

IS THERE A NEED TO INCREASE THE GENE POOL IN AVOCADO ROOTSTOCKS?



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AVOCADO ROOTSTOCKS

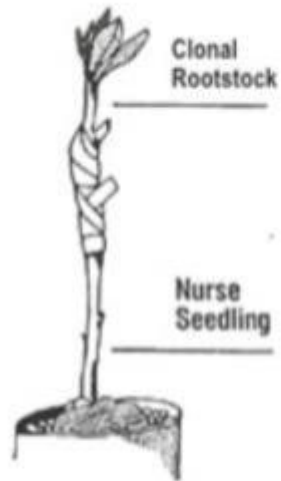
- VERY IMPORTANT TO GUARANTEE PRODUCTIVITY
- DIFFERENT ROOTSTOCKS AVAILABLE BUT THEY SHOULD BE STUDIED IN EACH PRODUCING REGION
- IMPORTANT INVESTMENT. RELIABLE NURSERIES.

CLONAL AND SEEDLING ROOSTOCKS

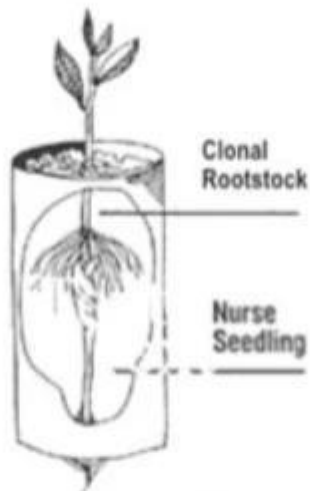




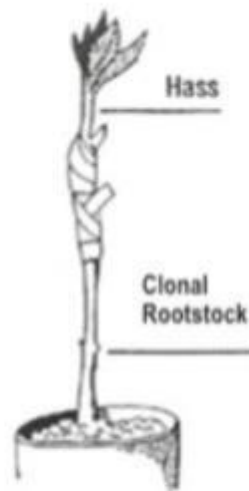
We start by growing a seedling that will be used as the 'nurse.'



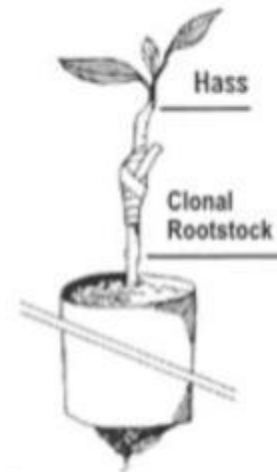
Bud-bearing tissue from cloned rootstock is grafted to the 'nurse.'



Roots are forced to grow from the clonal rootstock.



Fruiting scion is grafted onto the clonal rootstock.



The original 'nurse' is disconnected from the clonal rootstock.



MICROPROPAGATION

INICIO



MULTIPLICACIÓN



ENRAIZAMIENTO



ACLIMATACIÓN



Araceli Barceló, IFAPA

CLONAL ROOTSTOCKS

- MAINLY WITH TOLERANCE TO ROOT DISEASES
- HOMOGENEITY
- MOST ARE THE RESULT OF SURVIVOR/ESCAPE/SUPER TREES FROM SEEDLING ROOTSTOCKS
- EASY PROPAGATION IN NURSERY AND GOOD ESTABLISHMENT IN THE FIELD
- OTHER TRAITS OF INTEREST: TOLERANCE TO DROUGHT, SALINITY, ETC.
- ARE CLONAL ROOTSTOCKS MORE PRODUCTIVE THAN SEEDLING ROOTSTOCKS WITH NO SOIL FUNGI PRESSURE?



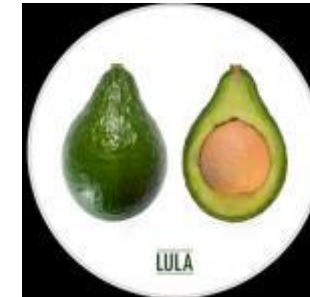
MAIN SEEDLING ROOSTOCKS (WE KNOW THE MOTHER NOT THE FATHER OF THE SEEDS)

MEXICAN

TOPA-TOPA, MEXICOLA,
WATERHOLE



GUATEMALAN x WEST INDIAN
LULA



WEST INDIAN

VELVICK, MAOZ, NACHAR,
DEGANIA, ASHDOT



MAIN GROUPS OF CLONAL ROOTSTOCKS

- SELECTED IN CALIFORNIA:
DUKE-7, TORO CANYON, THOMAS, BORCHARD
STEDDOM, ANITA, BRANDON, EDDIE (Douhan *et al.*,
2011)
- SELECTED IN SOUTH AFRICA
DUSA, LATAS, BOUNTY, SEVERAL UNDER STUDY
- SELECTED IN ISRAEL:
VC, DAY
- SELECTED IN AUSTRALIA:
VELVICK

	Topa Topa	Lula	G-6	Duke 7	Thomas	G755A,B,C (Martin Grande)	Barr Duke	Toro Canyon	D9	Borchard
Normal Propagation Method	seed	seed	seed	clonal	clonal	clonal	clonal	clonal	clonal	clonal
Horticultural race	Mexican	Guat. X West Indian	Mexican	Mexican	Mexican	Hybrid-P. <i>americana</i> x <i>P. shiedeana</i>	Mexican	Mexican	Mexican	Mexican
Parentage			seedling	Duke	escape seedling	market collection	Selfed Duke 6 seedling		Irradiated Duke seedling	
Geographic origin	California	Florida	Antigua, Guatemala	UC Riverside	Escondido, CA	Guatemala	Fallbrook, CA	Saticoy, CA	UC Riverside	Camarillo, CA
Productivity "clean" soil (a)	3	?	3	4	2	1	3	3	2.5	4
Productivity "root rot" soil (b)	1	?	3.5	3	3	2	3	3.5	3	2
Tree size "clean" soil (a)	5	?	5	5	5	5	5	4	4	5
Tree size "root rot" soil (b)	0.5	0.5	1	2	4	1.5	1.5	3	2.5	0.5
Tolerance to <i>P. cinnamomi</i> (c)	0	?	2	3	4.5	5	3.5	2.5	3.5	0.5
Tolerance to <i>P. citricola</i> (d)	3	?	3	4	2	3	3	5	4	3
Salt tolerance (e)	2	?	2	3	1	2	2	3	3	3
Frost tolerance (f)	4.5	1	4.5	4	4.5	1	4.5	4.5	4.5	4.5
Tolerance to <i>Dothierella</i> (g)	5	?	2	5	2	?	5	5	5	5

Legend: 0 = poor, 5 = best

Ratings by J. Menge, G. Bender, and M.L. Arpaia, 2002

Footnotes:

- Yield and canopy volume expressed as percentage in comparison to Topa Topa, based on 7 years of data (8 years for Thomas) at South Coast Field Station (Arpaia et al. 1993)
- Yield and canopy volume expressed as percentage in comparison to Thomas (consolidated data from J.A. Menge, 2002)
- Consolidation of performance of young replant trials, ratings by John Menge
- Results from greenhouse trials by A. Alizadah and J. Menge (unpublished)
- Rootstock trial in sand tanks treated with three levels of saline water (Oster and Arpaia, 1991)
- Observations by G. Bender and J. Menge after freezes in 1988-1991.
- Results from greenhouse trials by A. Alizadah and J. Menge (unpublished).

ROOSTOCKS SELECTED IN SPAIN

- IN THE CANARY ISLANDS FOR THEIR TOLERANCE TO *Phytophthora cinnamomi* (JULIAN, GALLOS) (Gallo et al., 2007)
- SELECTED IN MALAGA FOR HIGH PRODUCTIVITY (Olaya et al., 2003)
- SELECTED IN MALAGA FOR TOLERANCE TO *Rosellinia necatrix* (Barceló et al., 2007)

Selección de portainjertos de aguacate tolerantes a *Rosellinia necatrix*

Semillas de diferentes orígenes
(México, Australia, España)

Escapes de árboles supervivientes
en fincas afectadas por *R. necatrix*

Multiplicación in vitro de las plantas escape

Fase 0: poda de árboles escape
en el campo



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IFAPA



Establecimiento *in vitro*



Proliferación



Enraizado



Aclimatación



Plantas después de la inoculación



Parcela artificialmente infestada

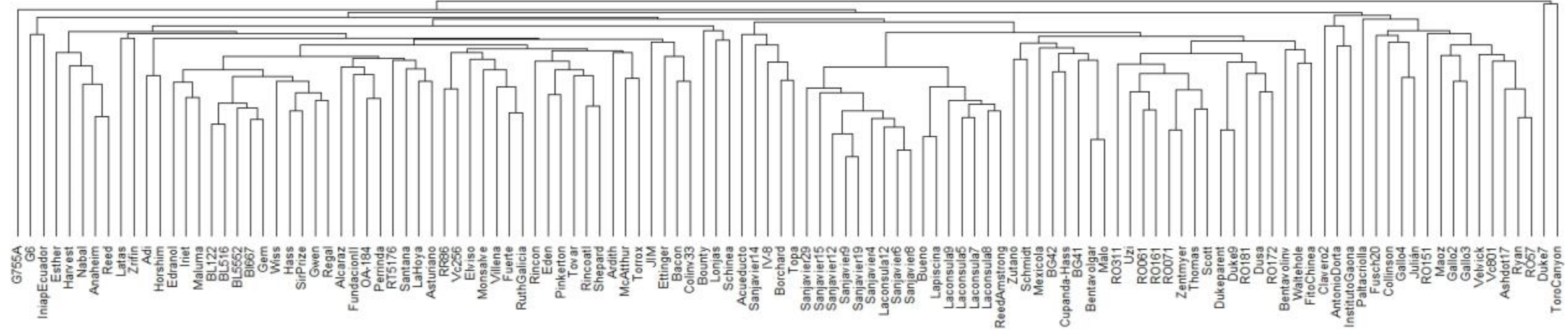
**varias
selecciones
en evaluación
avanzada**



**SELECTION OF ROOTSTOCKS WITH
TOLERANCE TO *ROSELLINIA*
*NECATRIX***

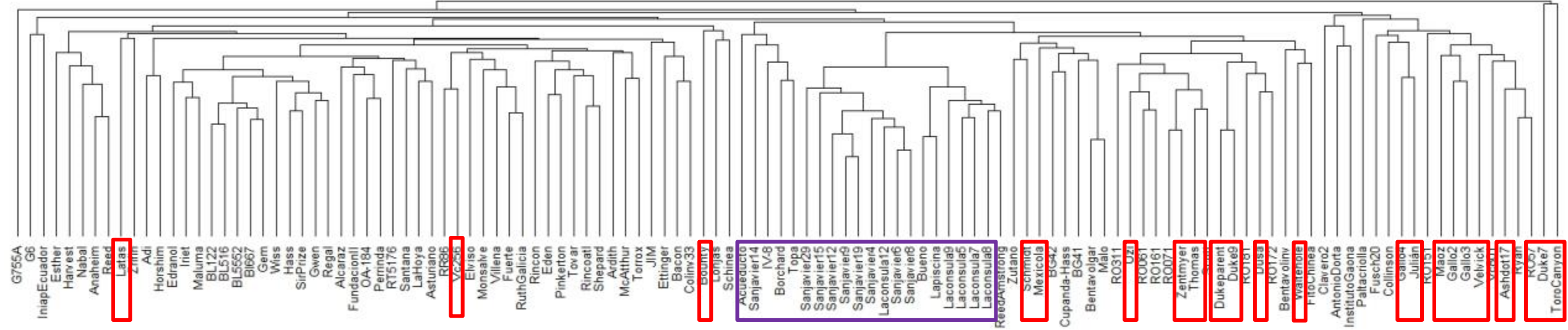


Cluster Dendrogram



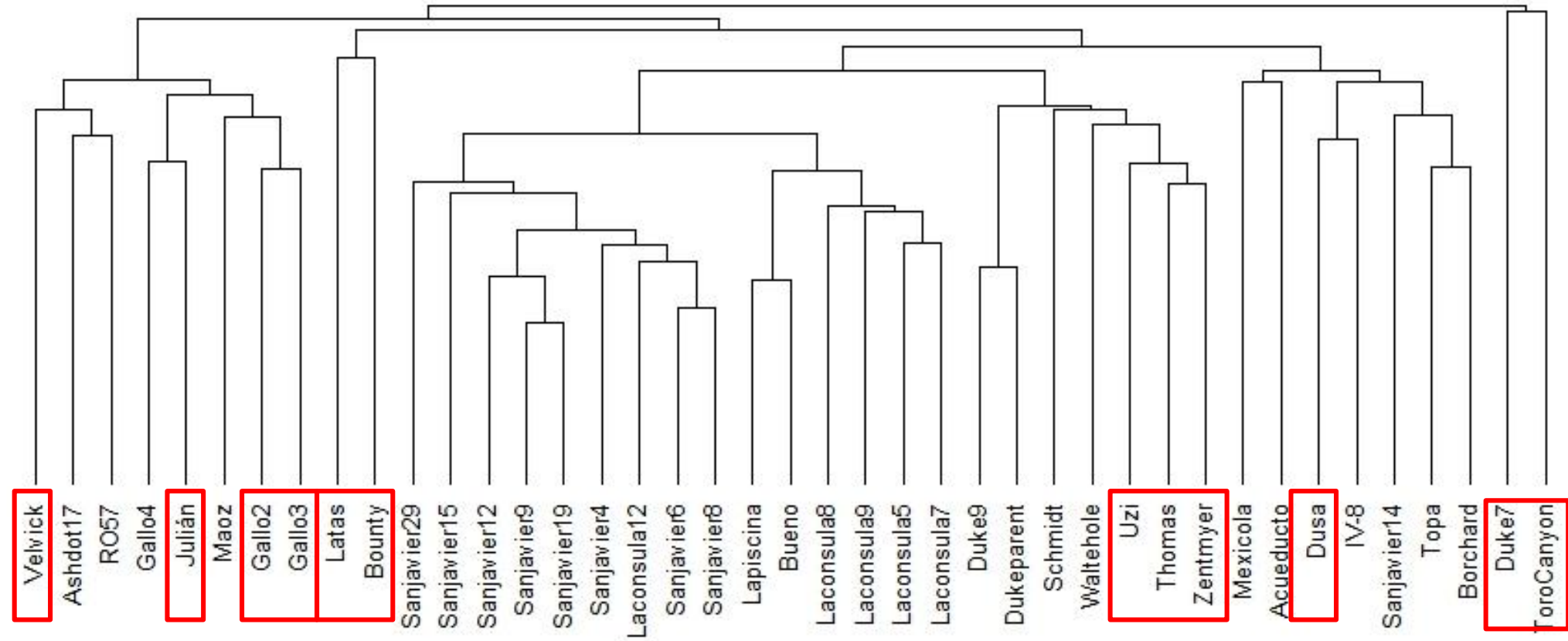
G755A
G6
IniapEcuador
Esther
Harvest
Nabal
Anaheim
Reed
Latas
Zrfin
Adi
Horshim
Edranol
Iriet
Maluma
BL122
BL516
BL552
BL667
Gem
Wiss
Hass
SirPrize
Gwen
Regal
Alcaraz
FundacionII
OA-184
Perminda
RT5176
Santana
LaHoya
Asturiano
RR86
Vc256
Elvijo
Monsalve
Villena
Fuerte
RuthGalicia
Rincon
Eden
Pinkerton
Tovar
Rincoati
Shepard
Ardith
McArthur
Terrox
JIM
Ettinger
Bacon
Colinv33
Bounty
Lonjas
Schinea
Acueducto
Sanjavier14
IV-8
Borchard
Tope
Sanjavier29
Sanjavier15
Sanjavier12
Sanjavier9
Sanjavier19
Sanjavier4
Laconsula12
Sanjavier6
Sanjavier8
Bueno
Lapiscina
Laconsula9
Laconsula5
Laconsula7
Laconsula8
ReedArmstrong
Zutano
Schmidt
Mexico
BG42
Cupanda-Hass
BG41
Bentav olgar
Malo
RO311
Uzi
RO061
RO161
RO071
Zentmyer
Thomas
Scott
Dukeparent
Duke9
RO181
Dusa
RO172
Bentavoliniv
Waitehole
FitoChina
Clavero2
AntonioDorta
InstitutoGaona
Paltaciolla
Fusch20
Collinson
Gallo4
Julian
RO151
Maoz
Gallo2
Gallo3
Velrick
Ve801
Ashdot17
Ryan
RO67
Duke7
ToroCanyon

Cluster Dendrogram

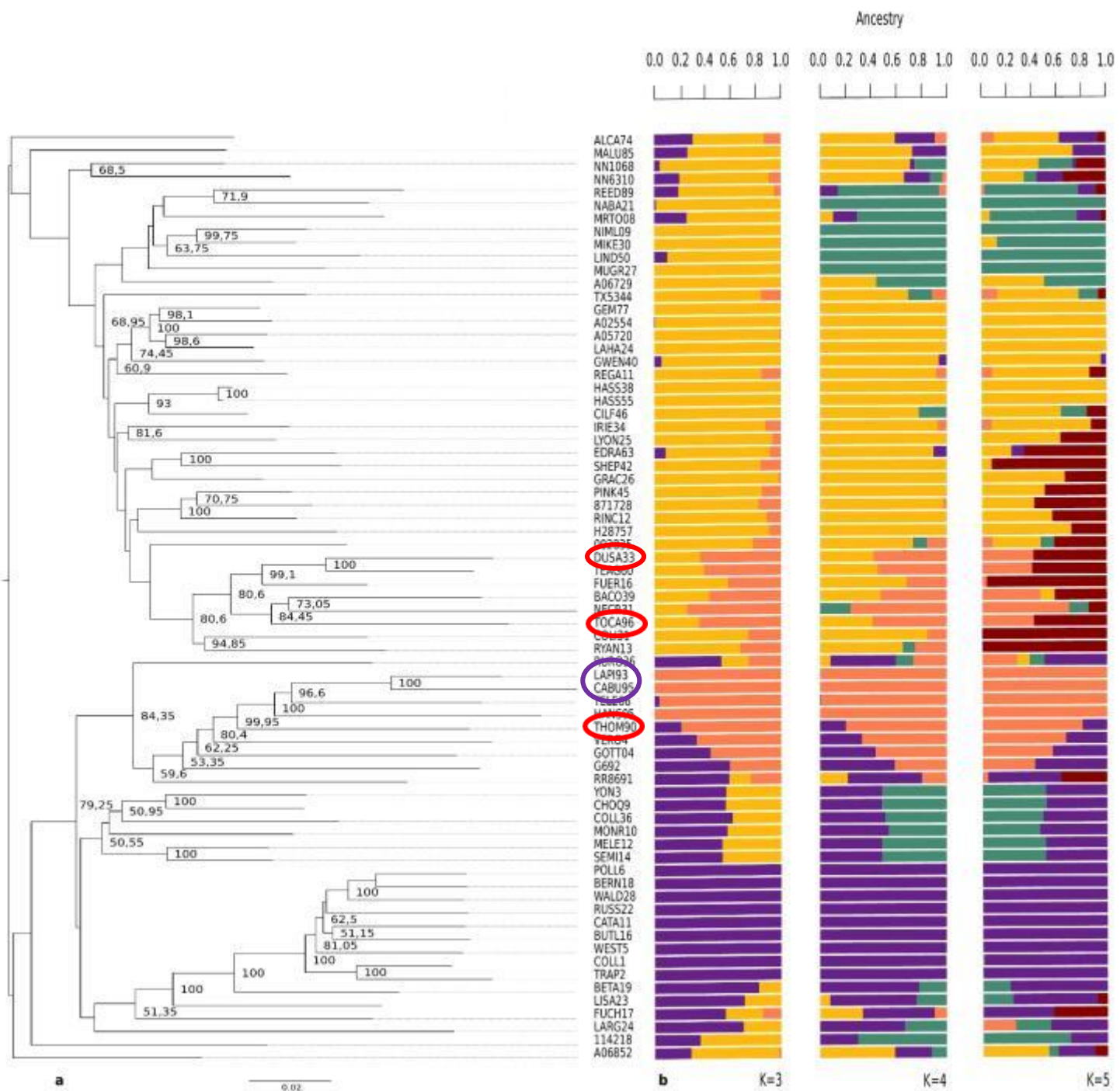


dist_dice
hclust (*, "average")

Cluster Dendrogram



dist_dice
hclust (*, "average")



MOST COMMERCIAL CLONAL ROOTSTOCKS ARE THE RESULT OF SURVIVOR/ESCAPE/SUPER TREES FROM SEEDLING ROOTSTOCKS

IF WE ONLY PLANT CLONAL ROOTSTOCKS WE WILL LOSE THE CHANCE TO SELECT SURVIVOR TREES IN THE FIELD

- HOW WILL WE SELECT FOR NEW GENOTYPES?**
- WHAT WOULD HAPPEN IF A NEW DISEASE APPEARS?**



GENOMICS

THE FUTURE OF NEW AVOCADO ROOTSTOCKS

- ADAPTED TO DIFFERENT GROWING REGIONS: NO UNIVERSAL ROOTSTOCK
- TOLERANCE TO SALINITY AND DROUGH IN ADDITION TO SOIL FUNGI (TOLERANCE TO DIFFERENT DISEASES IN THE SAME ROOTSTOCK?)
- ADAPTED TO NEW VARIETIES (MALUMA, CARMEN, ..)
- LOW VIGOR
- INCREASE THE GENETIC POOL OF THE AVAILABLE ROOSTOCKS
- GENOMIC APPROACHES. GOOD GENOTYPING AND GOOD PHENOTYPING

A scenic landscape photograph showing a valley with rolling hills. In the foreground, there is a large field of young, green trees planted in neat rows. The middle ground features a valley floor with some buildings and a dirt road. The background consists of several layers of rolling hills under a clear blue sky. The word "Gracias" is written in a white, serif font in the center of the image. There are some dark green leaves visible in the top corners of the frame.

Gracias