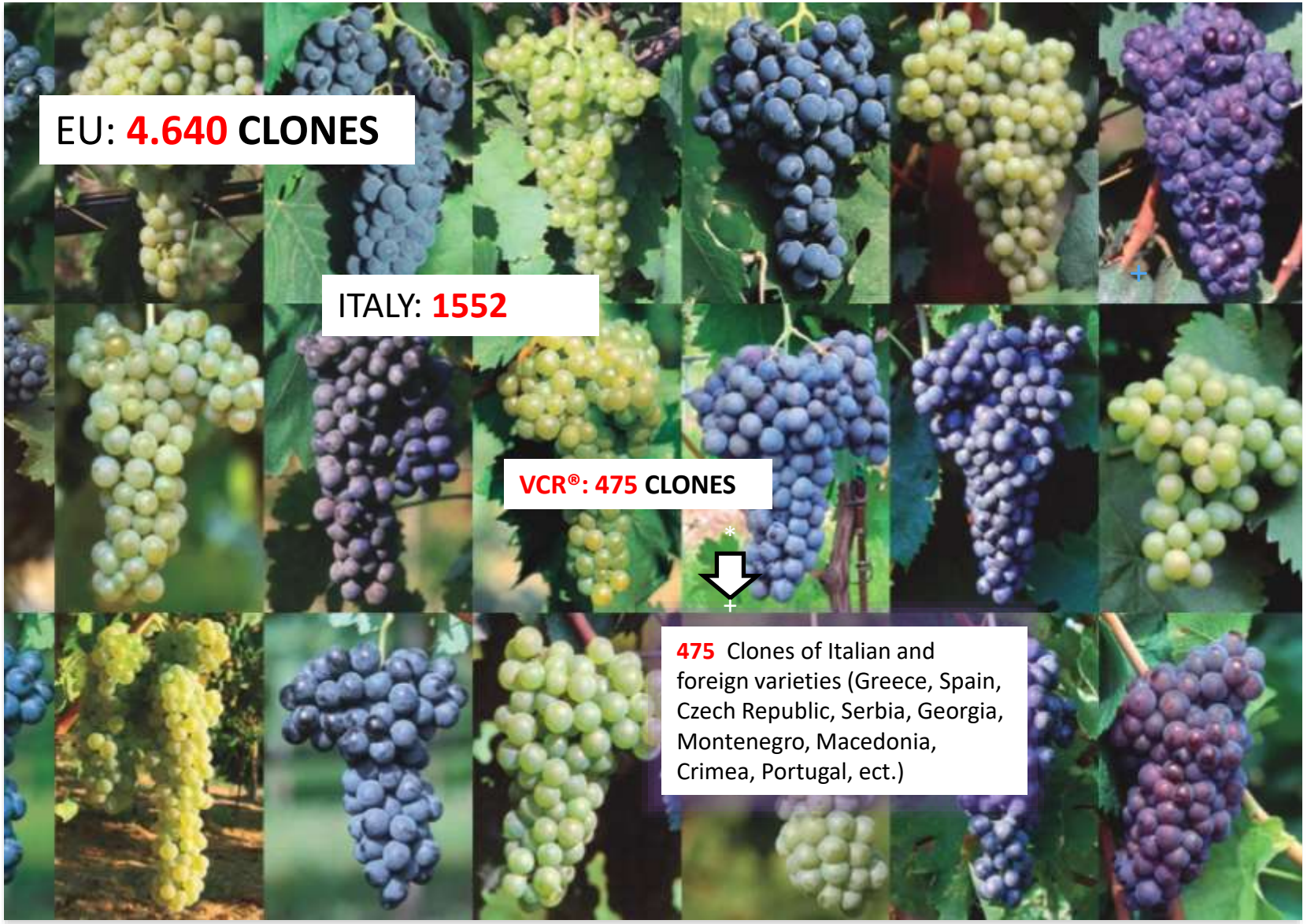
- THE CREATION OF "LARGE AOCs" IN THE CONTEXT OF ESPECIALLY DESIGNED MARKETING OPERATIONS, BALANCED PRICE/QUALITY RATIO, EFFICIENT COMMUNICATION: THESE FACTORS HAVE ENSURED A SUCCESS BEYOND EXPECTATIONS

- THE PLASTICITY AND THE CLIMATE-CHANGE RESILIENCE OF THESE VARIETIES HAVE MADE THEIR DIFFUSION EASIER

- REMARKABLE FACT: “GLERA” IS NOWADAYS CULTIVATED ON THE FOOTHILLS OF THE CARNIC PRE-ALPS AS PART OF THE AOC PROSECCO, THUS CONFIRMING ITS RESILIENCE. IT WOULD HAVE BEEN UNTHINKABLE ONLY 20 YEARS AGO!

- GLERA: CLIMATE CHANGE HAS PUSHED THE FERTILITY GROWTH IN THE LOWLADS AND THE CULTIVATION IN THE PRE-MOUNTAIN AREAS ALLOWS TO PRODUCE WINES WITH THE ANCIENT PROSECCO SCENTS.

CHOICE OF CLONES



TRENDS IN THE USE OF CLONES

RED VARIETIES:

- IN GENERAL, SHIFT TOWARDS OPEN CLUSTER CLONES, MILLERANDAGE-FREE, WIDE POLYPHENOLIC PROFILE
- CENTRE-SOUTH> CLONES WITH GREATER FERTILITY BUT WITH MORE SCATTERED CLUSTER IN ORDER TO DELAY THE RIPENING PERIOD

WHITE VARIETIES:

- SHIFT TOWARDS MORE PRODUCTIVE OPEN-CLUSTER CLONES WITH GREATER RESILIENCE AGAINTS HIGH TEMPERATURES (E.G.: CHARDONNAY VCR434, PINOT GRIS VCR 204 and VCR206, SAUVIGNON VCR328)
- MORE VIGOROUS CLONES WITH A LARGER CANOPY (FOLIAR MASS)
- ACCURATE LAND-PLACEMENT OF THE MOST AROMATIC CLONES, PROVIDED THAT THEY HAVE GOOD PRODUCTIVITY (E.G. SAUVIGNON R3)

MONTEPULCIANO

MONTEPULCIANO VCR453

MONTEPULCIANO VCR 456

MONTEPULCIANO VCR 453: PLAIN AREAS – LARGE CLUSTER, PRODUCTIVE
MONTEPULCIANO VCR 456: OPEN CLUSTER, SMALLER, SUITABLE FOR PRODUCTION OF ROSÉ

CHARDONNAY

CHARDONNAY VCR434: VERY SPARSE CLUSTER, LARGE, FOR PLAIN AREAS.
CHARDONNAY ISV5: VERY PRODUCTIVE GOOD FOR MEDITERRANEAN AREAS (SOUTHERN ITALY, SPAIN)
CHARDONNAY VCR68: ALSO WITH SCATTERED CLUSTER, LESS PRODUCTIVE, SUITABLE FOR HIGHER HILL AREAS.

CHOICE OF THE ROOTSTOCK

THE ROOTSTOCK: A MEDIATOR BETWEEN VARIETAL FEATURES AND PEDOCLIMATIC ENVIRONMENT

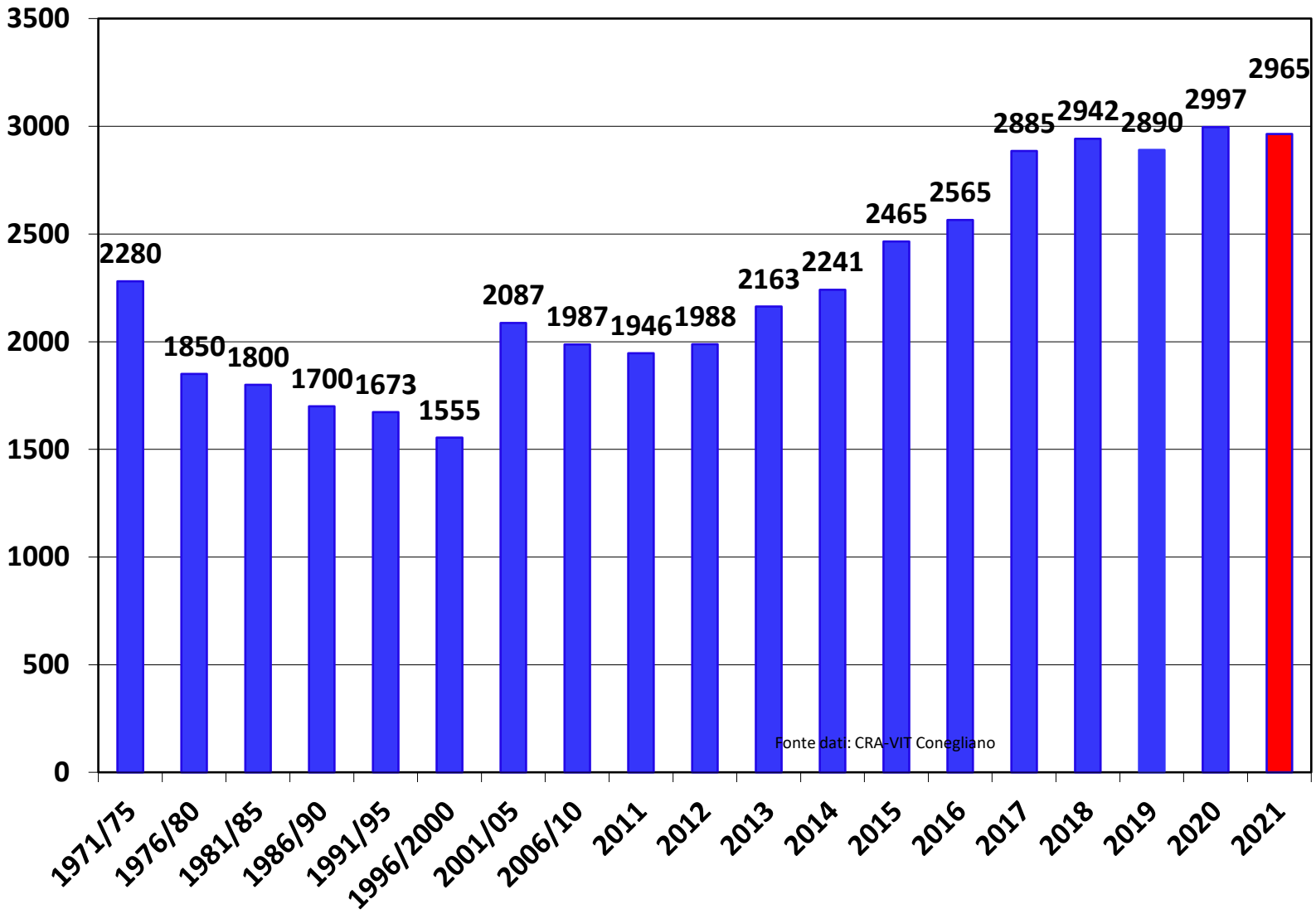
MACEDONIA

GRAVE DEL FRIULI

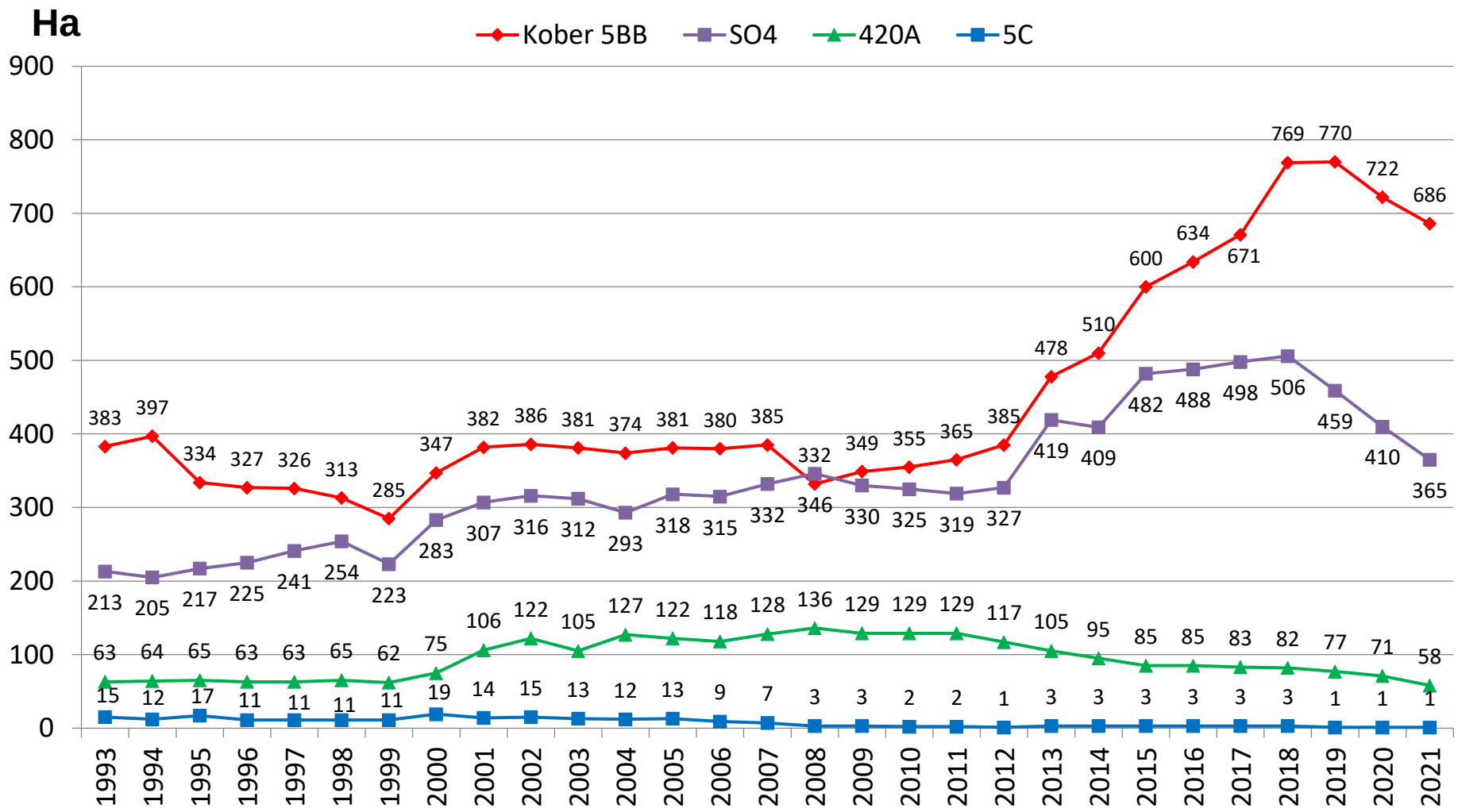
GALICIA - SPAIN

MOLDOVA

EVOLUTION OF THE ITALIAN SURFACE IN ROOTSTOCKS (HA)

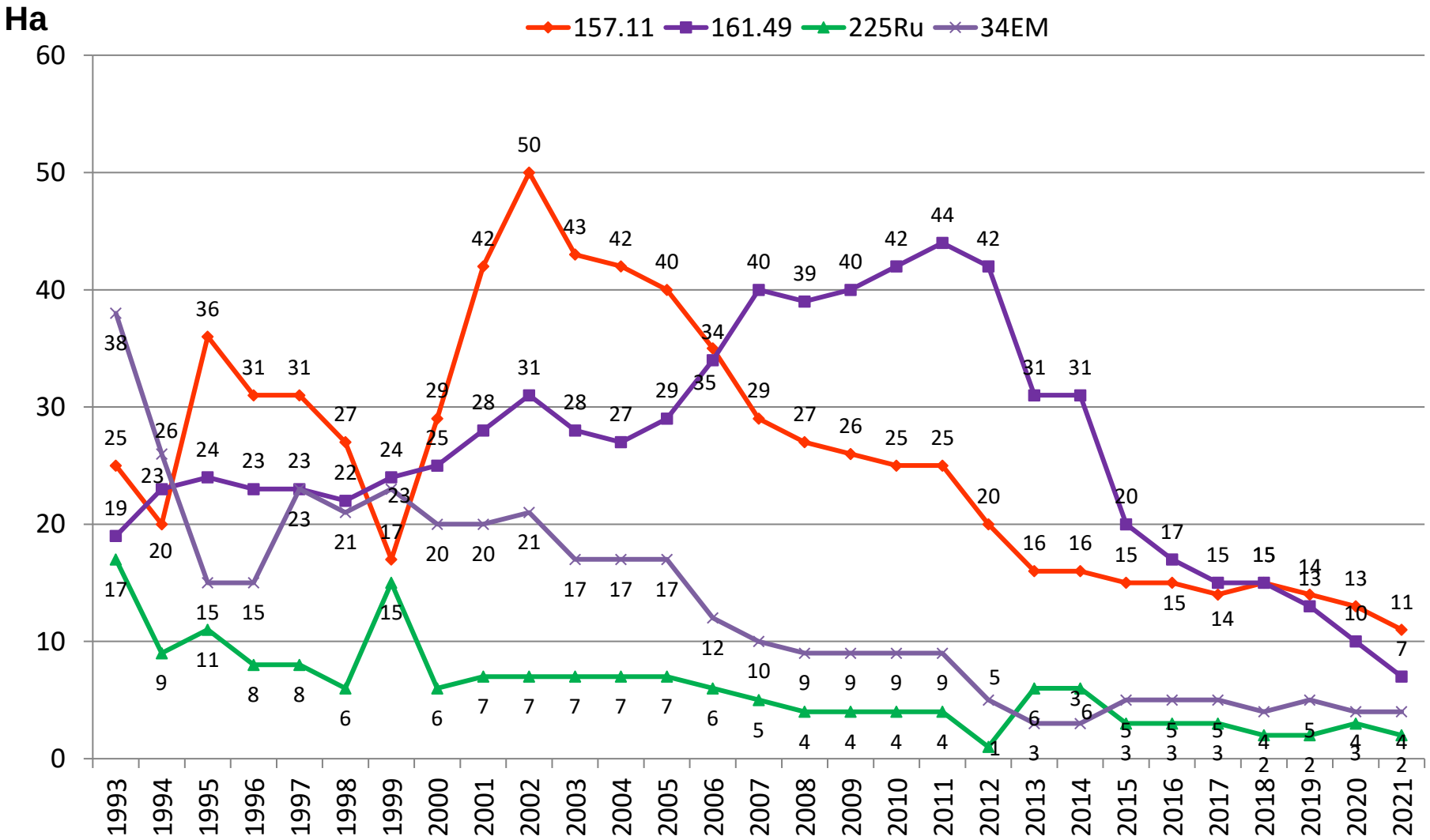


TRENDS IN MOTHER PLANT SURFACE OF BERLANDIERI X RIPARIA GROUP



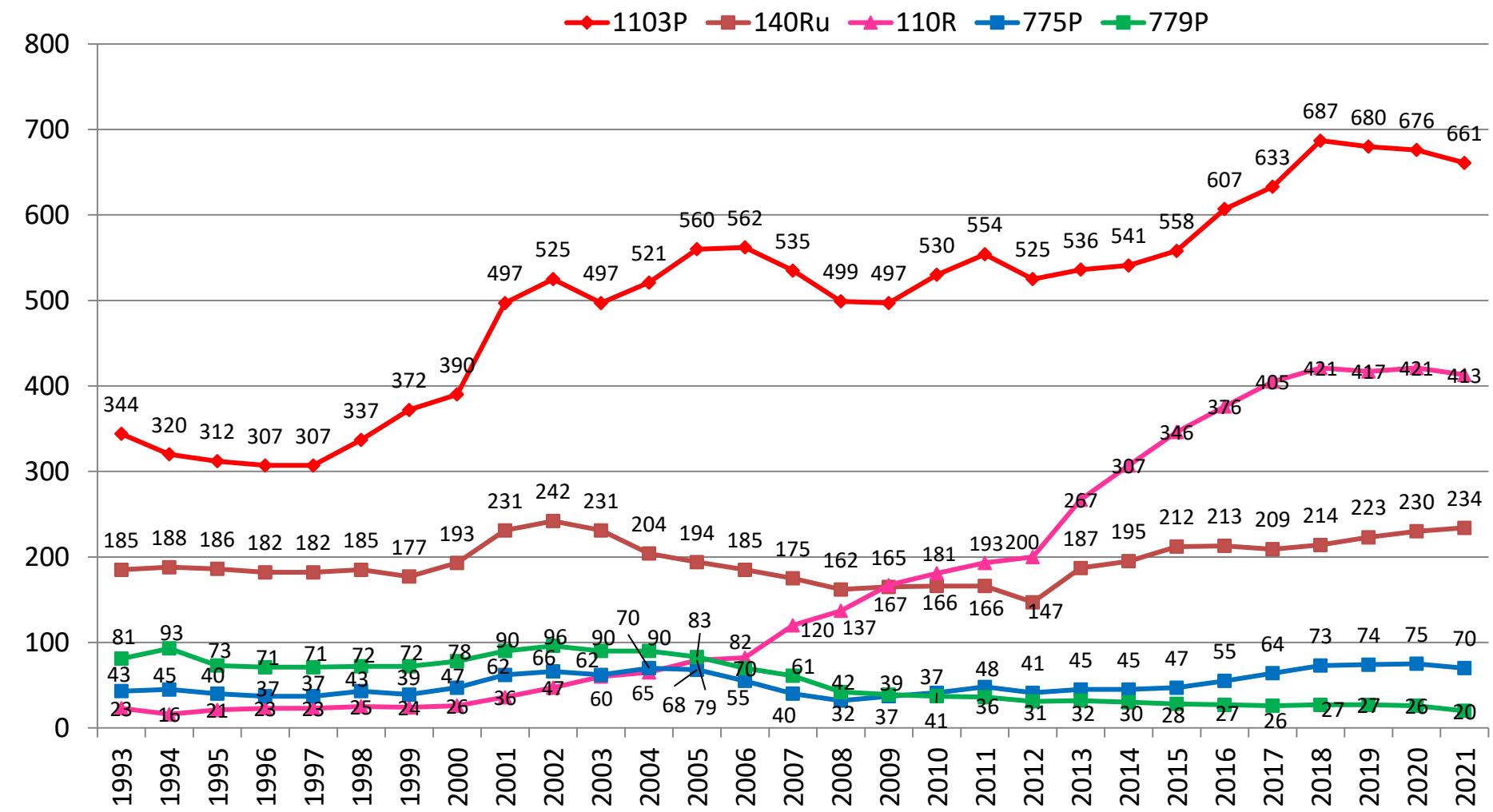
Fonte dati: CRA-VIT Conegliano

TRENDS IN MOTHER PLANT SURFACE OF BERLANDIERI X RIPARIA GROUP



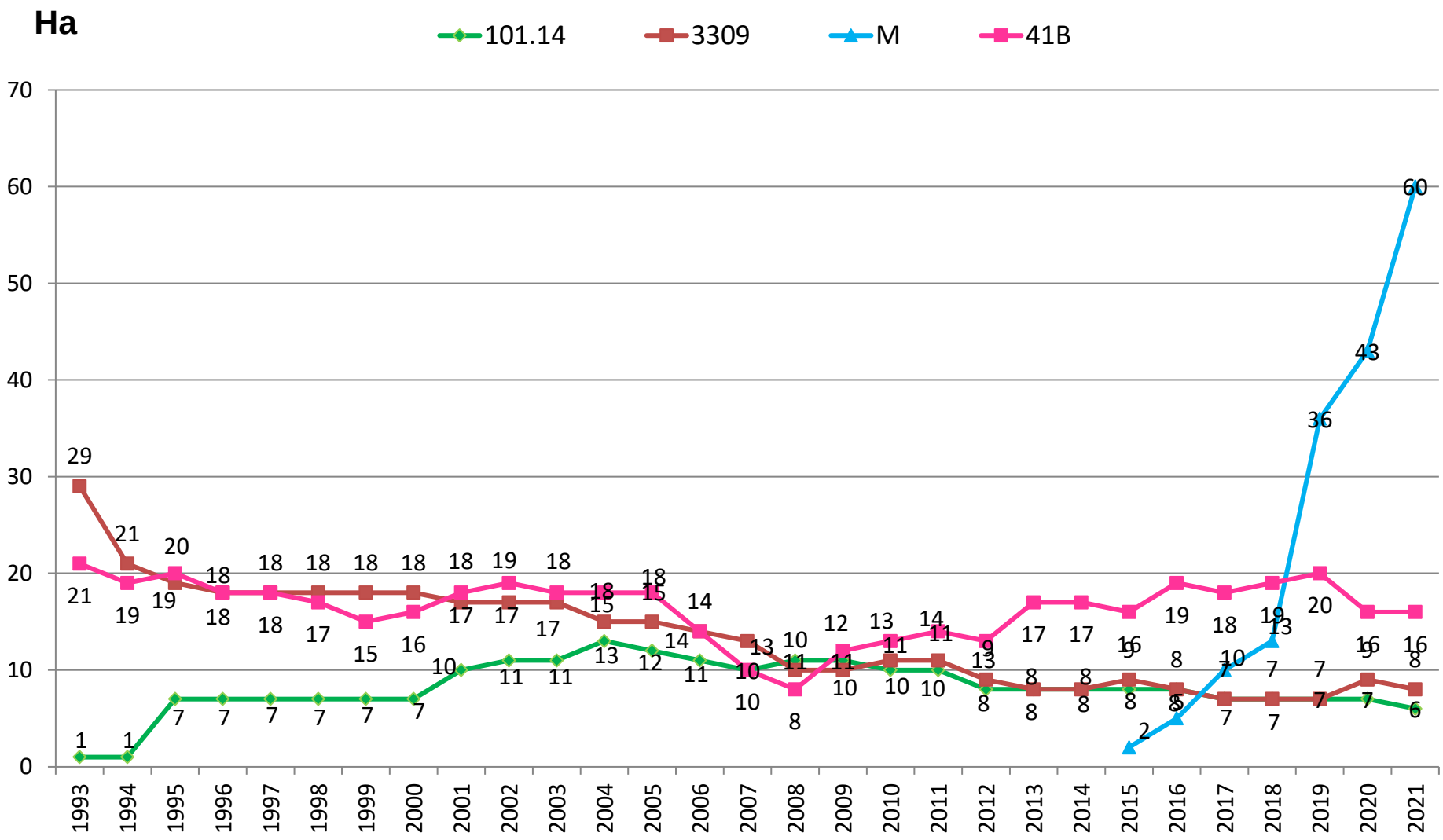
Fonte dati: CRA-VIT Conegliano

TRENDS IN MOTHER PLANT SURFACE OF RIPARIA X RUPESTRIS GROUP



Fonte dati: CRA-VIT Conegliano

TRENDS IN MOTHER PLANT SURFACE OF RIPARIA X RUPESTRIS AND "M" GROUP



REMARKS

- Out of the 37 rootstocks admitted to cultivation, the first 5 (1103P, Kober 5bb, SO4, 110R, 420A) represent about 78 % of the total mother-plant surface;

- With reference to the preferences of Italian winegrowers we can highlight:

  - growth of Kober 5bb in Northern Italy, 110R, 140RU, 1103P in Centre-South Italy;
  - growth of M1,M2,M3,M4
  - decrease of all the others;

- The “Italian vineyard” extends from the Aosta Valley to the slopes of Mount Etna. Soils, climates, breeding systems, varieties, and oenological goals are extremely differentiated, but this multi-faceted viticulture is **founded on a limited, and in some areas inadequate, range of rootstocks.**

- Often, some rootstocks have been introduced only because they are used in other prestigious areas.

PROBLEMS THAT CAN EMERGE DUE TO DEFECTIVE ROOTSTOCKS

EVENTS	ROOTSTOCKS	VARIETIES
DECAY OF FULLY PRODUCVITE VINEYARDS	101.14 3309 SCHWARZMANN	PINOT GRIS, CHARDONNAY, SAUVIGNON, CABERNET SAUVIGNON, GLERA, MALVASIA I.
	161.49	TOCAI FRIULANO, PINOT GRIS, SAUVIGNON, MONTEPULCIANO
	110R	NEGRO AMARO
MAGNESIUM DEFICIENCY AND/OR RACHIS DESSICCATION	SO4	CROATINA, MALVASIA I. MOSCATI, CABERNET S., AGLIANICO
GRAFTING POINT HYPERPLASIAS	SO4 110R	CANNONAO (GRENACHE), TEMPRANILLO
	140Ru 779P	ITALIA, MICHELE PALIERI, CATARRATTO, CANNONAO, CARIGNANO
EXCEEDING VIGOR WITH CONSEQUENT MILLERANDAGE, HERBACEOUS WINES, UNPLEASANT TANNINS, POOR LIGNIFICATION	779P 140Ru	ALL HIGHLY VIGOROUS VARIETIES
	RUP. DU LOT	CANNONAO (GRENACHE)
	KOBER 5BB	CARMENERE, THE REFOSCOES IN VERY FERTILE SOILS

SAUVIGNON/161.49

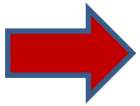
CANNONAO(GRENACHE)/779P

Picture 5

Grafting point hyperplasias in Cannonau vines grafted on 779P

WHY CONSIDER NEW ROOTSTOCKS

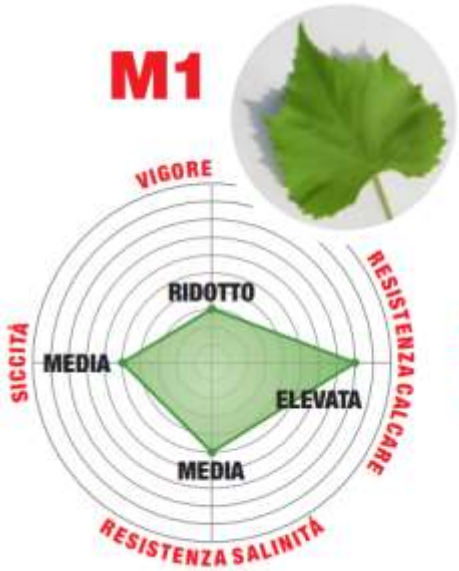
- Environmental sustainability
- Climate change
- Reduction of production costs
- Decay from disaffinity
- Endoparasite nematodes and virus vectors

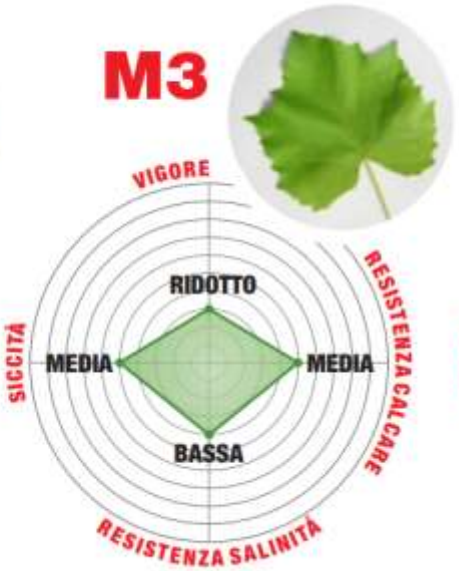


- Rusticity
- Lack/excess of water
- Greater efficiency in the absorption of nutrients
- Grafting compatibility
- Resistance againts endoparasite nematodes and viruses

M ROOTSTOCKS

Characteristics of M Rootstocks





Motherly parent	Motherly parent	Motherly parent	Motherly parent
106/8 [V.rip. x (V. cord. X V. rup.)]	**Teleki 8B** (V.berl. x V.rip.)	**R 27** (V.berl. x V.rip.)	**41 B** (V.vin. x V.berl.)
Fatherly parent	**Fatherly parent**	**Fatherly parent**	**Fatherly parent**
Resseguier n°1 (V. berl.)	**333 E.M.** (V.vin. x V.berl.)	**Teleki 5C** (V.berl. x V.rip.)	**Resseguier n°1** (V.berl.)

M ROOTSTOCKS

- They can respond to the new challenges of table grape viticulture, particularly in presence of:

- WATER DEFICIENCY
- EXCESSIVE SALINITY
- HIGH ACTIVE LIMESTONE
- NUTRIENT-POOR SOILS

- They play a role in the development of sustainable winegrowing models with a view to the correct irrigation and fertilization practices

M ROOTSTOCKS: MONTEPULCIANO- TOLLO

Place: Tollo (Abruzzo)
Variety: Montepulciano with “tendone” training system in a medium-textured clayey soil
Installation year: 2015
Rootstock comparison: M with K5bb, 1103P, 140Ru, 420a


M1


M2


M3


M4

M1: Compared to Kober shows slightly less resistance to drought. Fertility is better even if the cluster is smaller.

M2: Good drought resistance, higher than 1103P, lower than 140Ru. Well formed bunch, excellent fertility.

M3: Reduced vigor, lower than 420A. Small cluster, little resistance to drought.

M4: Excellent fertility, good vigor, well formed clusters. Drought resistance is lower than 140Ru but higher than 1103P.

MENFI – SICILY - 2017

GRILLO /M 4

GRILLO /110 R

MARSALA – SICILY- 2017

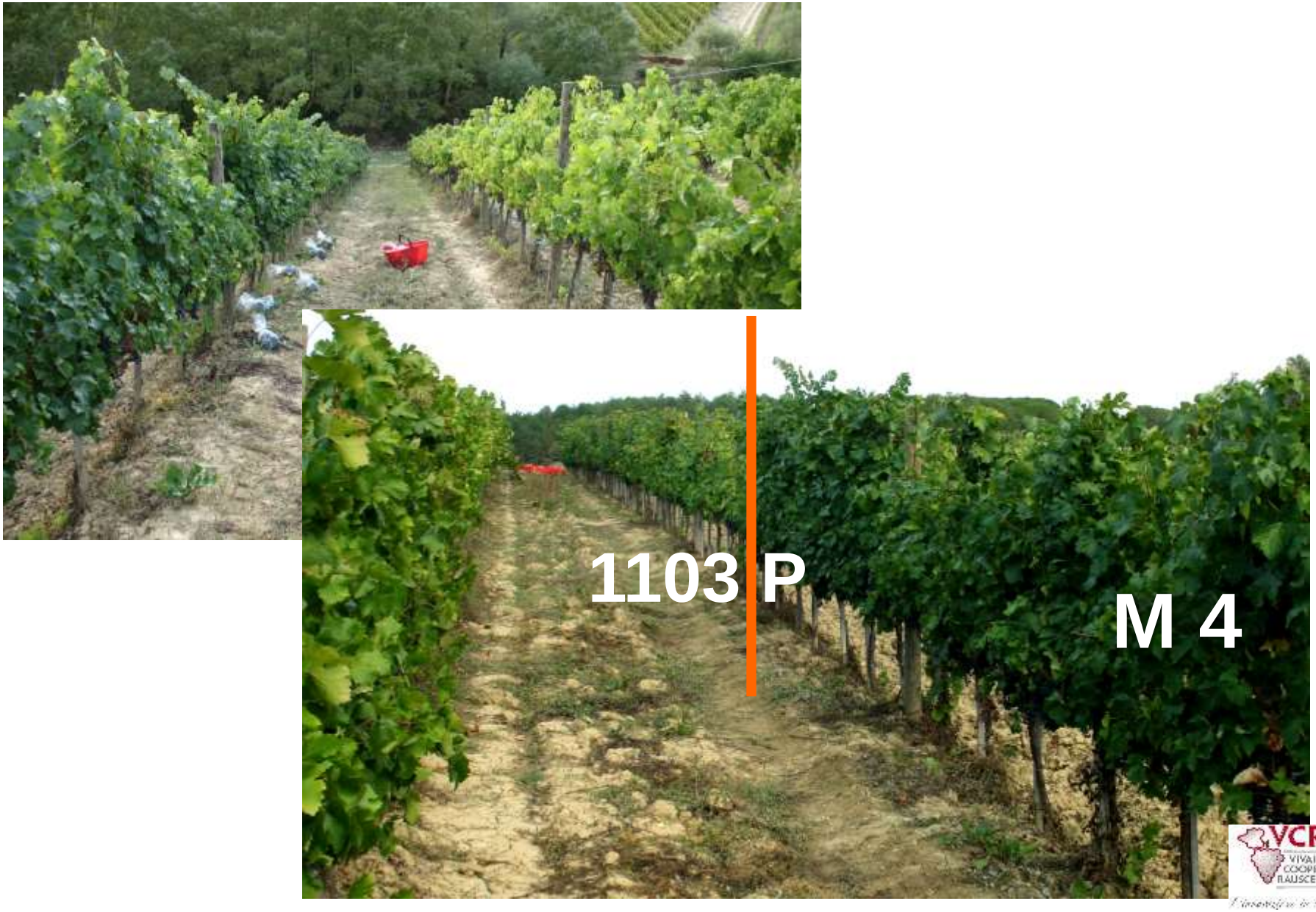
NEROD'AVOLA /M4 **NERO D'AVOLA / 1103P**

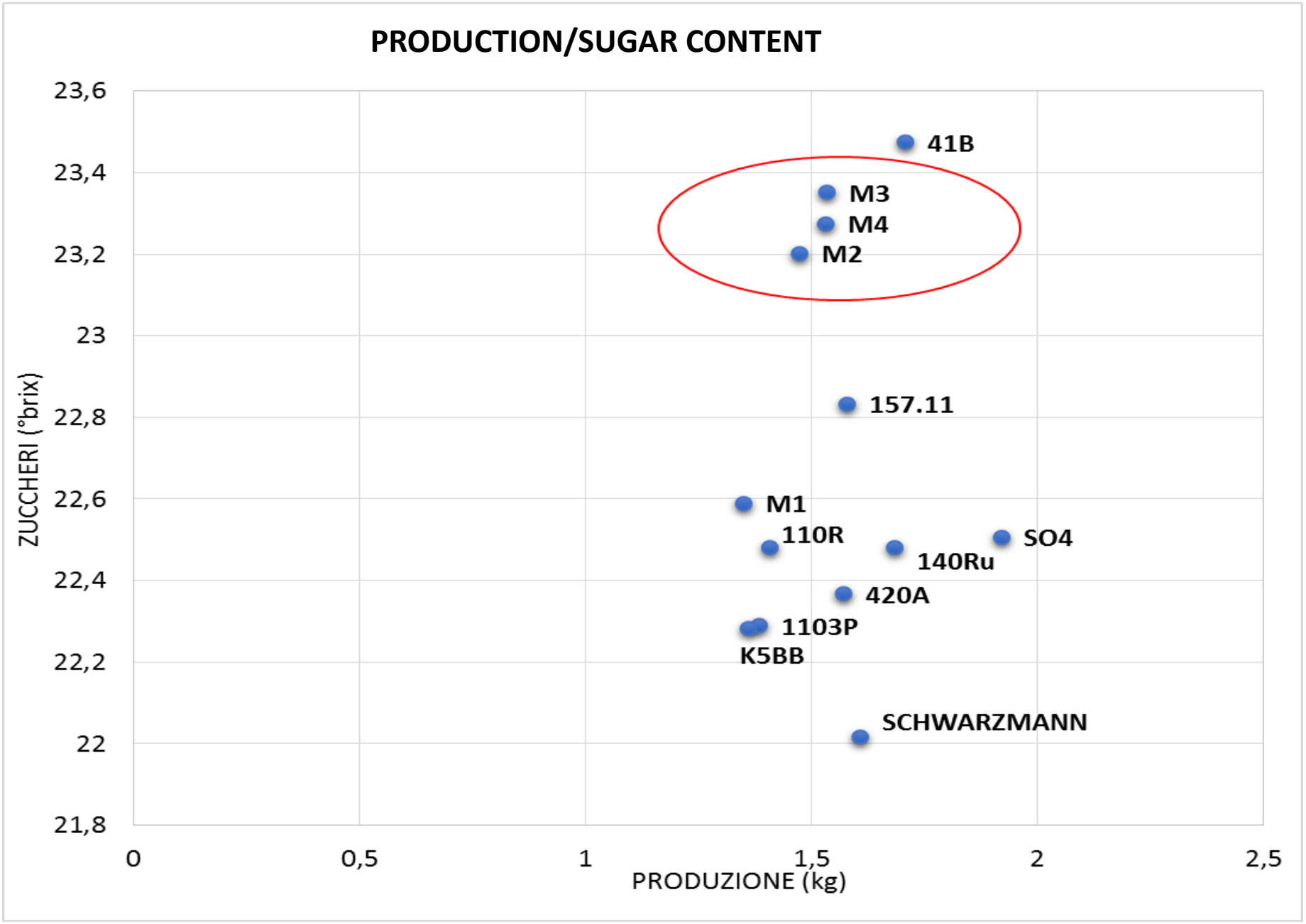
BOLGHERI- TUSCANY - 2017

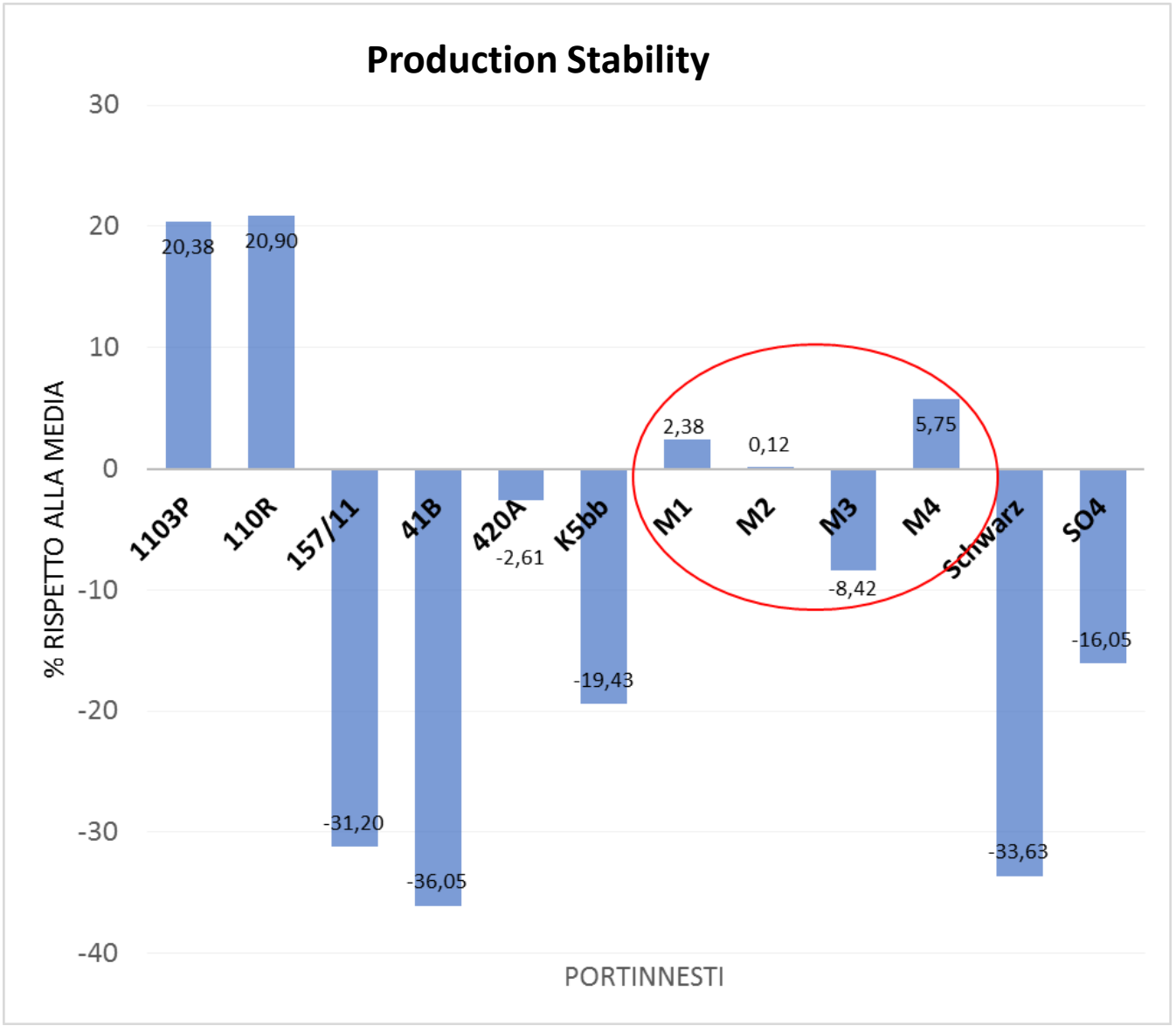
CABERNET S. /M 4

CABERNET S./ 110 R

CIRO MARINA – CALABRIA - 2017

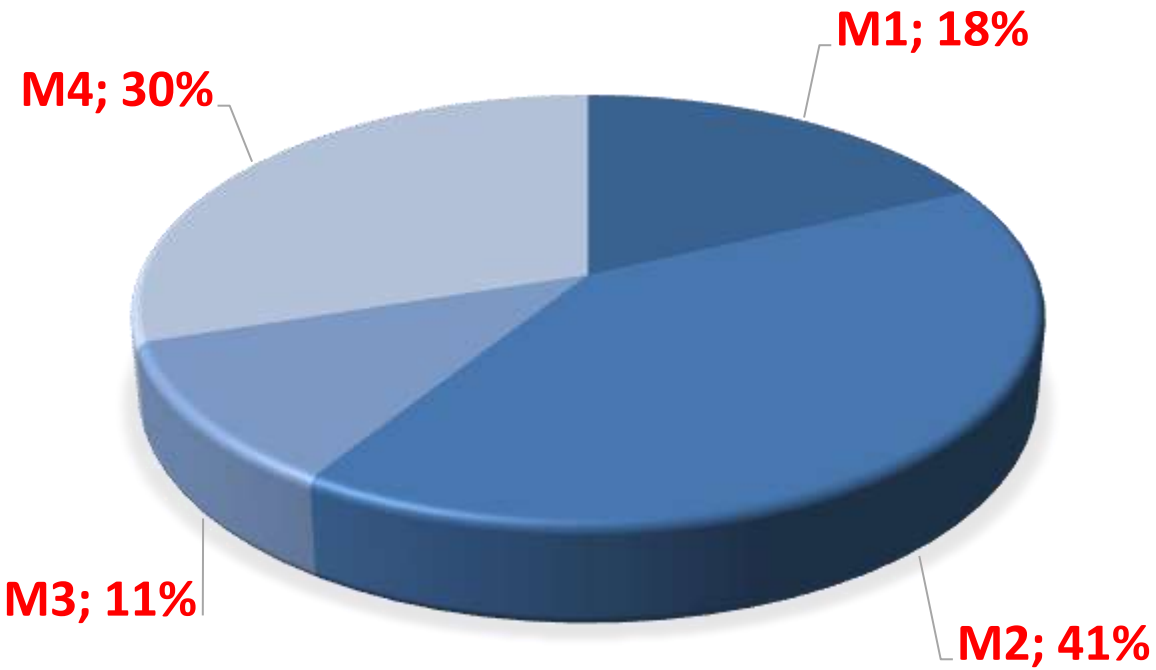



PRODUCTION/SUGAR CONTENT
ZUCCHERI (°brix)
23,6
23,4
23,2
23
22,8
22,6
22,4
22,2
22
21,8
0
0,5
1
1,5
2
2,5
PRODUZIONE (kg)
41B
M3
M4
M2
157.11
M1
110R
SO4
140Ru
420A
1103P
K5BB
SCHWARZMANN


Production Stability
30
20
10
0
-10
-20
-30
-40
% RISPETTO ALLA MEDIA
20,38
20,90
-31,20
-36,05
-2,61
-19,43
2,38
0,12
-8,42
5,75
-33,63
-16,05
1103P
110R
157/11
41B
420A
K5bb
M1
M2
M3
M4
Schwarz
SO4
PORTINNESTI

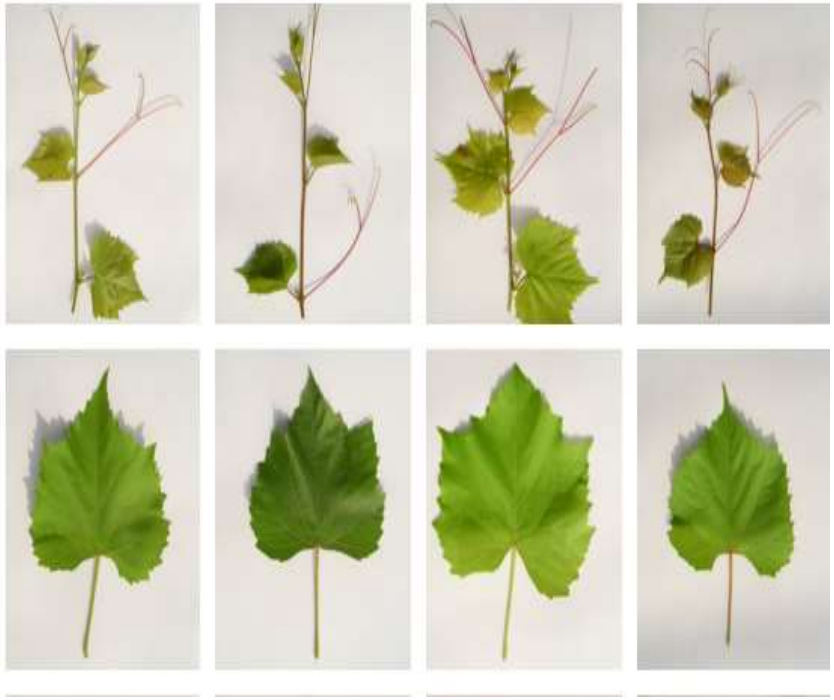
M rootstocks : commercial overview

Sales of vines grafted on M-rootstocks in 2021-22: 1.400.000



VCR ROOTSTOCK PROGRAM 2015-2022

- **2018: crossing**
- **Parents:** *V. rupestris; V. riparia; V. berlandieri; V. cordifolia; V. cinerea; V. amurensis; V. vinifera*
- **424 field seedlings**
- **6-12 GFLV-resistant genotypes 2020-2021** (index)
- **Resistance test to root phylloxera in field 2021-2022** (1-3 year seedlings)
- **Yield/compatibility tests 2021-2022** (Chardonnay, Sangiovese, Italia, Primitivo, Tempranillo, Grenache) + SO4,1103P, 110R, 41B
- **Installation of external fields 2022-2023 in different environments** with nematode pressure, limestone, drought, salinity, acidity.



CLIMATE CHANGE AND RESISTANT VARIETIES

May 2019 – Northern Italy

July 2019 - Montpellier

CLIMATE CHANGE AND RESISTANT VARIETIES

- Among the resistant varieties admitted to cultivation some have better agronomic and oenological characteristics than their Vinifera parents (e.g. Soreli, Pinot Iskra and Pinot Kors)

- The resistant varieties in environments with heavy rainfall or in situations of long-lasting extreme events can effectively contrast climate change due to the lower need of repeated treatments.

- Through hybridization, when working on a large scale, we can obtain resistant vines with agronomic and oenological characteristics designed to resist climate change. In particular, late budding and late ripening, high acidity, production steadiness and resilience.

PINOT ISKRA AND PINOT BLANC

PINOT ISKRA: Ripening period like Pinot, slightly less compact cluster, higher acidity, greater freshness, higher sugar content.
Aromatic profile like Pinot Blanc with Pinot Gris hints.

PINOT KORS AND PINOT NOIR

PINOT KORS: It ripens 10 days after Pinot Noir. Having a scattered cluster, the ripening period can be delayed to the optimal point, thus obtaining a greater sugar content and a higher net extract. The aromatic profile is very close to Pinot Noir.

RESISTANT VARIETIES
ADMITTED TO CULTIVATION AT REGIONAL LEVEL

LOMBARDY

Bronner
Helios
Johanniter
Solaris
Cabernet cortis
Cabernet Carbon
Prior
In osservazione
Souvignier gris
Muscaris
Fleurtai
Julius
Soreli
Sauvignon Kretos
Sauvignon Nepis
Sauvignon Rytos
Cabernet Eidos
Cabernet Volos
Merlot Kanthus
Merlot Khorus

VENETO

Sauvignon Kretos
Sauvignon Nepis
Sauvignon Rytos
Muscaris
Souvignier Gris
Fleurtai
Soreli
Pinot Iskra
Kersus
Cabernet Eidos
Cabernet Volos
Merlot Kanthus
Merlot Khorus
Julius
Pinot Kors
Volturnis
Bronner
Cabernet Carbon
Cabernet Cortis
Helios
Johanniter
Prior
Solaris
Regent

EMILIA ROMAGNA

Solaris
Johanniter
Souvignier Gris
Cabernet Eidos
Cabernet Volos
Merlot Kanthus
Merlot Khorus
Sauvignon Kretos
Sauvignon Rytos

MARCHE

Under observation
Bronner
Fleurtai
Johanniter
Cabernet Volos
Merlot Kkorus
Muscaris
Sauvignon Rytos Solaris
Souvignier gris
Soreli
Prior
Julius

FRIULI VENEZIA GIULIA

Fleurtai
Soreli
Sauvignon Kretos
Sauvignon Nepis
Sauvignon Rytos
Pinot Iskra
Kersus
Jiulius
Cabernet Eidos
Cabernet Volos
Merlot Kanthus
Merlot Khorus
Pinot Kors
Volturnis

ABRUZZO

Cabernet Volos
Merlot Kanthus
Sauvignon Kretos
Soreli
Under observation
Fleurtai
Merlot Khorus

TRENTINO

Helios
Muscaris
Bronner
Souvignier Gris
Johanniter
Solaris

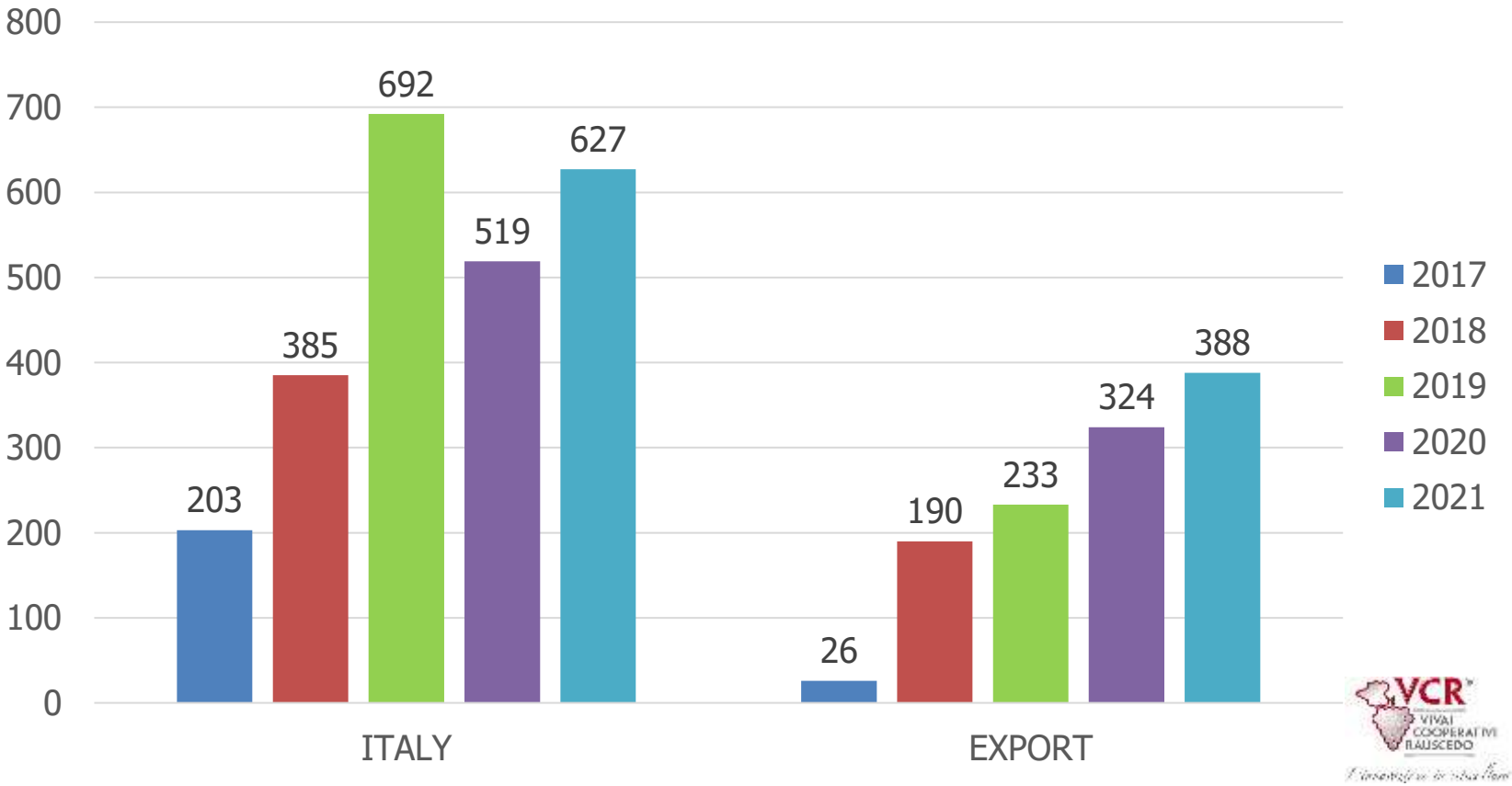
ALTO ADIGE

In osservazione
Bronner
Johanniter
Muscaris
Solaris
Cabernet cortis
Souvignier gris
Regent

Admission procedure undergoing also in : **Latium, Campania and Apulia.**

Article 19 of Regulation (EC) No 1493/1999 stipulates that **Member States must draw up a list of vine varieties suitable for cultivation on their territory.**
In Italy, the competent bodies to legislate on the matter based on the guidelines of the agreement of 25 July 2002 on the classification of vine varieties, are the **Regional governments.**

TRENDS IN SALES OF VCR-UNIUD/IGA VARIETIES 2017 - 2021 (Bi. x.000)



FUTURE GOALS

- Large-scale in-depth investigations by setting up experimental fields in different environments with the purpose to assess the agronomic and oenological characteristics of those varieties being considered to be the most resilient when grafted on the currently available rootstocks.

- Re-assess the adaptation rate to climate change of present-day registered clones

- Extend the rootstock range

- Creating not only disease-resistant varieties, but also varieties with a higher resilience to climate change

- Assess the expedience of genome-editing techniques for the improvement of the resilience in the most widespread vine varieties


Thank you for your attention…