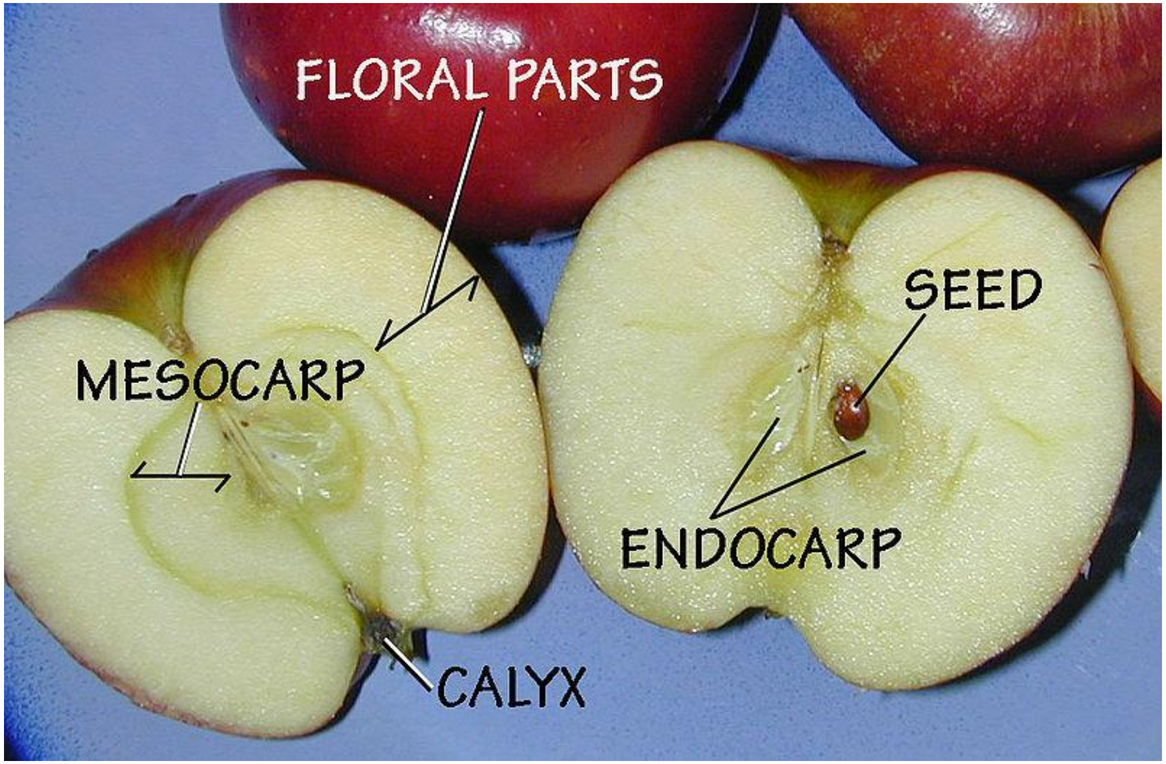
Why does crop diversity matter?

Rosaceae

Apple = Malus domestica – Kazaksthan
Pear = Pyrus communis – western China
Quince = Cydonia oblonga – Caucasus

Fruits = pome = 'accessory fruit' – the fleshy part formed from the flower parts which expand around the actual fruit which makes up the core



botanischer garten

der Universität Zürich

Universität Zürich

Pflanzenvielfalt im Botanischer Garten UZH Zürich

Obstsortenmarkt vom 27.10.2018 (in Klammern bestätigte Mengen zum Verkaufen zwischen 11 und 17 h)

Herbstäpfel	***Verwendung***	***Essreife***	***Geschichte Herkunft***
1 Cox Orange (50 kg)	Tafel;	Nov.;	GB; um 1830
2 Erdbeerapfel (25 kg)	Tafel, Kochen;	Nov.;	unbekannt
3 Cherry Cox Orange (20 kg)	Tafel;	Nov.;	DK/GB; um 1942
4 Spartan (25 kg)	Tafel, Spezialmost;	bis Nov.;	CN; um 1936;
5 Goldparmäne (100 kg)	Tafel;	Nov. bis Dez.;	GB; um 1300
6 Gelber Bellefleur (10 kg)	Tafel;	Nov. bis Feb;	USA; um 1797
7 Reinette de Cherbourg, R. de France (3 kg)	Tafel;	Dezember;	F; um 1795

Lager-Äpfel	***Verwendung***	***Essreife***	***Geschichte Herkunft***
8 Freiherr von Berlepsch (20 kg)	Tafel;	bis Jan.;	D; um 1880
9 Schöner von Fontanette (30 kg)	Tafel und Dörren;	bis Jan.;	CH/FR; um 1924
10 Schweizer Orangen (20 kg)	Tafel;	bis Jan;	um 1955; CH/ZH (Kreuzung Ontario x Cox Orange)
11 Glockenapfel (50 kg)	Tafel;	bis Feb.;	D/CH; um 1865
12 Adamsparmäne (15 kg)	Tafel;	Jan. bis März;	GB; um 1826
13 Boiken (15 kg)	Tafel;	bis März;	D; um 1820
14 Eierlederapfel (15 kg)	Tafel/Kochen;	bis März	CH/BL; um 1793
15 Königlicher Kurzstiel (5 kg)	Tafel;	bis März;	F; vor 1613
16 Weisser Wintercalville (10 kg)	Tafel;	März;	F; um 1558
17 Fraurotacher (25 kg)	Tafel;	Feb. bis April;	CH/SG und TG 1743
18 Ontario (20 kg)	Tafel / Kochen;	bis April;	CDN; um 1874
19 Feldbacher Seeapfel (25 kg)	Tafel/Mosten/Dörren;	März bis Mai;	CH/ZH; um1967
20 Champagner Reinette (30 kg)	Tafel;	bis Mai;	F; um 1650
21 Bohnapfel (20 kg)	Most/Tafel;	bis Juni;	D im 18. Jhdt

Weihnachtsbaum – Apfel	***Verwendung***	***Essreife***	***Geschichte Herkunft***
22 Jonathan (50 kg)	Tafel;	Nov. bis Jan.;	USA; um 1800
23 Rote Sternreinette (20 kg)	Tafel/Dekoration;	Dez. bis Jan.;	B; um 1830
24 Wildmuser (100 kg)	Tafel (Dessertapfel Weihnachten) /Dörren;	bis Feb;	CH/SG; um 1800

Äpfel: Spezieller Geschmack und Aussehen		***Essreife***	***Geschichte Herkunft***
25 Red Merylinn (30 kg)	Most/Kompott/Backen;	Sept.;	NZ ?; um 1990 ?
26 Chestnut (10 kg)	Tafel/Most/Dekoration;	bis Nov.;	USA; um 1830
27 Berner Rosen (60 kg)	Tafel;	bis Nov.;	CH/BE; um1880
28 Ananasreinette (95 kg)	Tafel;	Nov. bis Dez.;	NL; um 1800
29 Graue Parmentier Rtte. (10 kg)	Tafel;	Nov. bis Jan.;	B; um 1833
30 Kanada Reinette (40 kg)	Tafel;	Nov. bis März;	F; um 1769
31 Damason Reinette (20 kg)	Tafel;	Dez. bis März;	F; um 1628
32 Edelchrüsler (70 kg)	Tafel;	bis März;	CH/BL; um 1760

Äpfel: Wähen, Kuchen	***Verwendung***	***Essreife***	***Geschichte Herkunft***
33 Reinette de Chevroux (Westschweizer Zeienapfel) (30 kg)	Kochen;	bis Jan;	CH/VD; um 1820;
34 Graue Franz. Reinette (30 kg)	Kochen, Tafel;	Okt. bis Dez.;	F; 16. Jhdt.
35 Bismarck-Apfel (10 kg)	Kochen, Backen;	Okt. bis Dez.;	Australien um 1864
36 Schweizer Breitacher (10 kg)	Tafel/Backen/Kochen;	Nov. bis Feb;	CH; vor 1774
37 Wilerrot (30 kg)	Kochen/Spezialmost (Abkömmling Sauergrauech);	bis Jan;	CH/AG; um 1800
38 Schneiderapfel (20 kg)	Dörren/Kuchen/Most;	bis Jan.;	CH/ZH; um 1760
39 Boskoop (50 kg)	Kochen, Tafel, Spezialmost;	bis Feb.;	NL; um 1850

Äpfel: Chüechli	***Verwendung***	***Essreife***	***Geschichte Herkunft***
40 Köngisberger Reinette (50 kg)	Tafel/Kochen;	Dez. bis Feb.;	unbekannt;
41 Pomme chasseur, Jägerapfel (10 kg)	Kochen;	Dez.;	CH/FR; um 1890
42 Baarapfel, Schafnase (20 kg)	Kochen/Mosten;	Dez. bis Jan.;	CH/ZG; um1741
43 Munigrind, Tête de Veau (10 kg)	Kochen/Mosten;	Okt. bis Nov.;	CH/FR; unbekannt

Äpfel: Kompott, Apfelmus, Most	***Verwendung***	***Essreife***	***Geschichte Herkunft***
44 Sauergrauech (50 kg)	Spezialmost, heute auch Tafel;	bis Nov;	CH/BE: um 1720
45 Calville de Galmiz (20 kg)	Most/Tafel;	Dez. bis April;	CH/FR; um 1870
46 Gurwolfer Reinette (10 kg)	Tafel/Mosten;	bis März;	CH/FR; um 1836
47 Stäfner Rosen (= Baldwin) (20 kg)	Most /Tafel;	bis März;	USA; um 1750, ab 1880 in CH/Stäfa

Äpfel: Dörren	***Verwendung***	***Essreife***	***Geschichte Herkunft***
48 Seeländer Reinette (30 kg)	Tafel/Dörren;	Okt. bis Feb.;	USA; um 1680
49 Süsser von Lustorf (20 kg)	Dörren/Tafel/Kochen;	Nov. bis Feb.;	CH/FR; um 1855
50 Douce blanche de Romont (5 kg)	Dörren/Tafel/Kochen;	bis Feb.;	CH/FR; um 1914
51 Winterzitrone, Zitronen-A. (25 kg)	Kochen/Dörren;	bis Feb.;	F; um 1628
52 Herbstrambour (9 kg)	Tafel/Dörren;	bis März;	F; um ???
53 Cutoy (5 kg)	Dörren/Tafel;	bis März;	CH/FR; um 1860
54 Thurgauer Borstorfer (40 kg)	Tafel/Kompott/Dörren;	bis März;	D; um 1874

Birnen	***Verwendung***	***Essreife***	***Geschichte Herkunft***
55 Salzburger Butterbirnen (30 kg)	Tafel/Sterilisieren;	Sept. bis Nov.;	A ?; um 1850
56 Gute Louise (28 kg)	Tafel/Backen/Dörren;	Okt. bis Dez.;	F; 1778
57 Blumenbachs Butterbirne (5 kg)	Tafel, Kochen;	Nov.;	B; um 1820
58 Bosc Flaschenbirne, Kaiser Alexander (10 kg)	Tafel;	bis Ende Nov.;	F; um 1793
59 Conference (30 kg)	Tafel;	bis Nov.;	GB; um 1890
60 Pastorenbirne (20 kg)	Tafel/Backen/Mosten/Dörren;	Nov. bis Jan.;	F; um 1760
61 Concorde (10 kg)	Tafel;	Nov. bis Feb.;	GB; um 1969
62 Doyenne de Comice (40 kg)	Tafel;	Nov. bis Dez.;	F; um 1850;
63 Schweizer Bratbirne (33 kg)	Braten/Kochen/Liebhaber;	Nov. bis Feb.;	CH/ZH vor 1820
64 Zweiäugler Birne (10 kg)	Tafel/Kochen;	bis Dez.;	F; um 1530, Bot. Seltenheit
65 Poire Sans Règle, Regelbirne (10 kg)	Kochen	Jan. bis April;	CH/NE; um 1751
66 Quitten Vranja (25 kg)	Kochen;	Okt bis Nov;	urspr. Kleinasien





BIO 235 Plants & People - Evolution & Domestication of Crops

Lecture 7 Minor Crops - *Lost Crops of the Incas* - quinoa, tarwi, mashua, oca, yacon & ulluco (& llama, alpaca, guinea pig....)

Colin Hughes, Institute of Systematic Botany
colin.hughes@systbot.uzh.ch





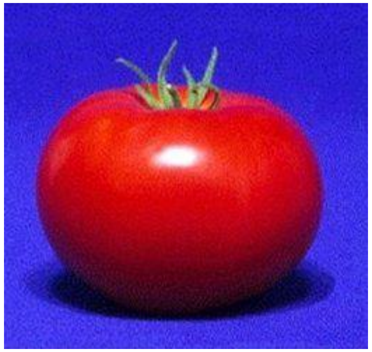
Minor Crops

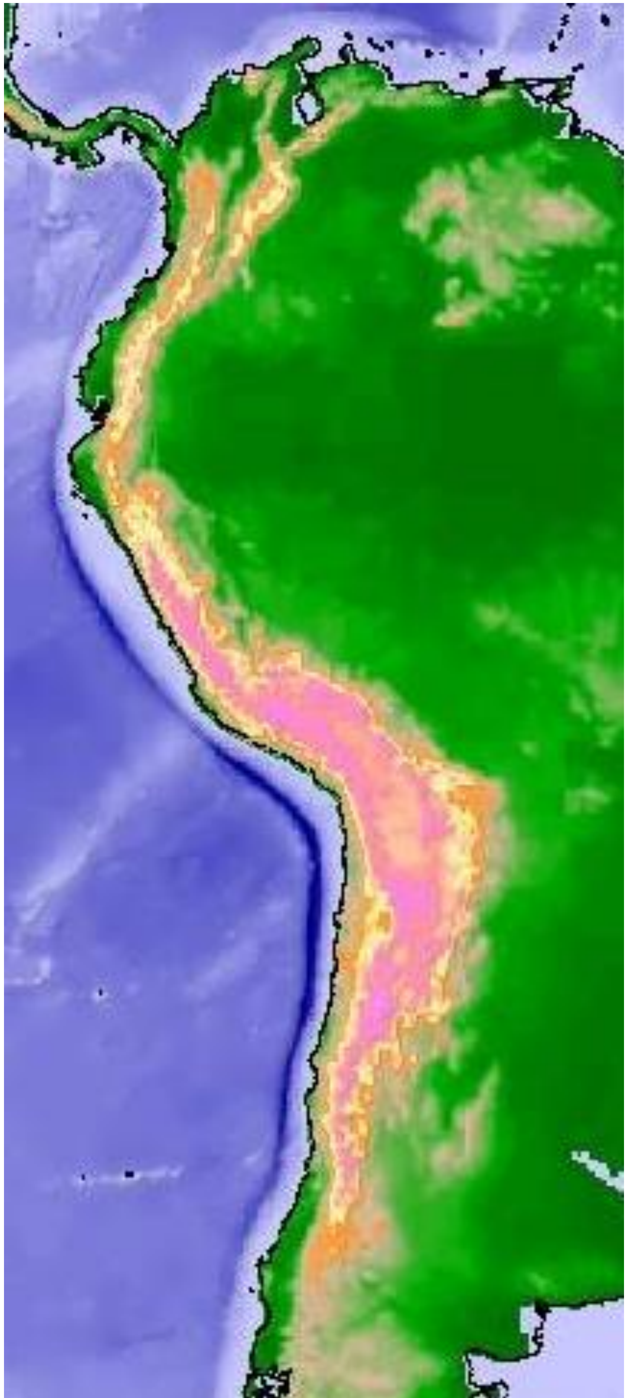
Underutilized or non-commercial crop species that are important components of regional or national agricultural biodiversity, which were potentially more important in the past, but which are today mainly used locally.

These minor, displaced and underutilized crops nevertheless continue to play an important role in food security of rural communities in many parts of the world.

This lecture will examine what we know about such 'lost crops' in one region of the world, the Andes.

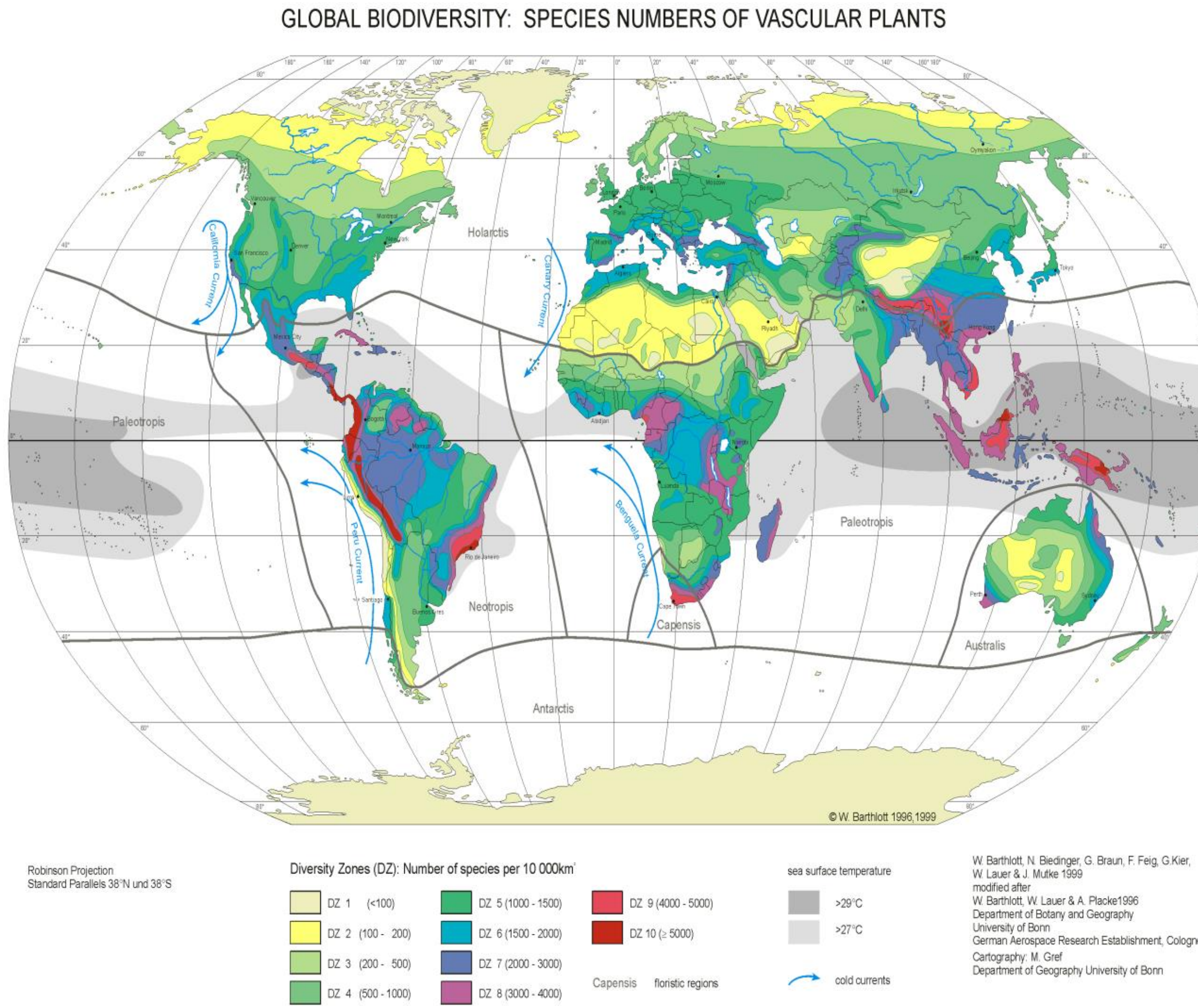
Lost Crops of the Incas

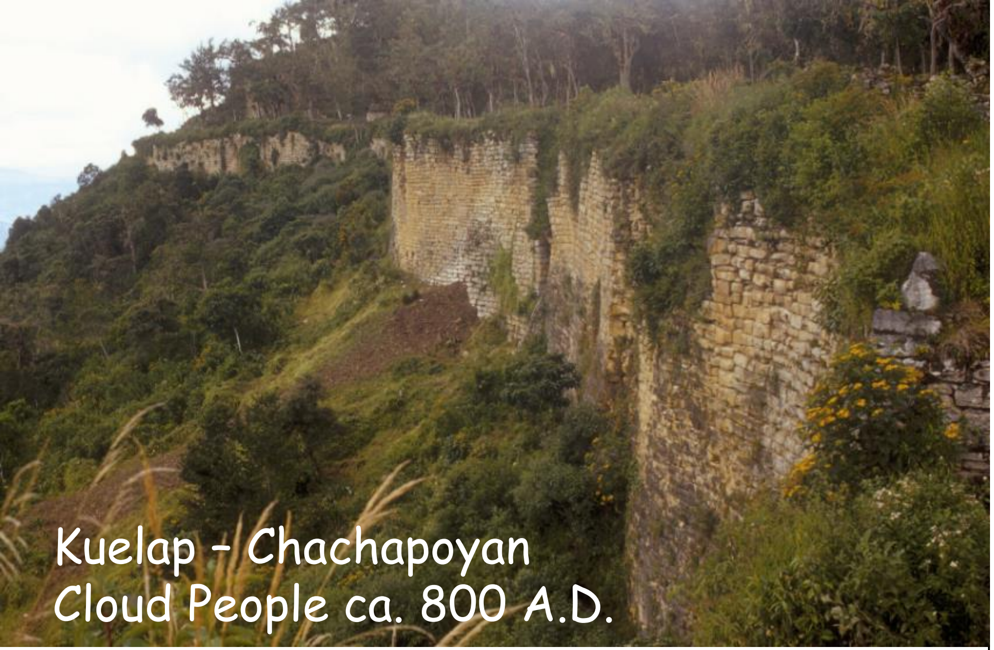




The Andes

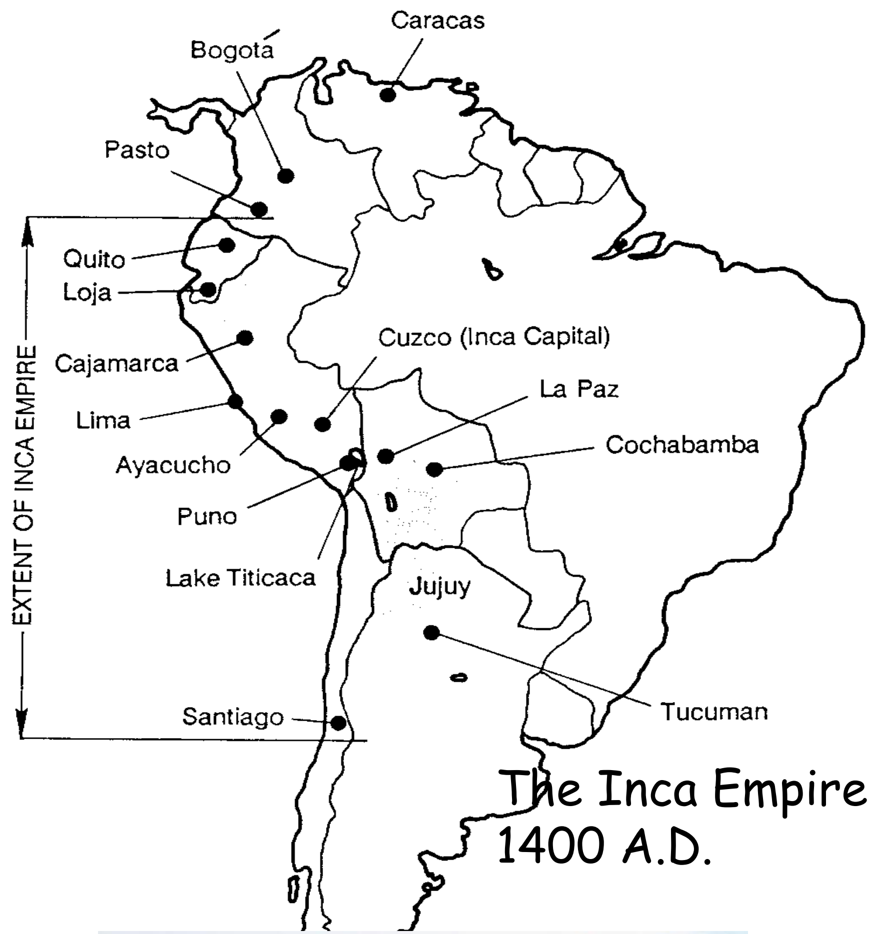
The hottest biodiversity hotspot
45,000 plant species
Geologically recent
Steep, extended environmental gradients ; 0 - 5,000m





Kuelap – Chachapoyan
Cloud People ca. 800 A.D.

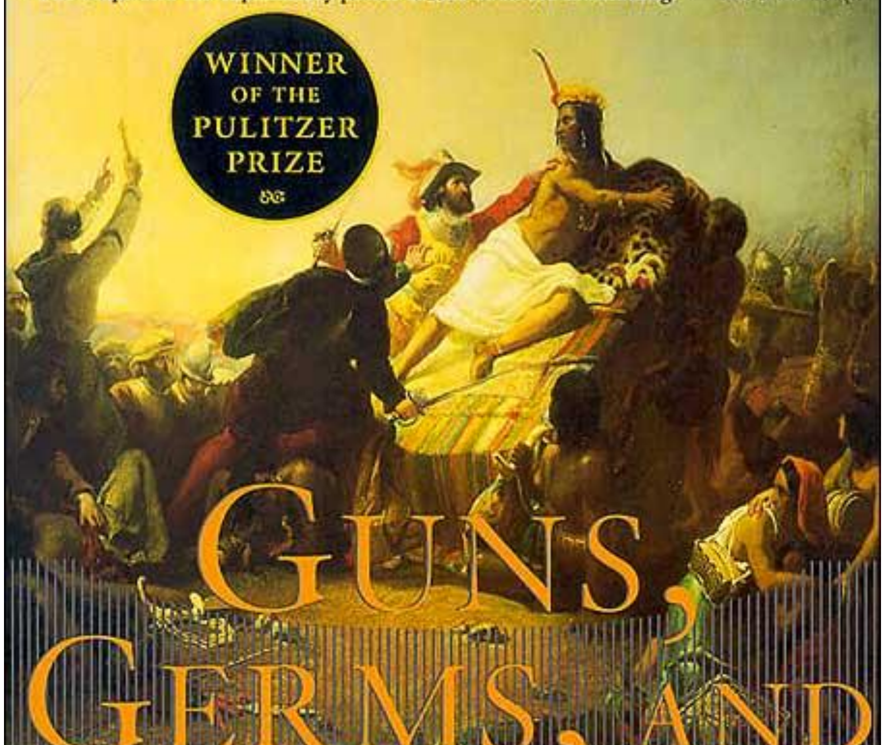
Marka Huamachuco
ca. 900 A.D.



The Inca Empire
1400 A.D.

NEW YORK TIMES BESTSELLER

"The scope and the explanatory power of this book are astounding." —*The New Yorker*



WINNER OF THE PULITZER PRIZE

GUNS, GERMS, AND STEEL

The FATES *of* HUMAN SOCIETIES

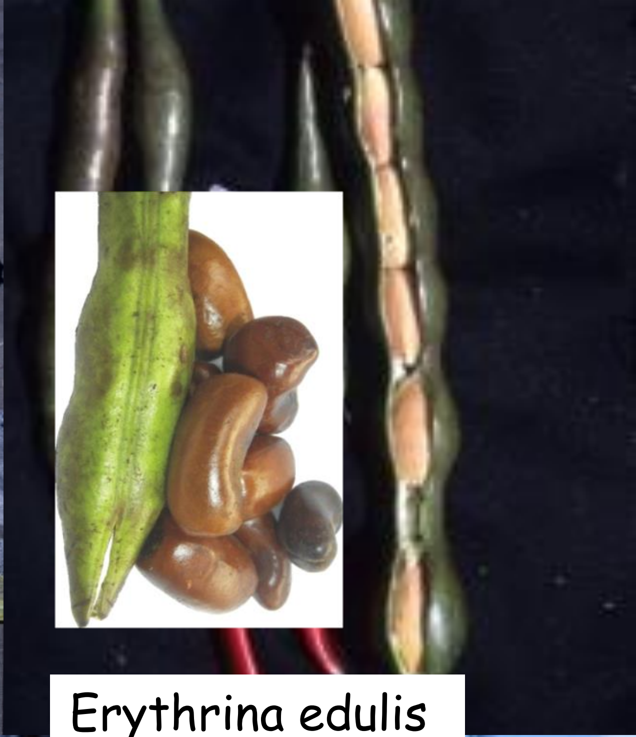
JARED DIAMOND

WITH A NEW AFTERWORD ABOUT THE MODERN WORLD









Inga edulis – Leguminosae
Ice Cream Bean


Erythrina edulis – Leguminosae
El pajuro


Kiwicha
Amaranthus caudatus


Quinua
Chenopodium quinoa

Quinoa – *Chenopodium quinoa*

Highly nutritious pseudocereal – the 'mother grain' of the Incan empire

Gluten-free, low glycaemic index, excellent balance of essential amino acids, fibre, lipids, carbohydrates, vitamins & minerals.

Adapted to harsh abiotic conditions – aridity (highly drought tolerant), cold, high elevations (up to 4500m), salinity

Quinoa

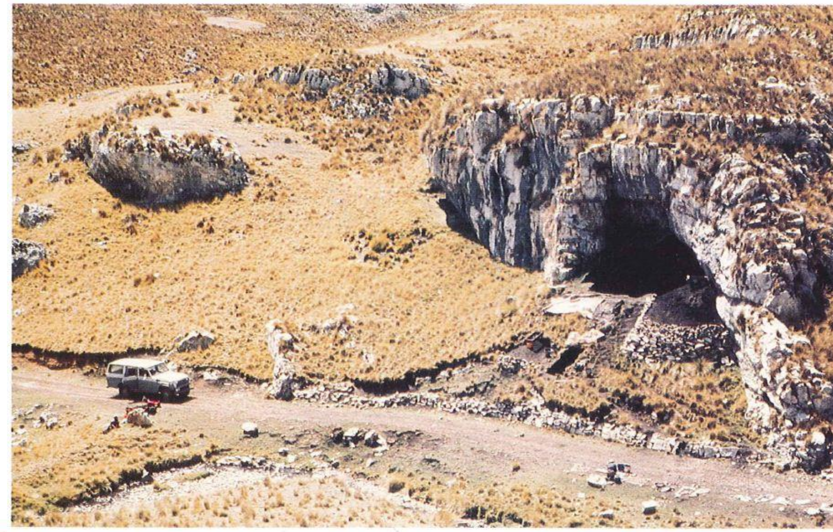
Chenopodium quinoa = quinoa
Weedy counterpart quinoa negra
C. pallidicaule – kañawa

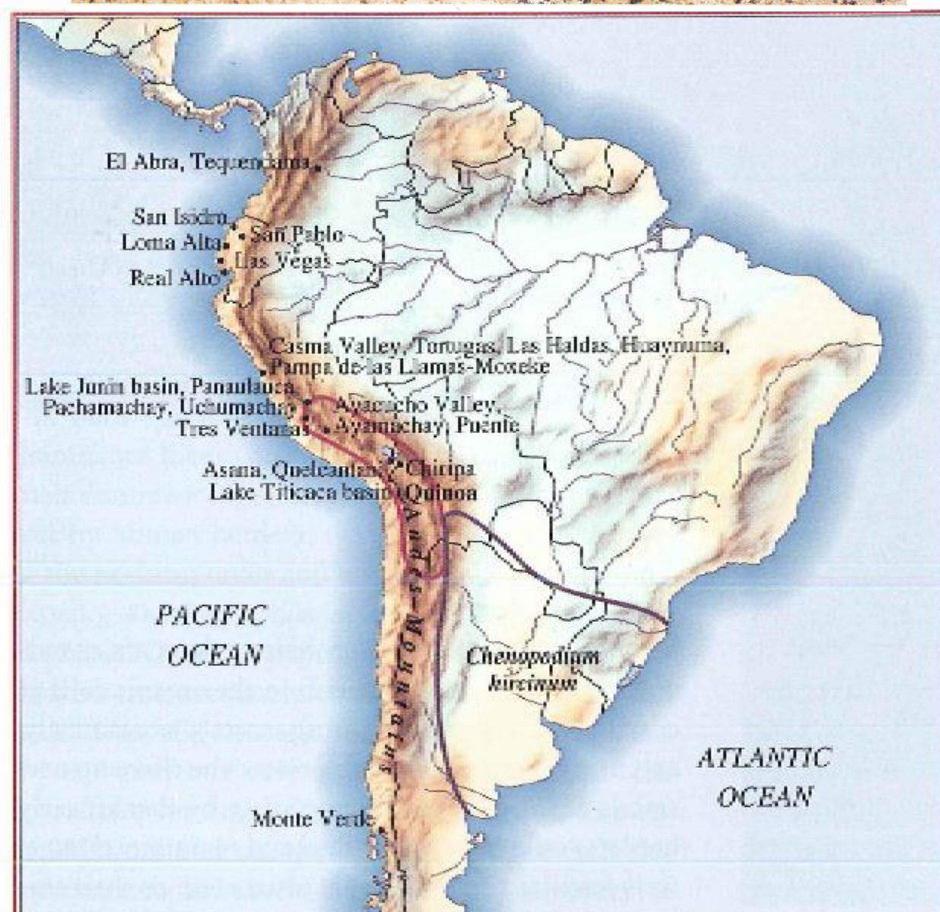
Quinoa archaeology

Dramatic reductions in testa thickness

Evidence of domesticated forms from 3600 BP from archaeological sites in the Lago Titicaca basin

3500-2800 BP mix of weedy quinoa negra and domesticated quinoa replaced by pure domesticated quinoa ca. 2800 BP.





Chenopodium domestication

Five separate domestications

C. pallidicaule - Peru/Bolivia altiplano – diploid

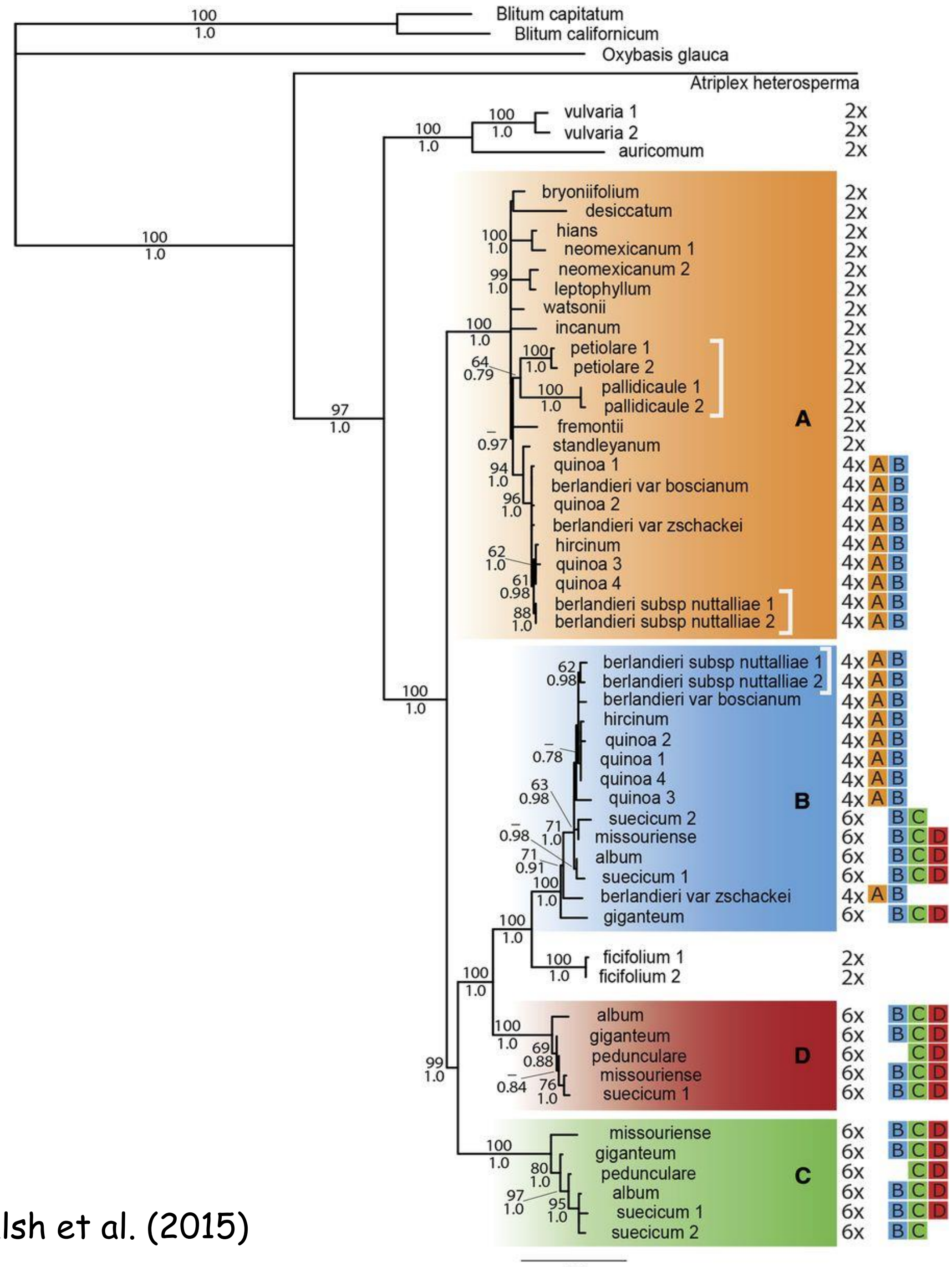
C. giganteum - Asia – hexaploid

C. quinoa – Andes - tetraploid

C. berlandieri subsp. *nuttalliae* – Mexico – tetraploid

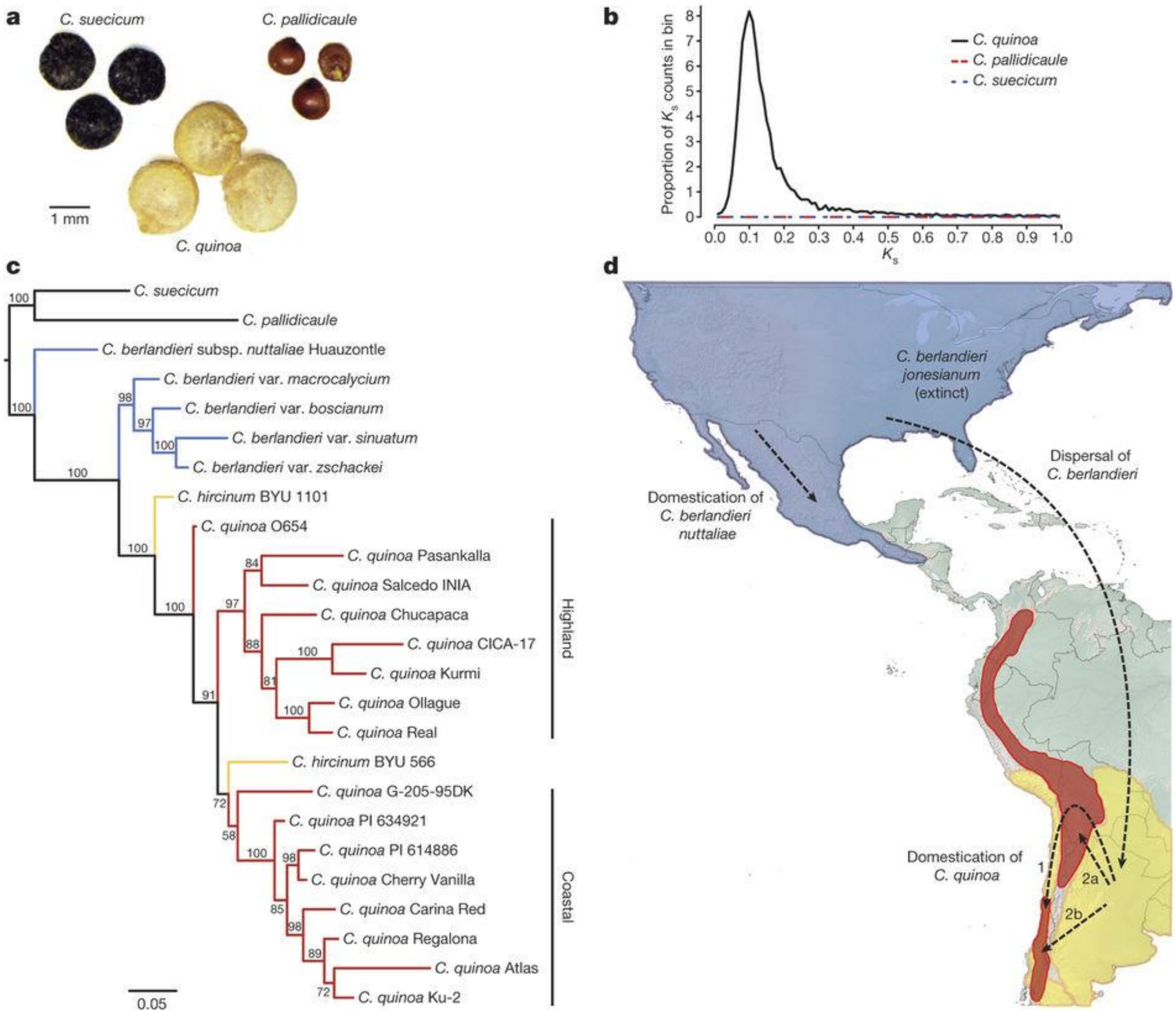
C. berlandieri subsp. *jonesianum* – S.E. U.S.A. – tetraploid

Single New World polyploidy event, but too poorly resolved to ascertain parentage beyond *C. standleyanum* as one putative diploid parent.



Walsh et al. (2015)

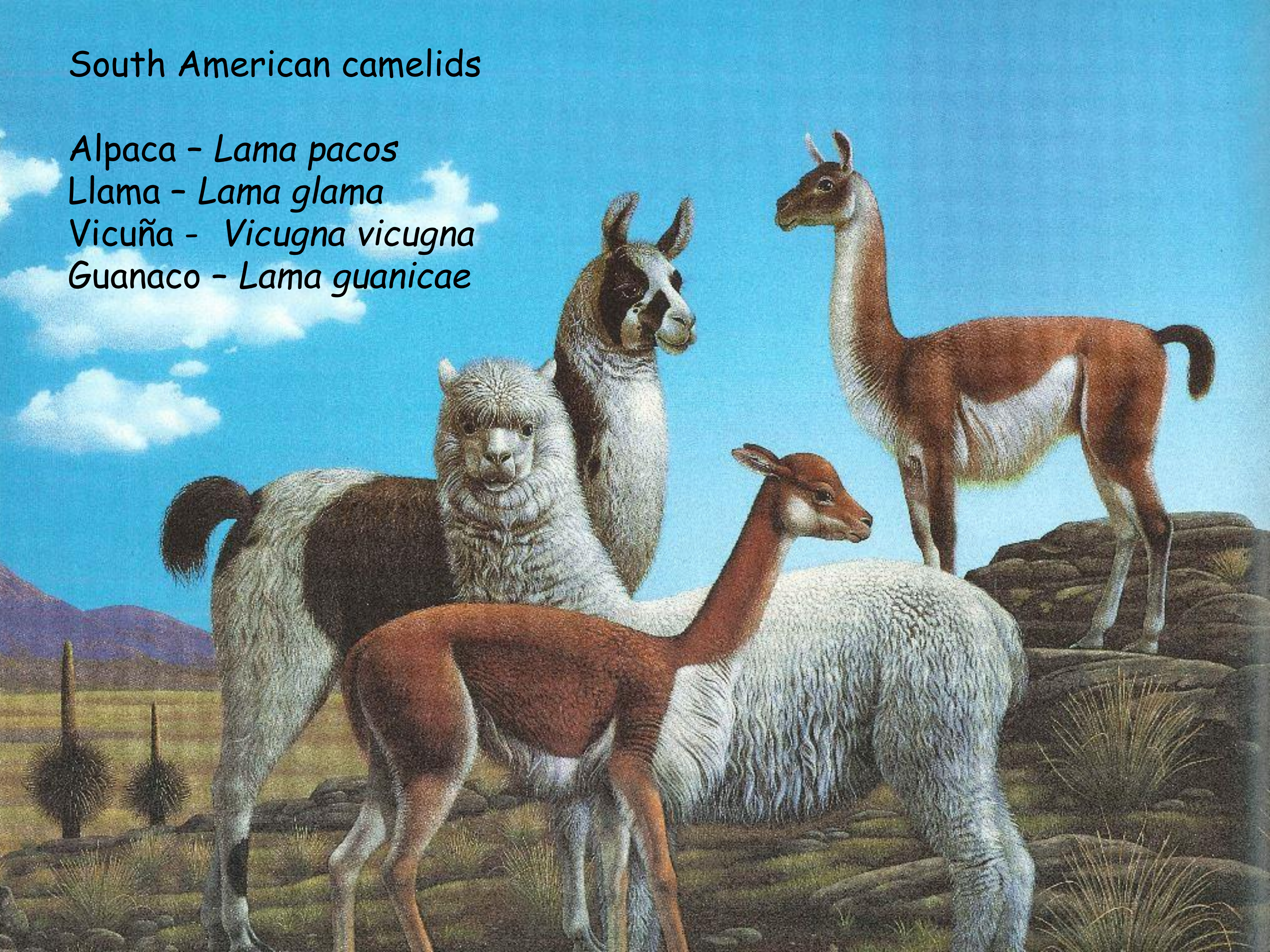
The Genome of *Chenopodium quinoa*



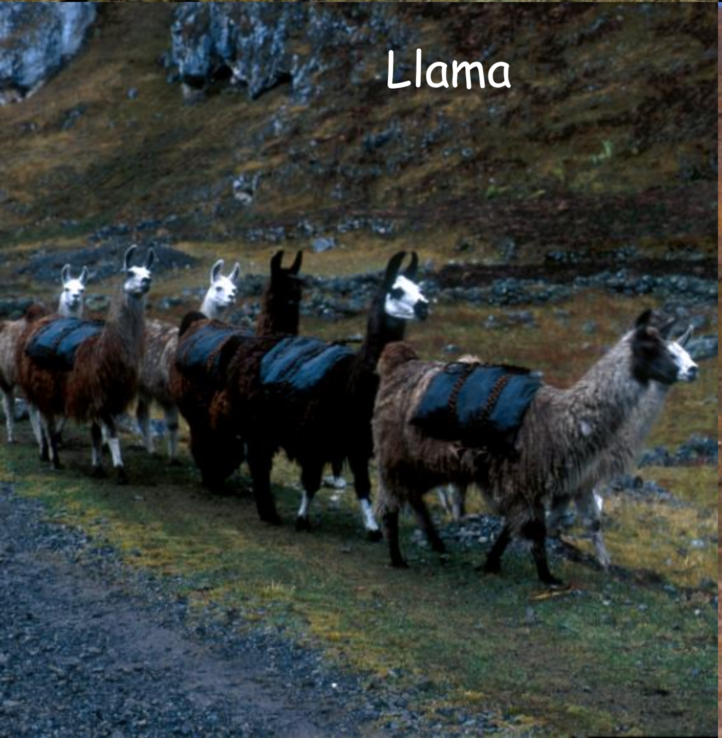
Jarvis et al. (2017)

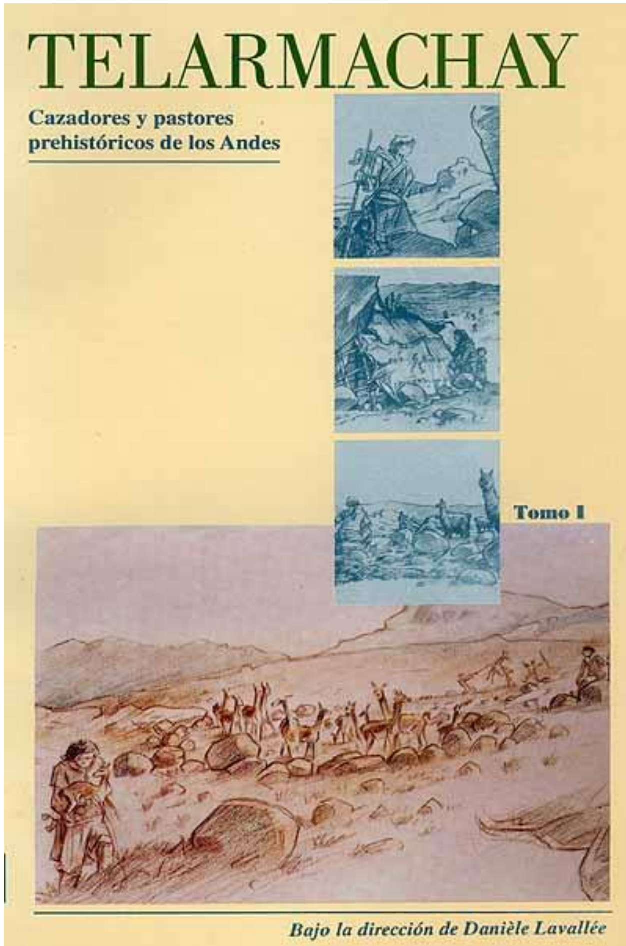
South American camelids

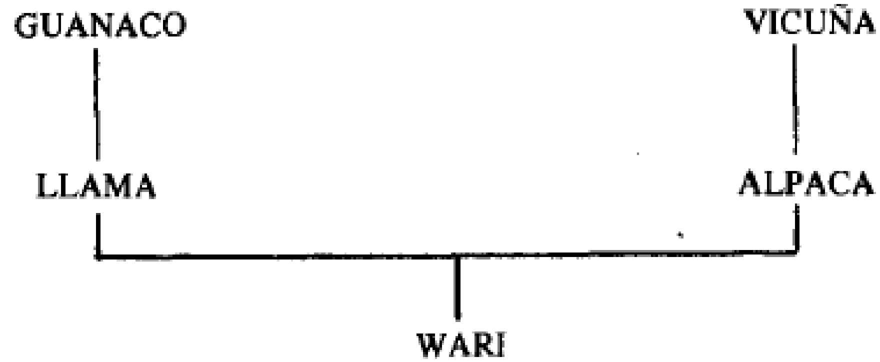
Alpaca – *Lama pacos*
Llama – *Lama glama*
Vicuña - *Vicugna vicugna*
Guanaco – *Lama guanicae*



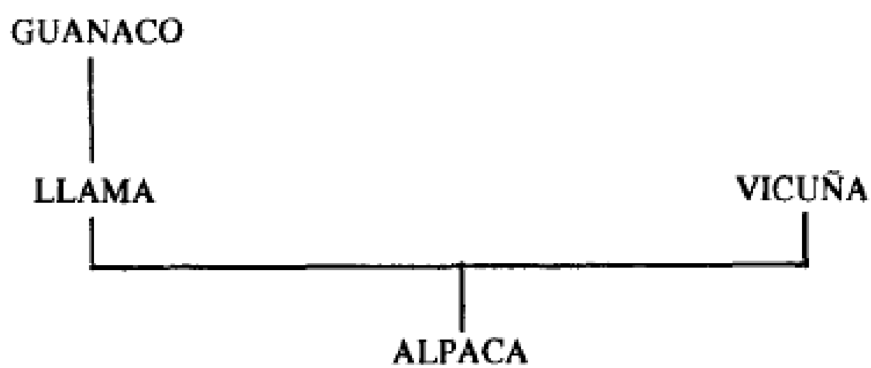

Alpaca

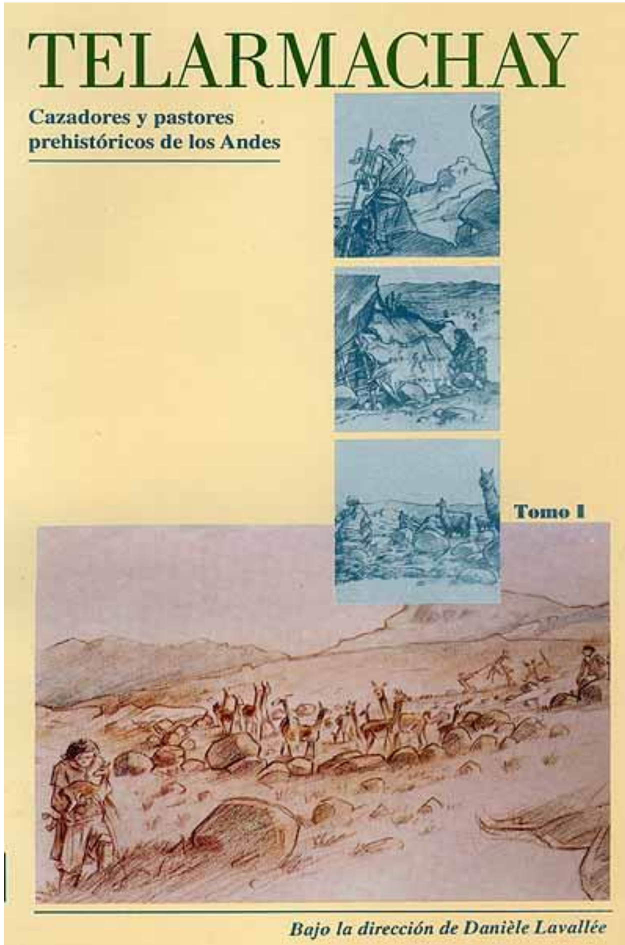

Llama



TELARMACHAY
Cazadores y pastores prehistóricos de los Andes
Tomo I
Bajo la dirección de Danièle Lavallée


GUANACO
VICUÑA
LLAMA
ALPACA
WARI


GUANACO
VICUÑA
NOT DOMESTICATED
LLAMA
ALPACA


GUANACO
LLAMA
VICUÑA
ALPACA


TELARMACHAY
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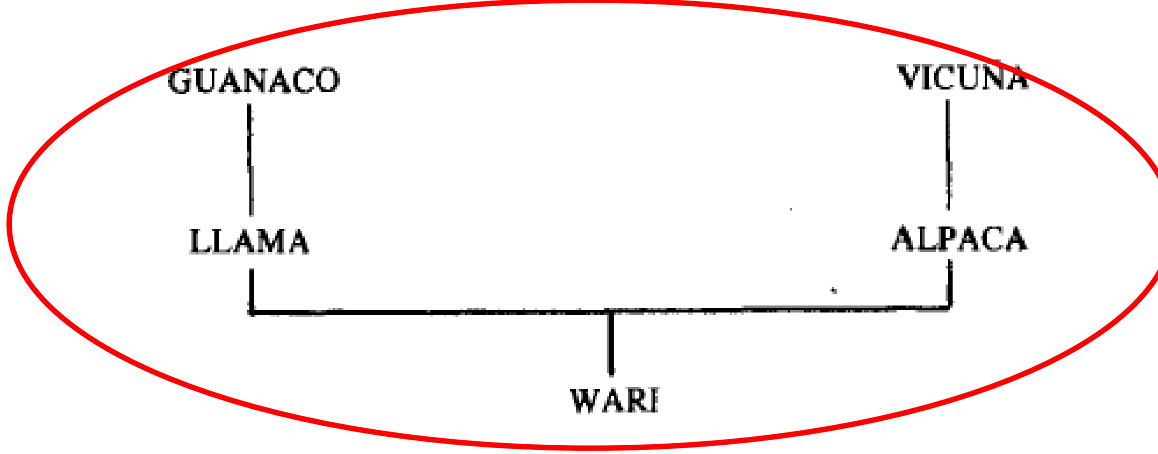
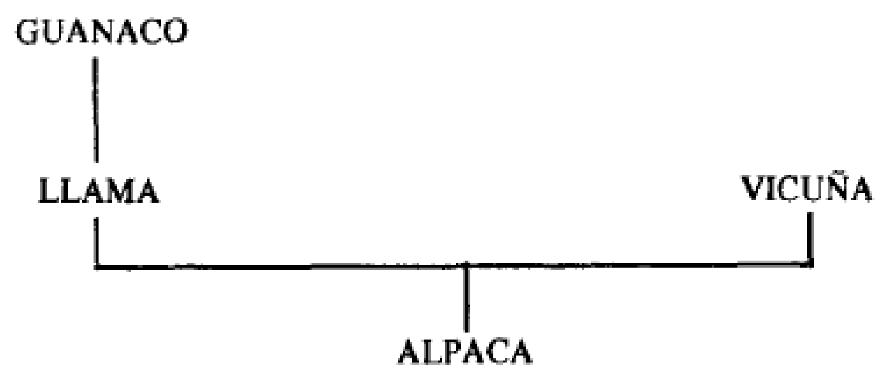
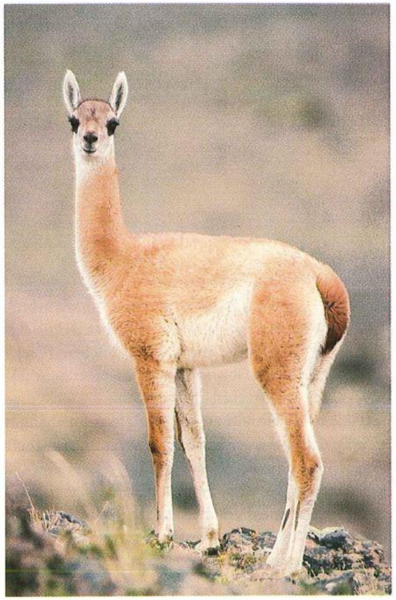

GUANACO
VICUNA
LLAMA
ALPACA
WARI


GUANACO
VICUÑA
NOT DOMESTICATED
LLAMA
ALPACA

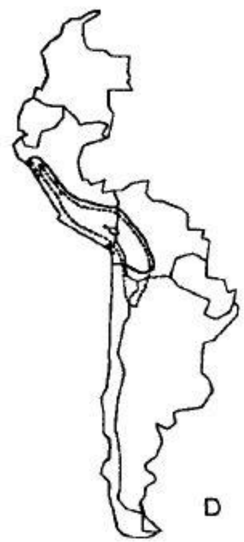

GUANACO
LLAMA
VICUÑA
ALPACA



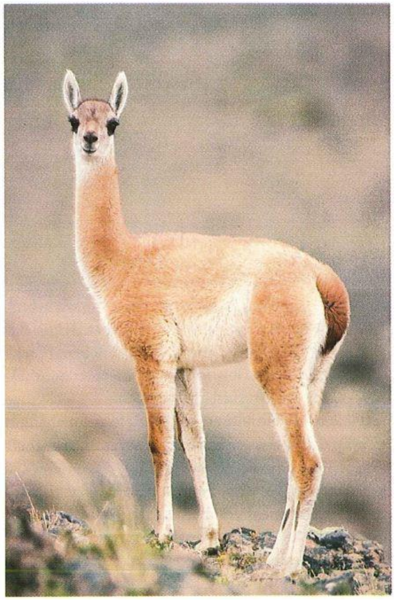
Guanaco

Vicuña

Llama



Alpaca



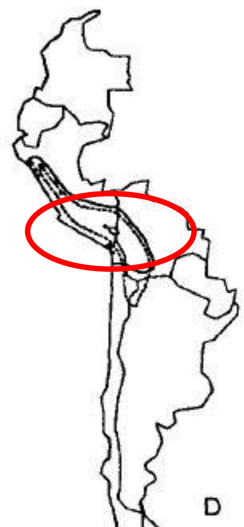
Guanaco

Vicuña

Lago Titicaca
Basin

7,000-6,000 BP

Llama



Alpaca

Guinea Pigs

Cavia porcellus and other species

Used by hunter-gatherers 12,000 – 7,500 B.P.

Domesticated by 4,500 B.P. in parallel to the emergence of llama & alpaca herding in the south-central Andes

Andean Tuber Crops

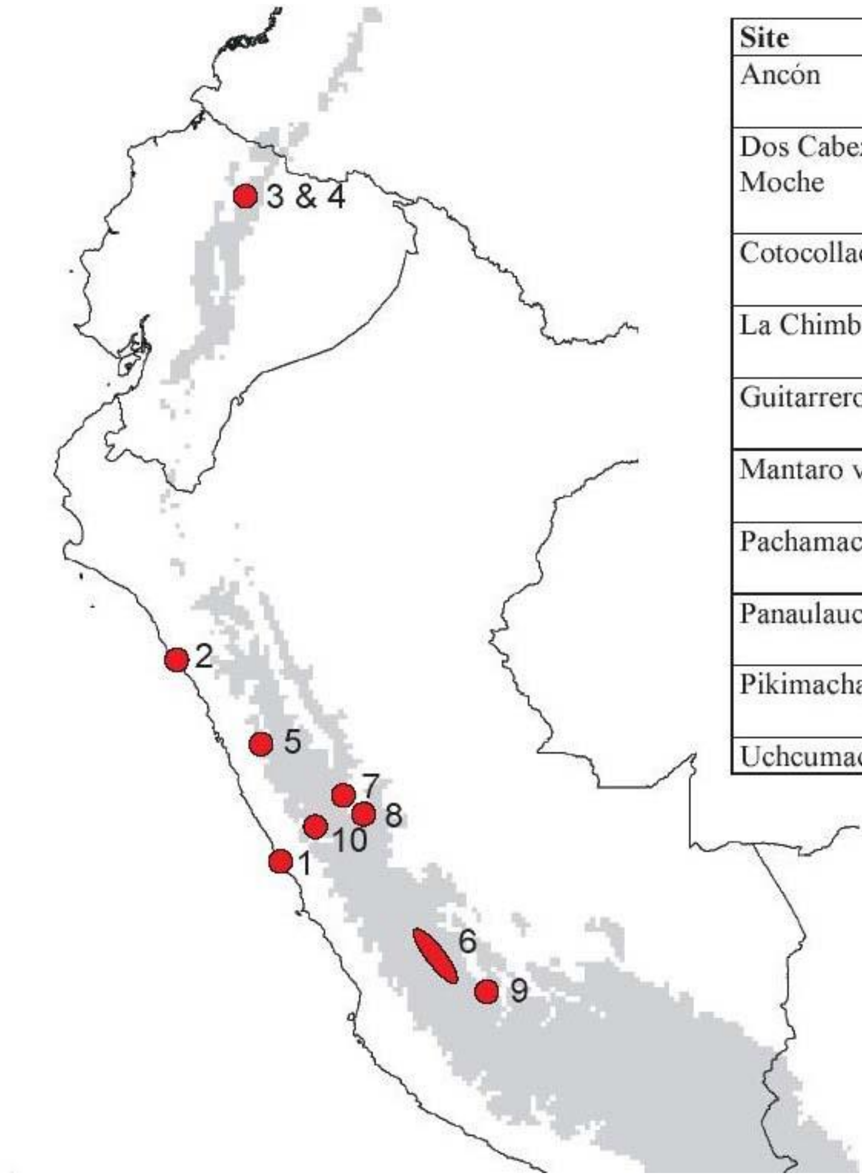
Mashua
Tuberous Nasturtium
Tropaeolum tuberosum
Tropaeoleaceae

Ulluco
Ullucus tuberosus
Basselaceae

Oca
Oxalis tuberosus
Oxalidaceae

Potato
Solanum tuberosum
Solanaceae

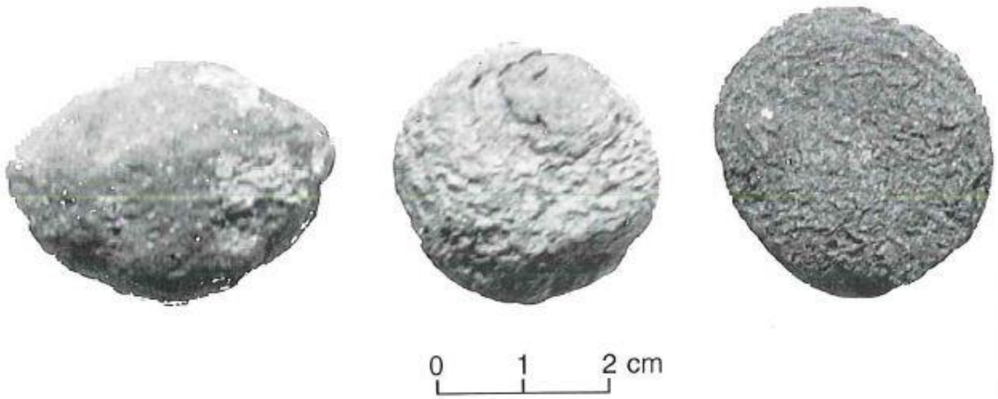
Archaeobotanical sites in the Andes

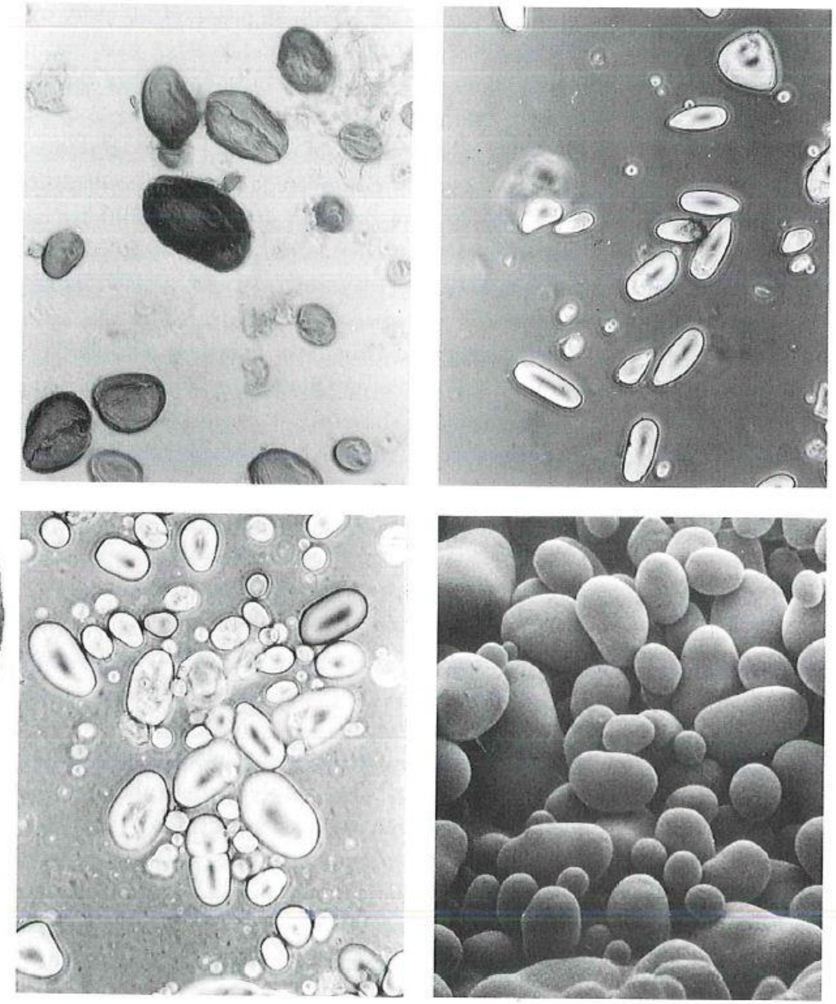


Site	No.	Location	Coast/Sierra	Date	Reference
Ancón	1	Lima, Central Peru	Coast	5,300 BC -	(Towle, 1961)
Dos Cabezas Moche	2	La Libertad, northern Peru	Coast	100-700AD	(Geyer, Larson, and Stroik, 2003)
Cotocollao	3	Pichincha, northern Ecuador	Sierra	1500-500 BC	(Pearsall, 2003)
La Chimba	4	Pichincha, northern Ecuador	Sierra	2440 BC to 1500 BC	(Pearsall, 2003)
Guitarrero Cave	5	Callejón de Huaylas, Peru	Sierra	8000-7500 BC	(Lynch, 1980)
Mantaro valley	6	Mantaro valley, Peru	Sierra	1350 AD onwards	(Hastorf, 1993)
Pachamachay	7	Junín, Peru	Sierra	9850 BC - 80 AD	(Pearsall, 1980)
Panaulauca	8	Junín, Peru	Sierra	2100-1400 BC	(Pearsall, 1988)
Pikimachay	9	Ayacucho, Peru	Sierra	5800-1750 BC	(Rick, 1988)
Uchcumachay	10	Junín, Peru	Sierra	N/A	(Rick, 1988)

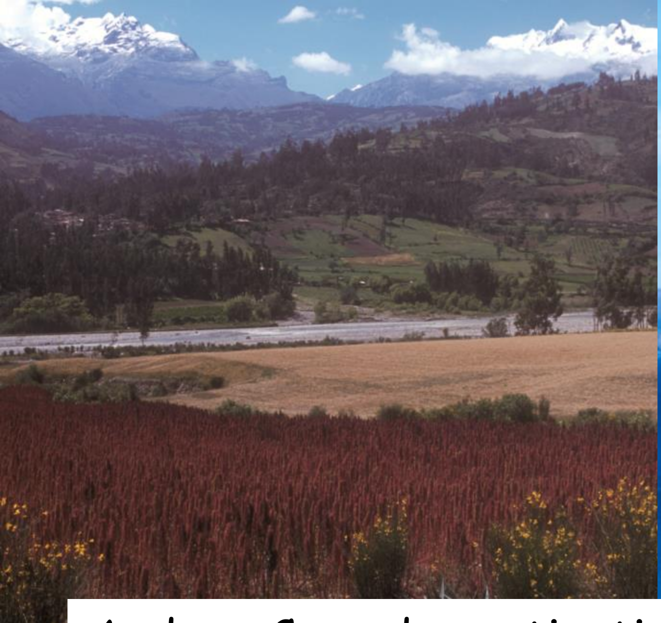
Root crops (potatoes, oca, ulluco, and mashua) not generally preserved – very sparse archaeological evidence for these crops that dominate Andean crops

<u>Potato</u>
Solanum tuberosum
Solanaceae



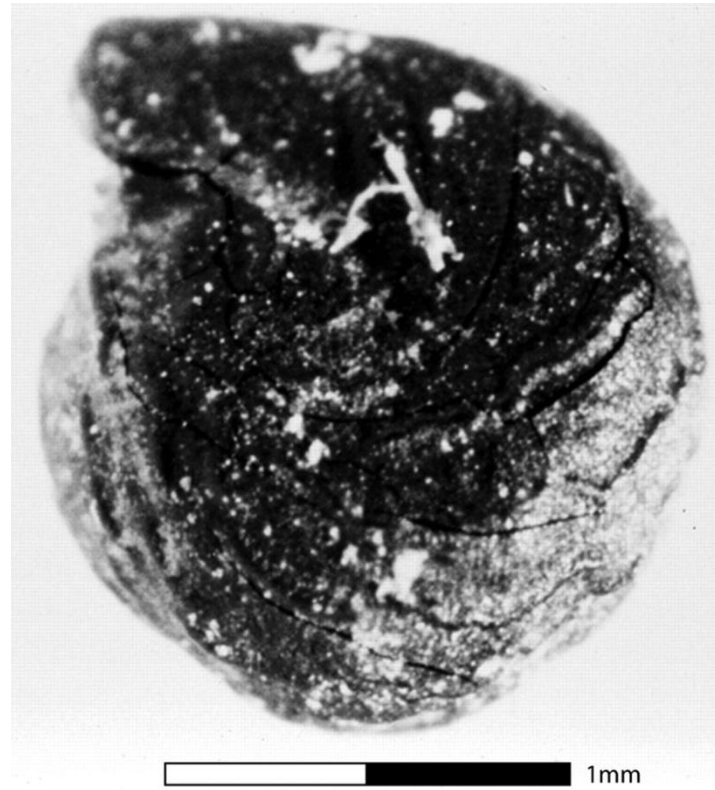


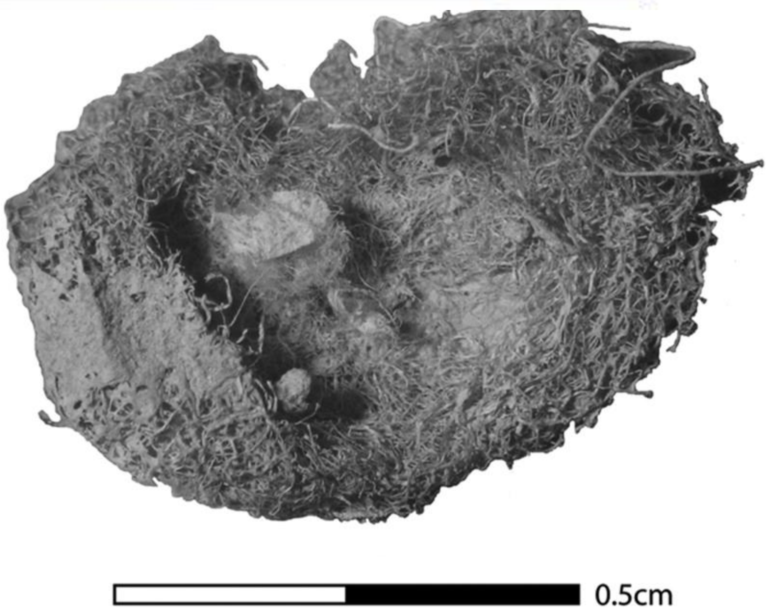
- 20 well-preserved potato tubers
- 4,000 – 3,200 BP
- Casma, Pacific coastal Peru
- Large starch grains characteristic of domesticated potato




Andean Crop domestication – the early consensus
S-C Andean core region; 4,500 BP – alpaca, llama, guinea pig, potato, quinua


Nanchoc, Coastal Peru, seasonally dry forest alluvial zone





Peanut – 7,840 BP
Quinua – 7,000-8,000 BP
Squash – 9,240-7660 BP
Cotton – 5,490 BP

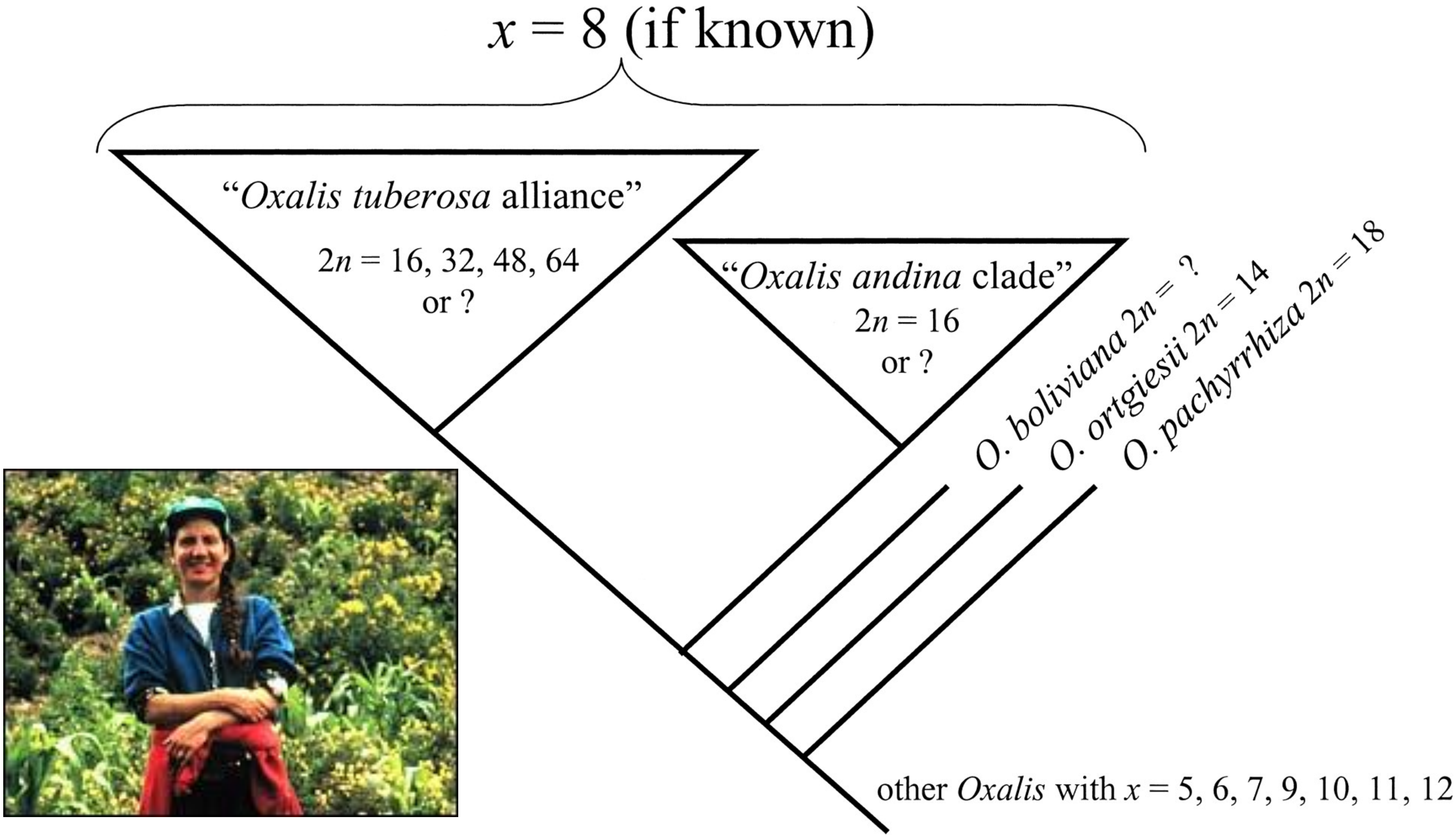
Dillehay et al (2007)


<u>Oca</u>

Oxalis tuberosa, Oxalidaceae

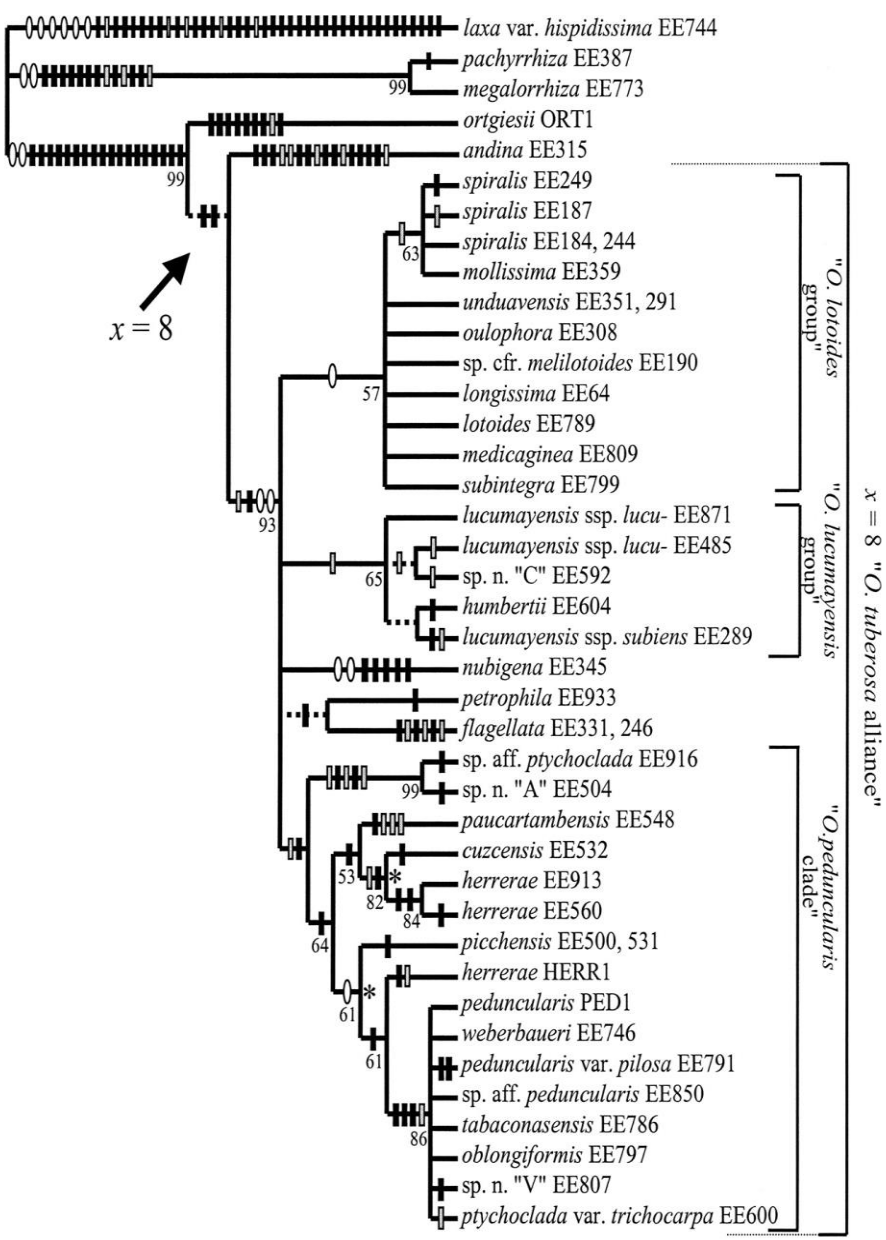
Polyploid - octaploid – i.e. eight sets of chromosomes. Likely complex hybrid origin, but still poorly understood due to lack of DNA sequence variation and confused taxonomy

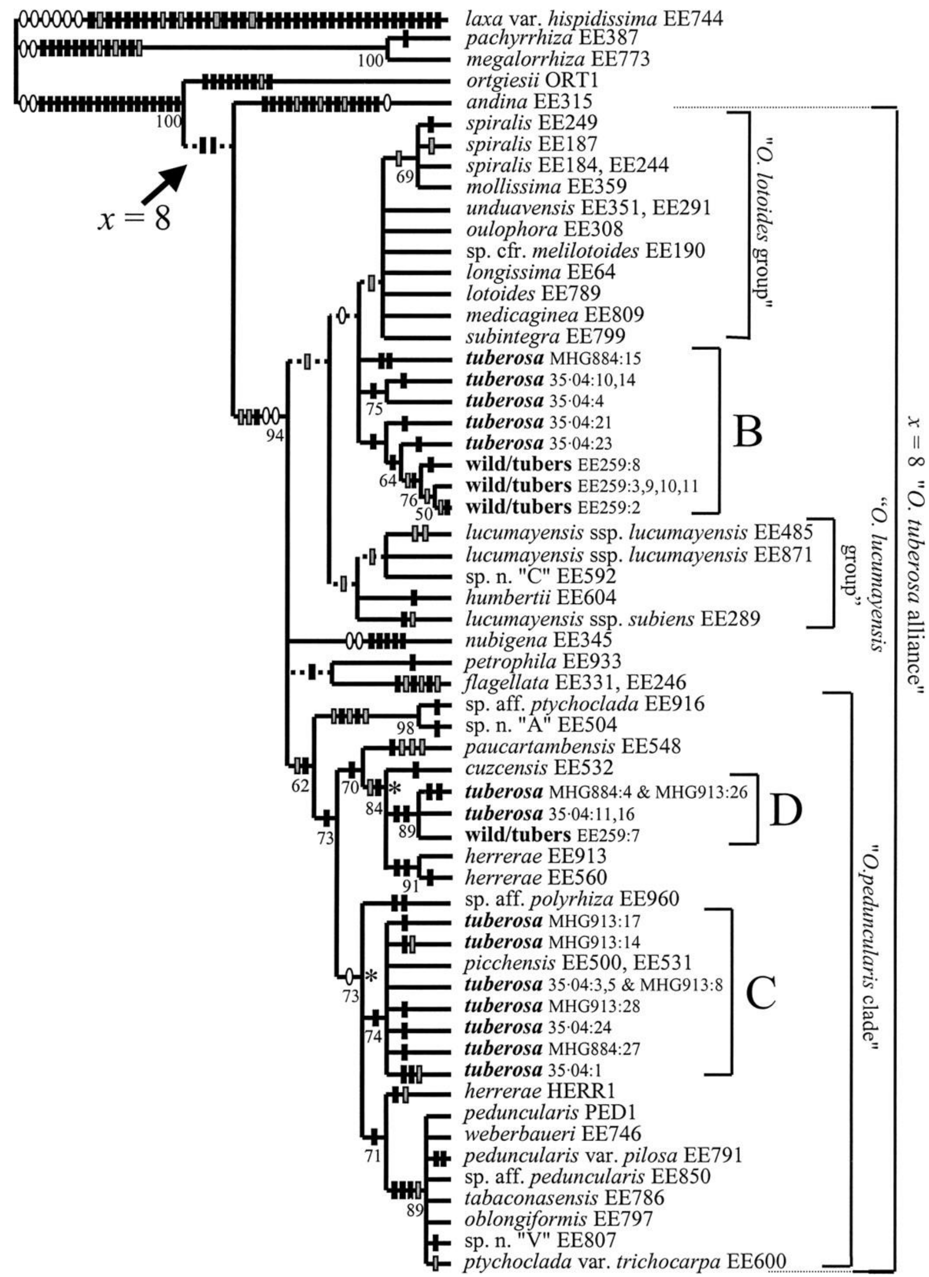
Summary ITS tree for *Oxalis tuberosa* & allies



Emshwiller & Doyle, 2002

Gene trees for the *Oxalis tuberosa* alliance using nuclear-encoded ncpGS gene sequences

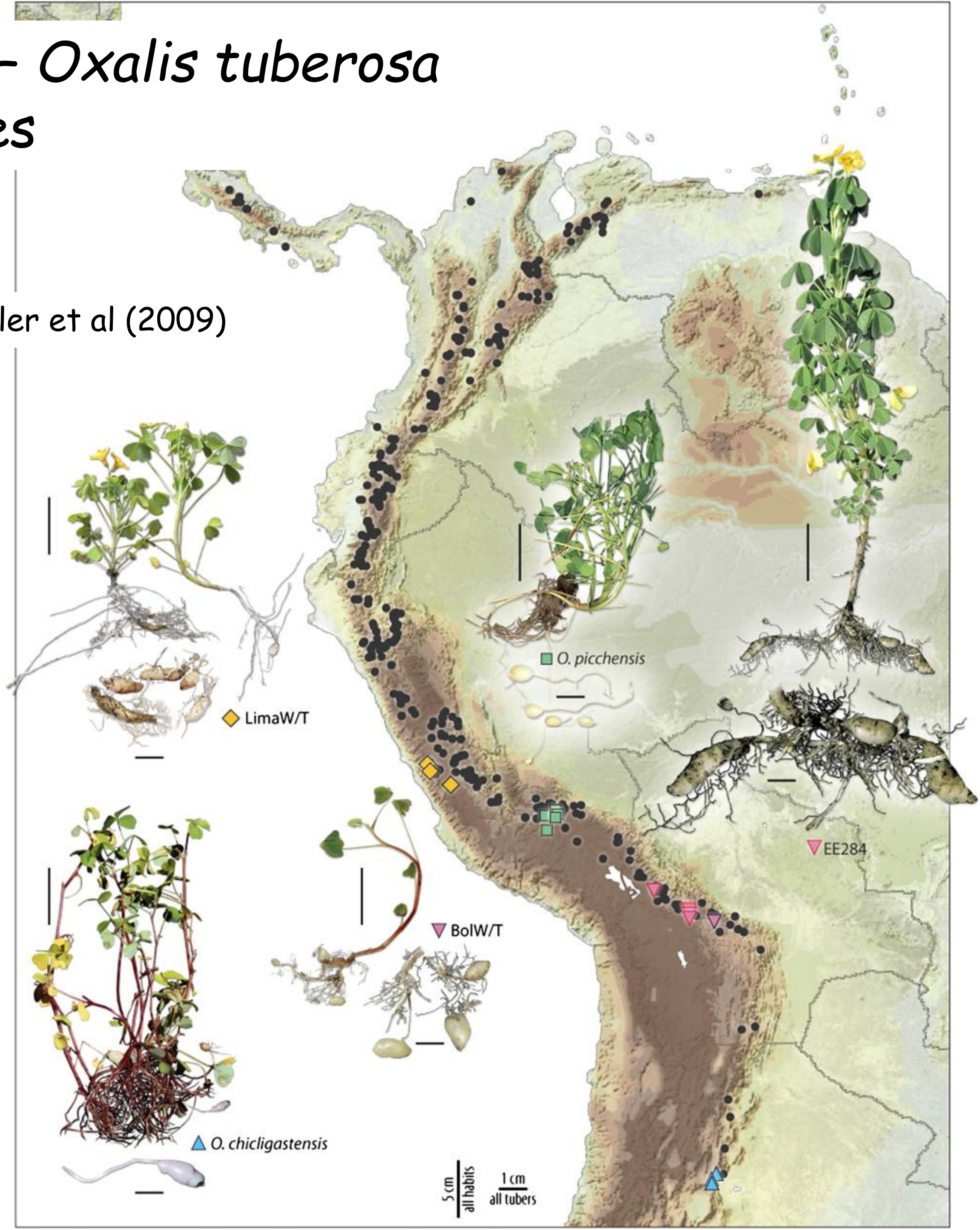




Emshwiller & Doyle, 2002

Oca – *Oxalis tuberosa*
Andes

Emshwiller et al (2009)



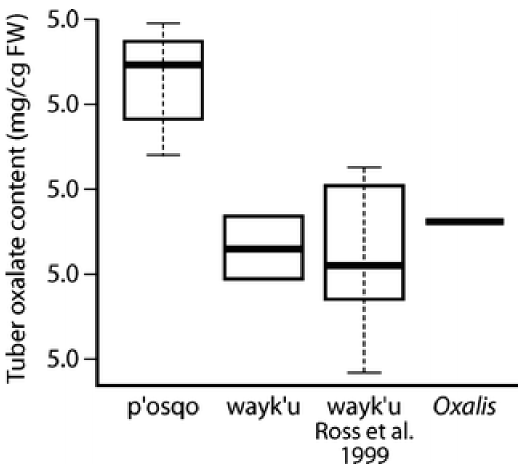
Cultivated oca –

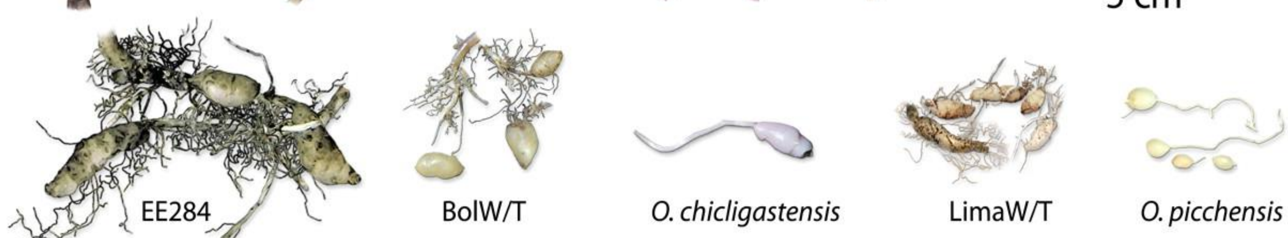
<u>2 types</u>:

- Khaya (Posq'u) – sour - preserved

- Wayk'u – sweet, eaten fresh

- Opposing domesticated phenotypes

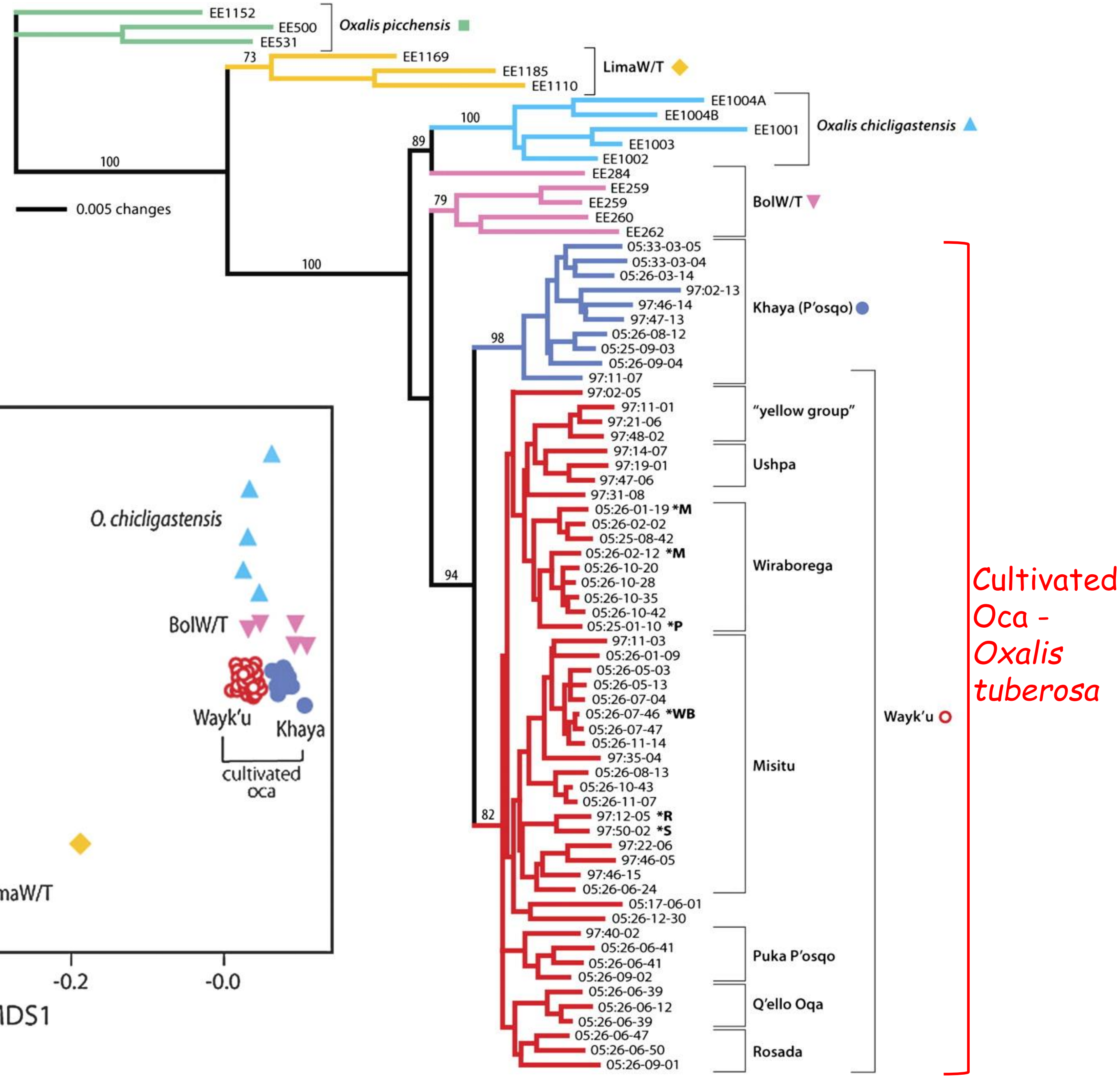


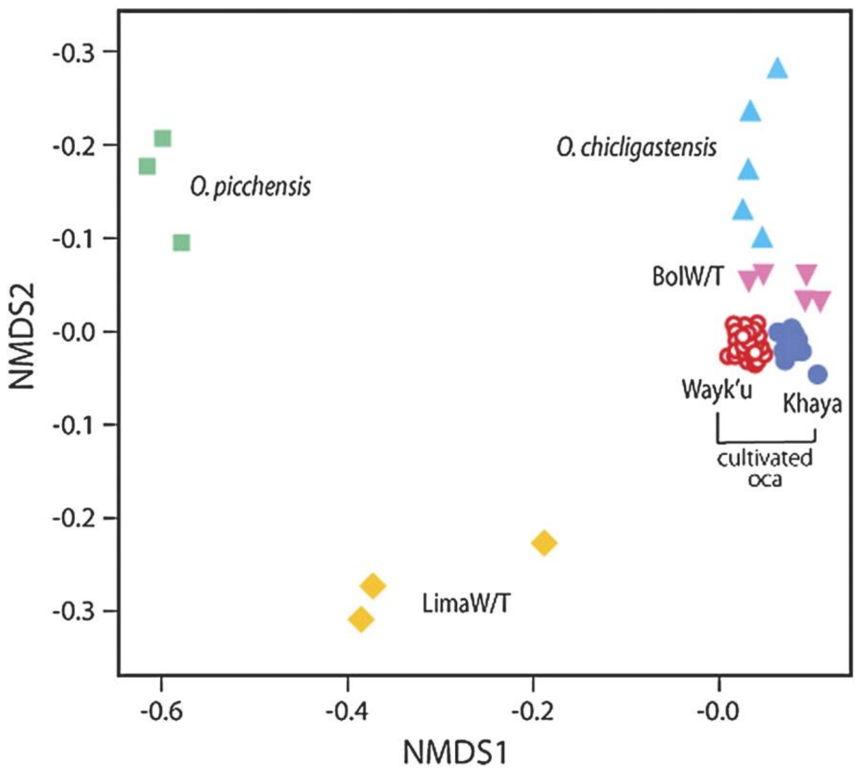


Unknown, probably polyploid   tetraploid   ?hexaploid   tetraploid

Emshwiller et al (2009); Bradbury & Emshwiller (2010)

AFLP analyses of Oca and four wild tuber-bearing species of *Oxalis*





Emshwiller et al (2009)

Domestication of Oca - Conclusions

- Each of the wild tuber-bearing populations represent potentially distinct species.
- The two cultivated oca use categories are molecularly distinct, suggesting some as yet unknown difference in their evolutionary histories – possibly separate polyploidy events and/or separate origins of domestication. This provides a good example of how ethnobotanical information can reveal evolutionary differences that might otherwise have been overlooked.
- That the BolW/T and *O. chiclisgastensis* are possible genome donors of domesticated oca, but great uncertainty about the polyploid origins and domestication of this crop remain.
- Potentially complex origins of polyploids.
- Comparisons of closely related and recently diverged species where little variation in DNA sequences are challenging.
- Incomplete taxonomy poses considerable problems for these sorts of studies e.g. the unrecognized wild tuber-bearing populations of *Oxalis* may well represent distinct species.

Mashua
Tuberous Nasturtium
Tropaeolum tuberosum
Tropaeoleaceae

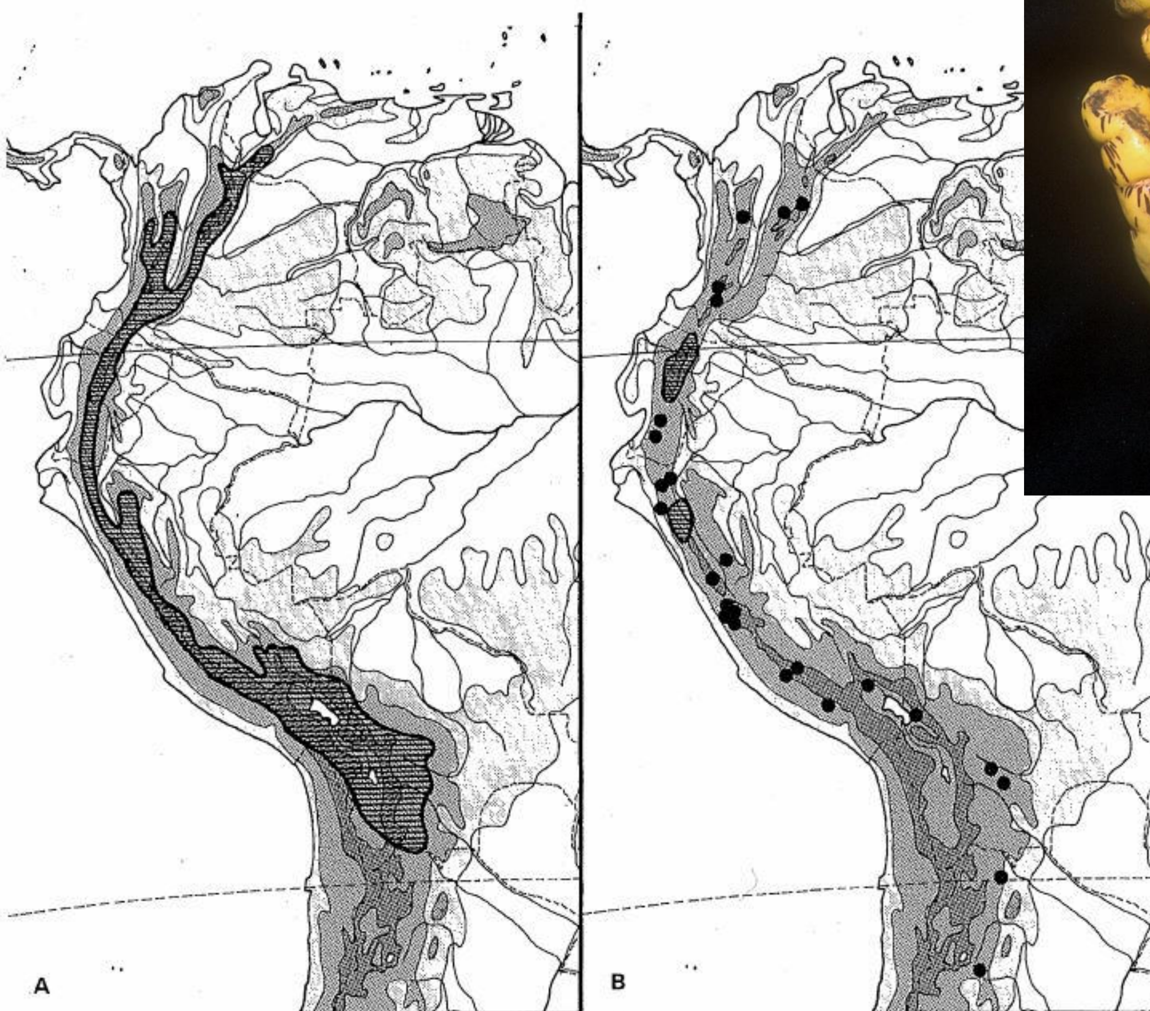


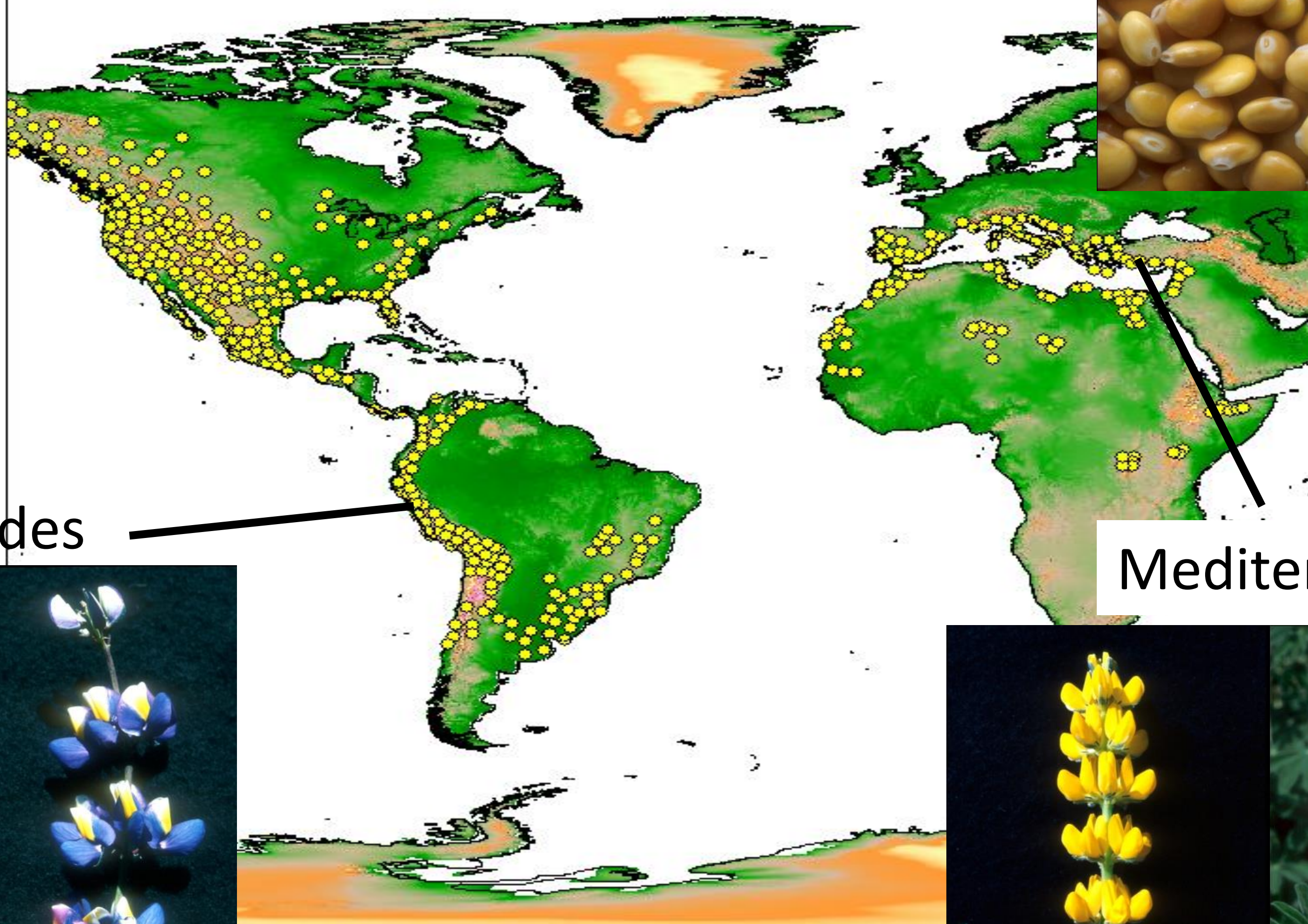
Fig. 35. Distribution of *Tropaeolum tuberosum*. A: ssp. *tuberosum*, area where cultivated. – B: ssp. *silvestre*.

subsp silvestre – wild form without tubers

subsp tuberosum – domesticated form with subterranean tubers

Tarwi / Chocho
Lupinus mutabilis (Leguminosae)

Domestication of Lupinus

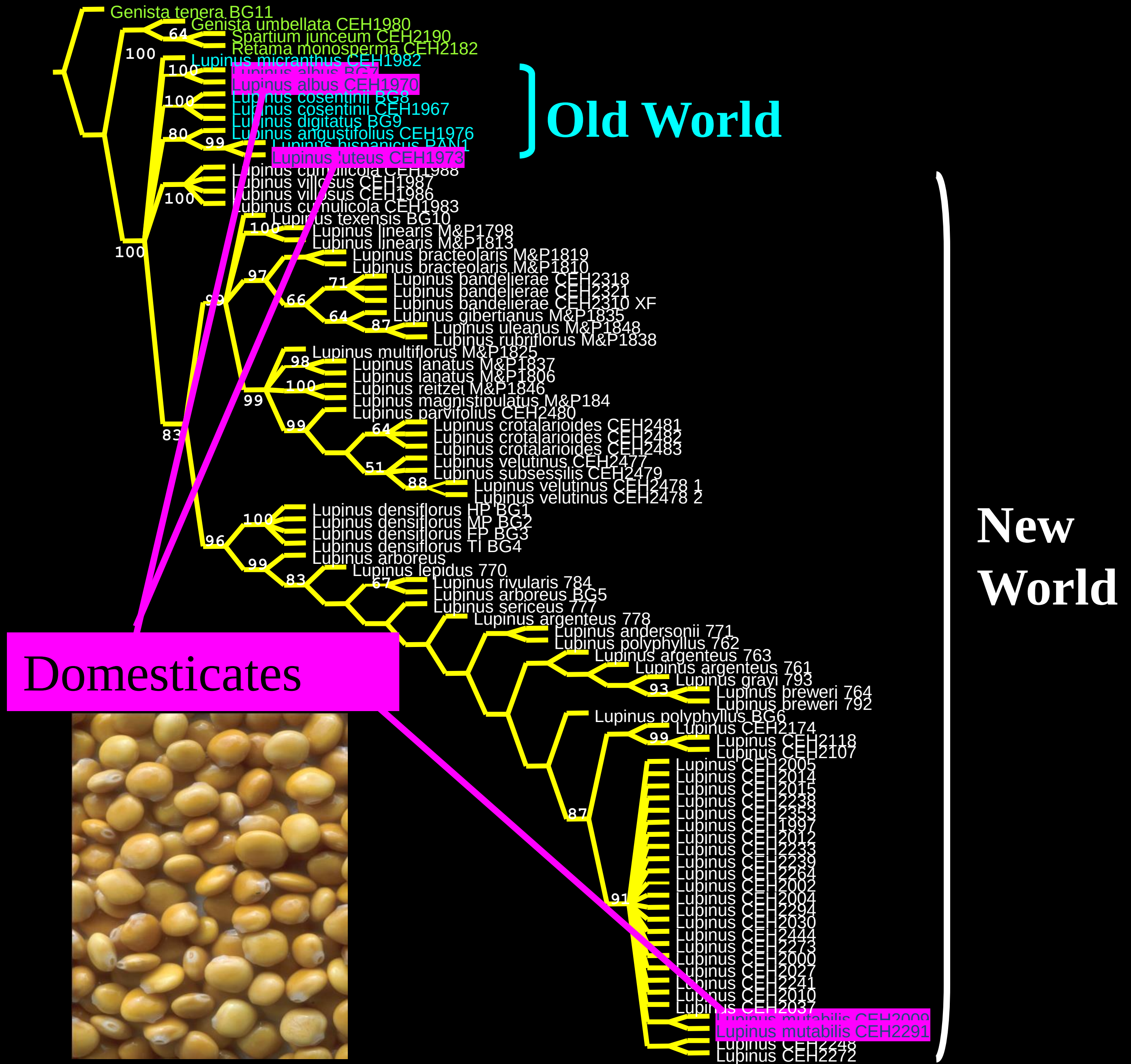


Andes

Mediterranean

L. mutabilis

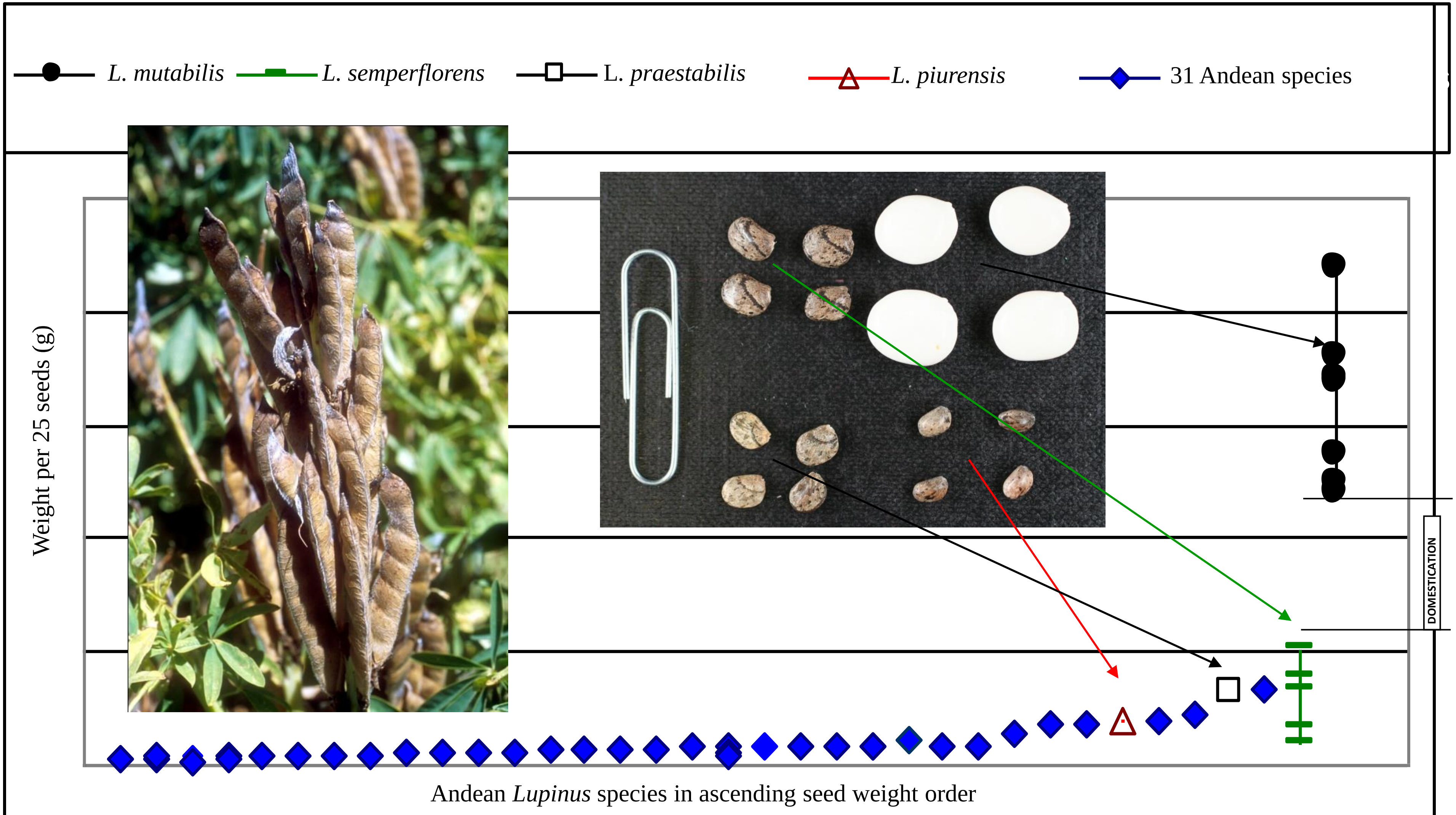
L. luteus L. albus

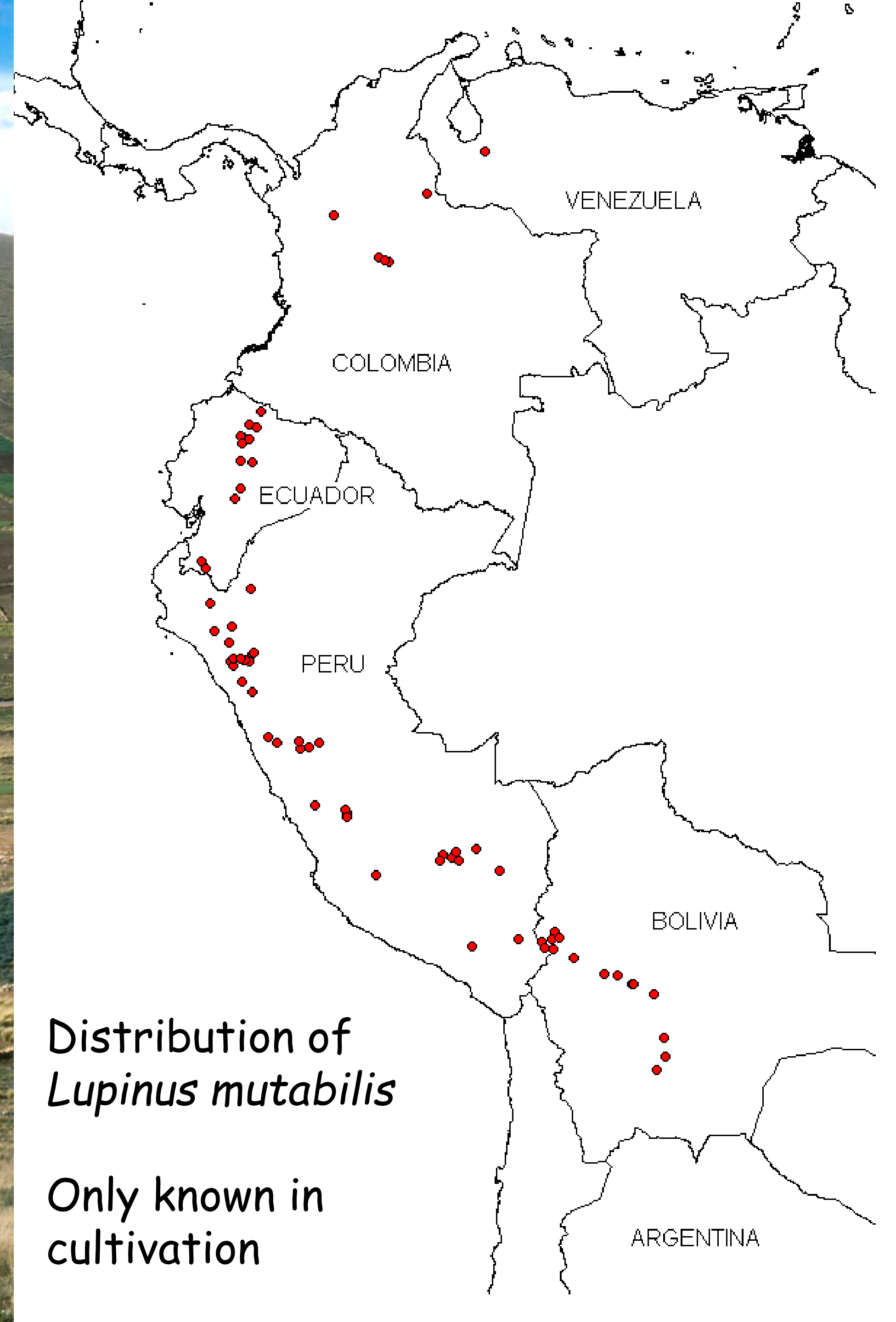


Old World
New World
Domesticates
Genista tenera BG11
Genista umbellata CEH1980
Spartium junceum CEH2190
Retama monosperma CEH2182
Lupinus micranthus CEH1982
Lupinus albus BG7
Lupinus albus CEH1970
Lupinus cosentinii BG8
Lupinus cosentinii CEH1967
Lupinus digitatus BG9
Lupinus angustifolius CEH1976
Lupinus hispanicus BAN1
Lupinus luteus CEH1973
Lupinus cumulicola CEH1988
Lupinus villosus CEH1987
Lupinus villosus CEH1986
Lupinus cumulicola CEH1983
Lupinus texensis BG10
Lupinus linearis M&P1798
Lupinus linearis M&P1813
Lupinus bracteolaris M&P1819
Lupinus bracteolaris M&P1810
Lupinus bandelierae CEH2318
Lupinus bandelierae CEH2321
Lupinus bandelierae CEH2310 XF
Lupinus gibertianus M&P1835
Lupinus uleanus M&P1848
Lupinus rubriflorus M&P1838
Lupinus multiflorus M&P1825
Lupinus lanatus M&P1837
Lupinus lanatus M&P1806
Lupinus reitzei M&P1846
Lupinus magnistipulatus M&P184
Lupinus parvifolius CEH2480
Lupinus crotalarioides CEH2481
Lupinus crotalarioides CEH2482
Lupinus crotalarioides CEH2483
Lupinus velutinus CEH2477
Lupinus subsessilis CEH2479
Lupinus velutinus CEH2478 1
Lupinus velutinus CEH2478 2
Lupinus densiflorus HP BG1
Lupinus densiflorus MP BG2
Lupinus densiflorus EP BG3
Lupinus densiflorus TI BG4
Lupinus arboreus
Lupinus lepidus 770
Lupinus rivularis 784
Lupinus arboreus BG5
Lupinus sericeus 777
Lupinus argenteus 778
Lupinus andersonii 771
Lupinus polyphyllus 762
Lupinus argenteus 763
Lupinus argenteus 761
Lupinus grayi 793
Lupinus breweri 764
Lupinus breweri 792
Lupinus polyphyllus BG6
Lupinus CEH2174
Lupinus CEH2118
Lupinus CEH2107
Lupinus CEH2005
Lupinus CEH2014
Lupinus CEH2015
Lupinus CEH2238
Lupinus CEH2353
Lupinus CEH1997
Lupinus CEH2012
Lupinus CEH2233
Lupinus CEH2239
Lupinus CEH2264
Lupinus CEH2002
Lupinus CEH2004
Lupinus CEH2294
Lupinus CEH2030
Lupinus CEH2444
Lupinus CEH2273
Lupinus CEH2000
Lupinus CEH2027
Lupinus CEH2241
Lupinus CEH2010
Lupinus CEH2037
Lupinus mutabilis CEH2009
Lupinus mutabilis CEH2291
Lupinus CEH2248
Lupinus CEH2272

Tarwi - *Lupinus mutabilis* in the Andes

Exhibits typical legume domestication syndrome traits of indehiscent pods, large seeds, water permeable seed coats, reduced seed pigmentation, rapid and uniform germination and growth, and nearly annual life history, but retains higher seed alkaloid levels than other lupins.

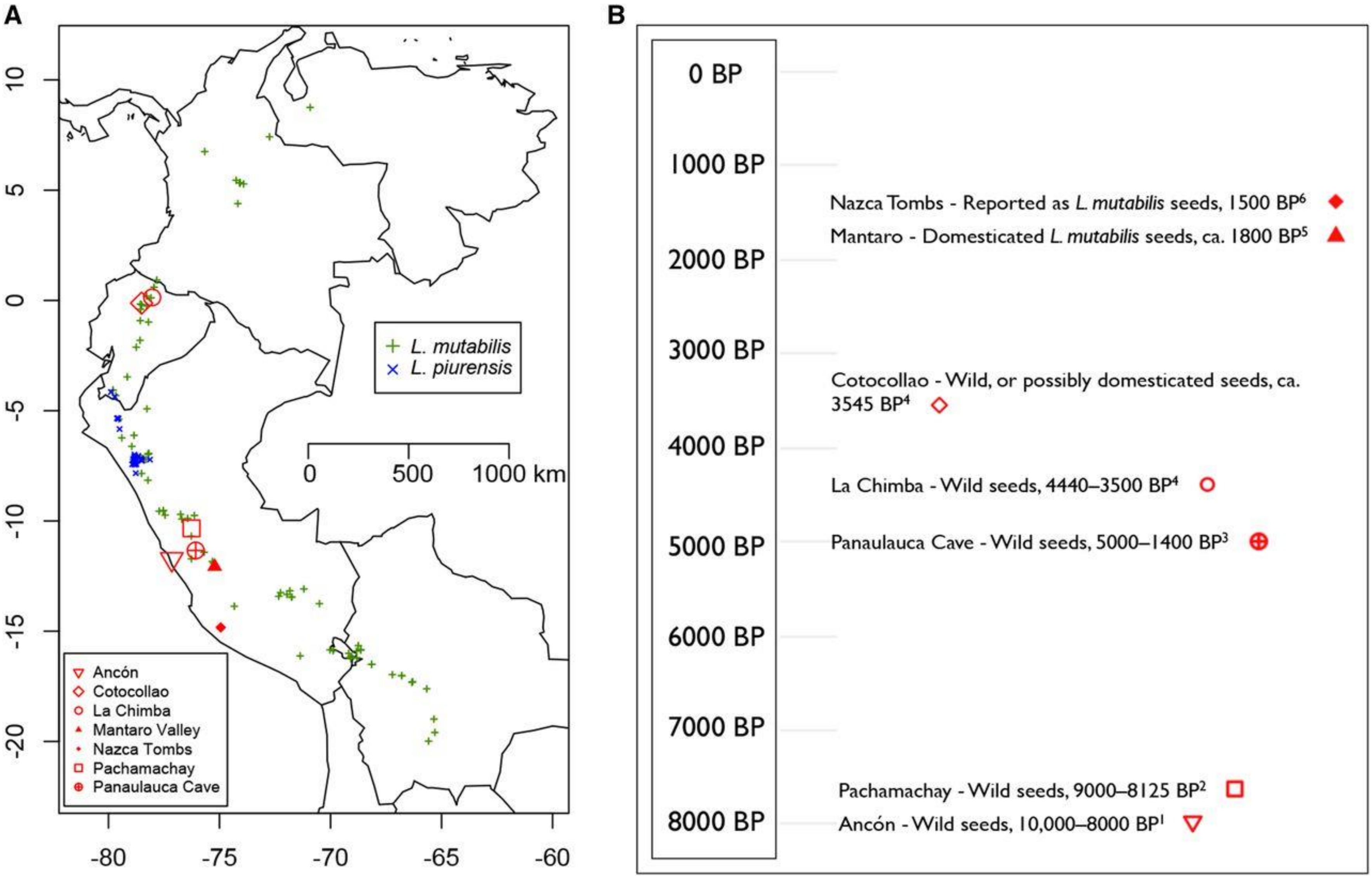




Distribution of *Lupinus mutabilis*

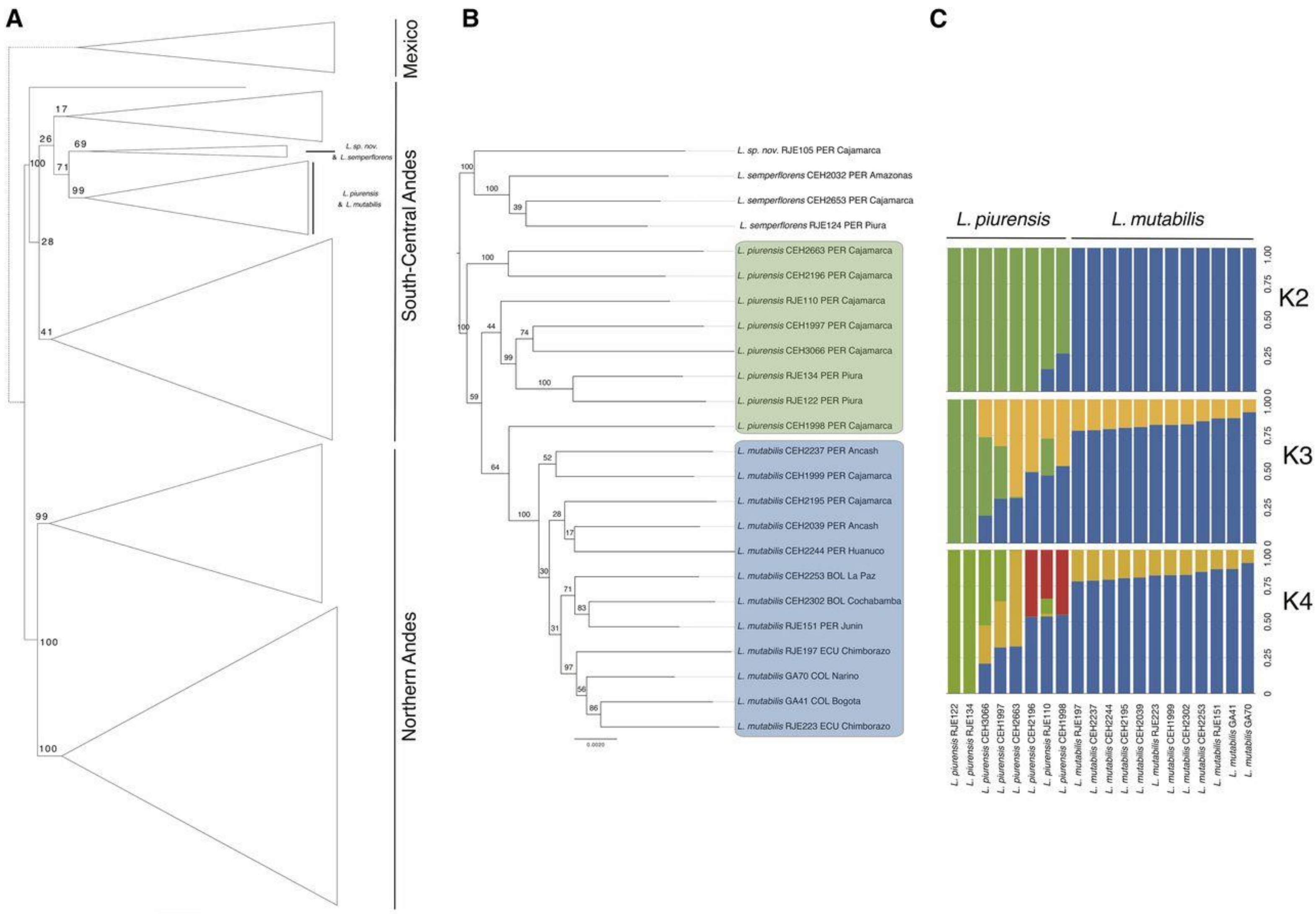
Only known in cultivation

Tarwi archaeology



Atchison et al. (2016)

Origin of tarwi – *L. piurensis* as the putative progenitor, domestication in northern Peru



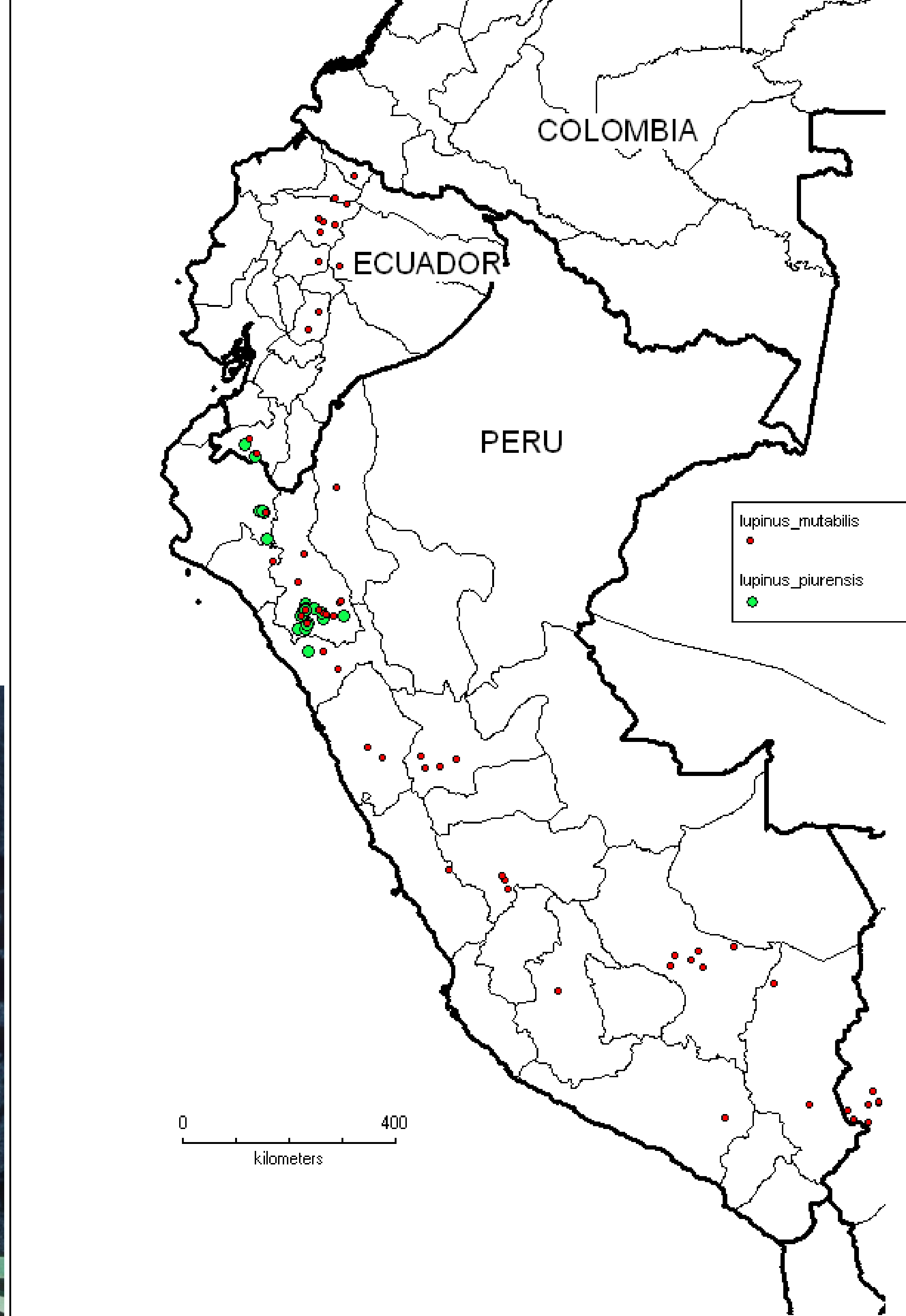
Atchison et al. (2016)

Lupinus mutabilis

Lupinus piurensis

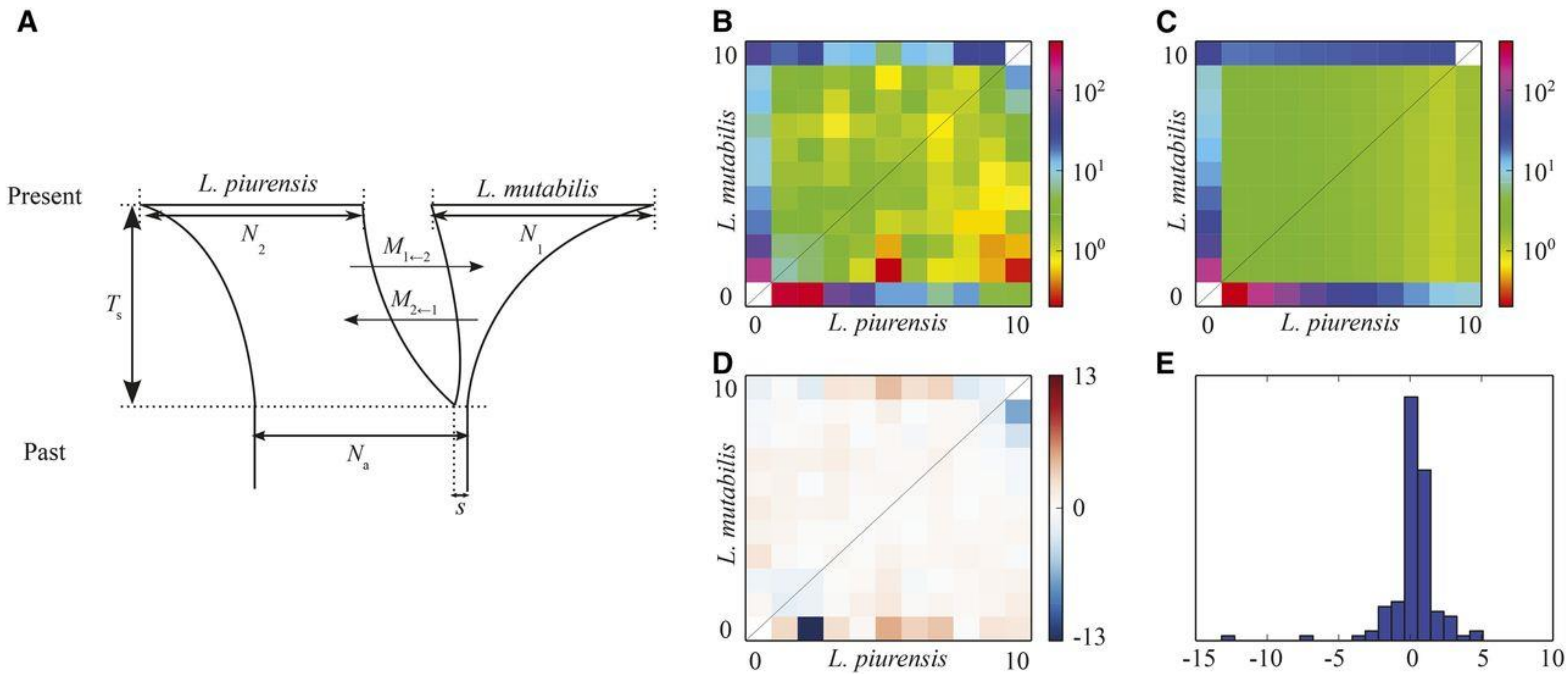
Lupinus piurensis

Native in N Peru & S Ecuador



Tarwi domestication – demographic analysis

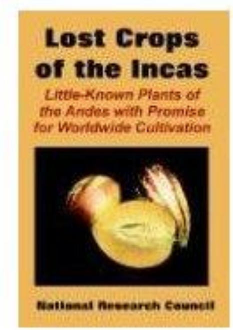
- 2,600 BP, invovolving an intense genetic bottleneck
- From *L. piurensis*, in northern Peru
- Late stage domesticate, added to existing S-C Andean crop assemblage



Atchison et al. (2016)

Faba bean – Vicia faba

Wheat



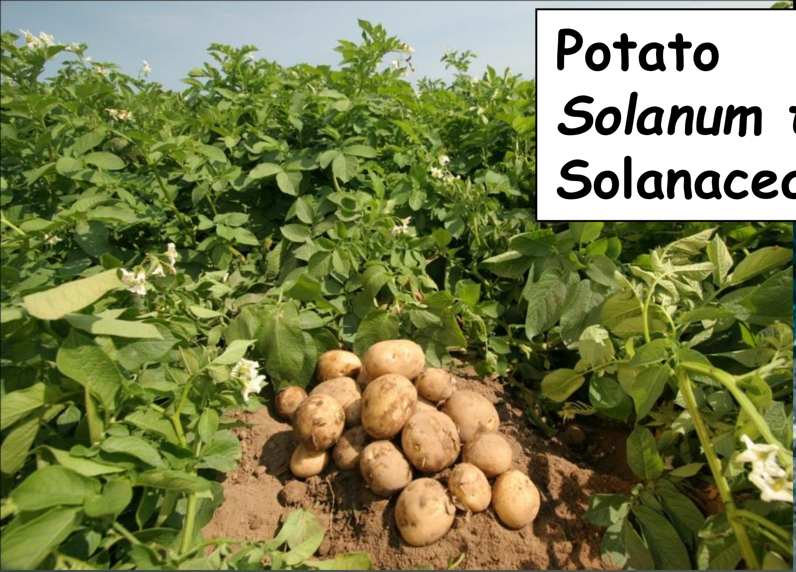
Lost Crops of the Incas - *Little-Known Plants of the Andes with Promise for Worldwide Cultivation.*

Displacement of indigenous Andean crops by Old World crops, such as wheat and broad beans introduced by the Spanish in th 17th Century. These now taking over from Quinua and Tarwi.

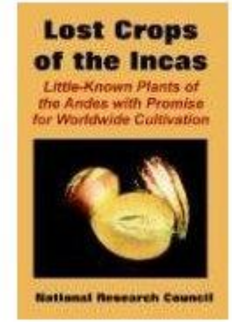
Potato

Solanum tuberosum

Solanaceae



Lost crops of the Andes – Conclusions



There are many so called *minor crops.* These are under-utilized or non-commercial crop species that are important components of regional or national agricultural biodiversity, which were potentially more important in the past, but which are today mainly used locally. These minor, displaced and underutilized crops nevertheless continue to play an important role in food security of rural communities in many parts of the world.

The origins of domestication of many of these minor crops remain poorly known – i.e. the detailed archaeological and genetic data that are needed to pinpoint where, when, how many times and from what progenitors these crops were domesticated are often lacking. This limits our understanding of regional geotemporal trajectories of agricultural development in each of the main areas of independent agriculture.

Many of these crops are considered *lost* because they are being displaced by other crops – e.g. Faba bean displacing tarwi, wheat displacing quinua, uniform and highly bred potato varieties displacing indigenous potato cultivars, raising important issues about crop genetic resource conservation

The rise of Africa's super vegetables
Long overlooked in parts of Africa, indigenous greens are now capturing attention for their nutritional and environmental benefits

Nature June 2015

nature plants

PERSPECTIVE

PUBLISHED: 5 JULY 2017 | VOLUME: 3 | ARTICLE NUMBER: 17092

Growing the lost crops of eastern North America's original agricultural system

Natalie G. Mueller[1]*, Gayle J. Fritz[1], Paul Patton[2], Stephen Carmody[3] and Elizabeth T. Horton[4]

a. Goosefoot – *Chenopodium berlandieri*
b. Sumpweed / Marsh Elder – *Iva annua*
c. Little Barley – *Hordeum pusillum*
d. Erect Knotweed – *Polygonum erectum*
e. Maygrass – *Phalaris carolinum*

Neglected & Under-utilized Crops to Improve Food Security

Indigenous ancient crops often still used locally & regionally – wider use offers scope to help poorer subsistence farmers

Reduce risks of over-reliance on a small number of major crops – strength in diversity

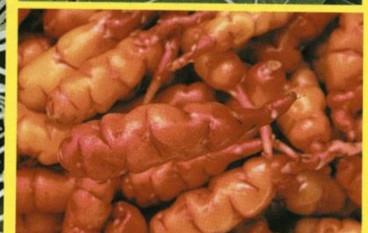
Environmental benefits: Increases sustainability of agriculture using crops with wider environmental tolerances requiring lower inputs of fertilizers, pesticides, water and energy

Nutritional benefits: Contribute to food quality and nutritional value

Preserve, promote and celebrate cultural and dietary diversity

Growing

Unusual Vegetables



Weird and Wonderful Vegetables and How To Grow Them

Simon Hickmott

BIO 235 – Plants & People – Evolution and Domestication of Crops

Course Assignment – What do we eat today?

Compile a complete list of all the plants and plant parts that you eat, drink or otherwise consume during the course of one week, i.e. over seven consecutive days. Include everything – breakfast, lunch, dinner, snacks, inhalations and ***all*** major and minor ingredients. Leave **nothing** out.

Annotate your list, as far as you can, in a table showing: common name / scientific name / plant family / part of the plant (seed, fruit, root, stem, leaves, etc) / region of origin (i.e. where does the plant grow naturally) / and place of production (i.e. where was the plant that supplied your food grown). For example: potato / *Solanum tuberosum* / Solanaceae / stem tuber / Andes / Switzerland. Only record each plant once on your list, even if you eat it several times.

Make an estimate of your 'food kilometers' for each plant product and for the week in total, i.e. how far in total did all the elements of your weekly food travel to reach you?

Analyse and summarize in **a few pages** any interesting features about the taxonomic diversity and geographic distribution of your food intake, and what it means in relation to how we use plants, and how that is changing through time. **Step back and think!**

Submit a **hard (paper) copy** of your assignment to me by 6th **November**.
The assignment is worth 50% of the overall BIO235 assessment.

Any questions: ask me, or email me!
Colin Hughes, Oct 2017, Email: colin.hughes@systbot.uzh.ch


HAPPY HALLOWEEN