
Pomegranates

Selecting YOUR Pomegranate



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North San Diego Chapter

Disclaimer!



I – Love – Pomegranates!!

Tonight...

- Brief Taxonomy Information
- Few Facts of the Pomegranate
- Overview of Pomegranate Cultivars and Concerns
- The History of the Pomegranate at the UC Davis Repository
- Take a Bite Out of the Science of Taste
- Focus on the Taste of Pomegranates
- Properties (Use of a Spreadsheet)
- How to select YOUR Pomegranate



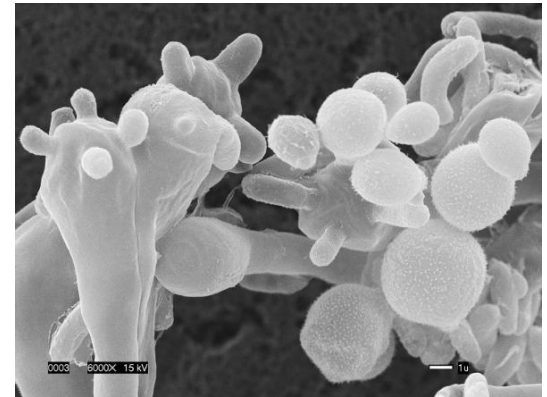
What will not be cover:

- Detailed propagation methods
- Fertilization
- Pruning
- Diseases
- Medicinal Properties



Before we begin...

- *Cryptococcus gattii*
- *National Geographic News:*
- A new strain of hypervirulent, deadly *Cryptococcus gattii* fungus has been discovered in the United States
- People can become infected by inhaling the microscopic organisms—and there's not much you can do about it.
- Appearing several months after exposure to the fungus, the infection causes a bad cough and shortness of breath, among other symptoms.
- On a positive note: fungal infections, unlike viruses, can't be passed from person to person.
- And can be controlled and in some cases eliminated.



Before we begin...

- Some on sent me an email asking for a cutting of my Yellow Mangosteen (*Randia fitzalanii*)... ???



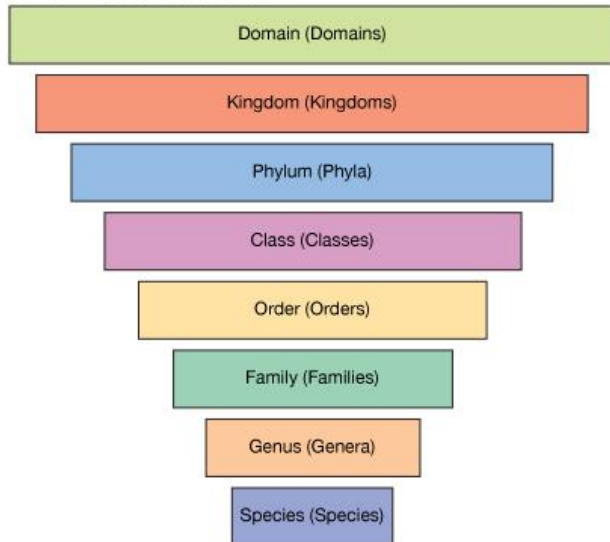
Brief Taxonomy Information

- Kingdom: Plantae
- Phylum: Tracheophyta
- Class: Magnoliopsida
- Order: Myrtales
- Family: Punicaceae
- Genus: Punica
- Species: Granatum
- Binomial (Scientific) Name: *Punica granatum*
- Common Names: Pomegranate, Granada (Spanish), Grenade (French), Anar (Hindi)...
- Related Species: *Punica protopunica**
- *Endemic to Socotra Island (Yemen) and is the only relative of the pomegranate that produces non-edible fruits

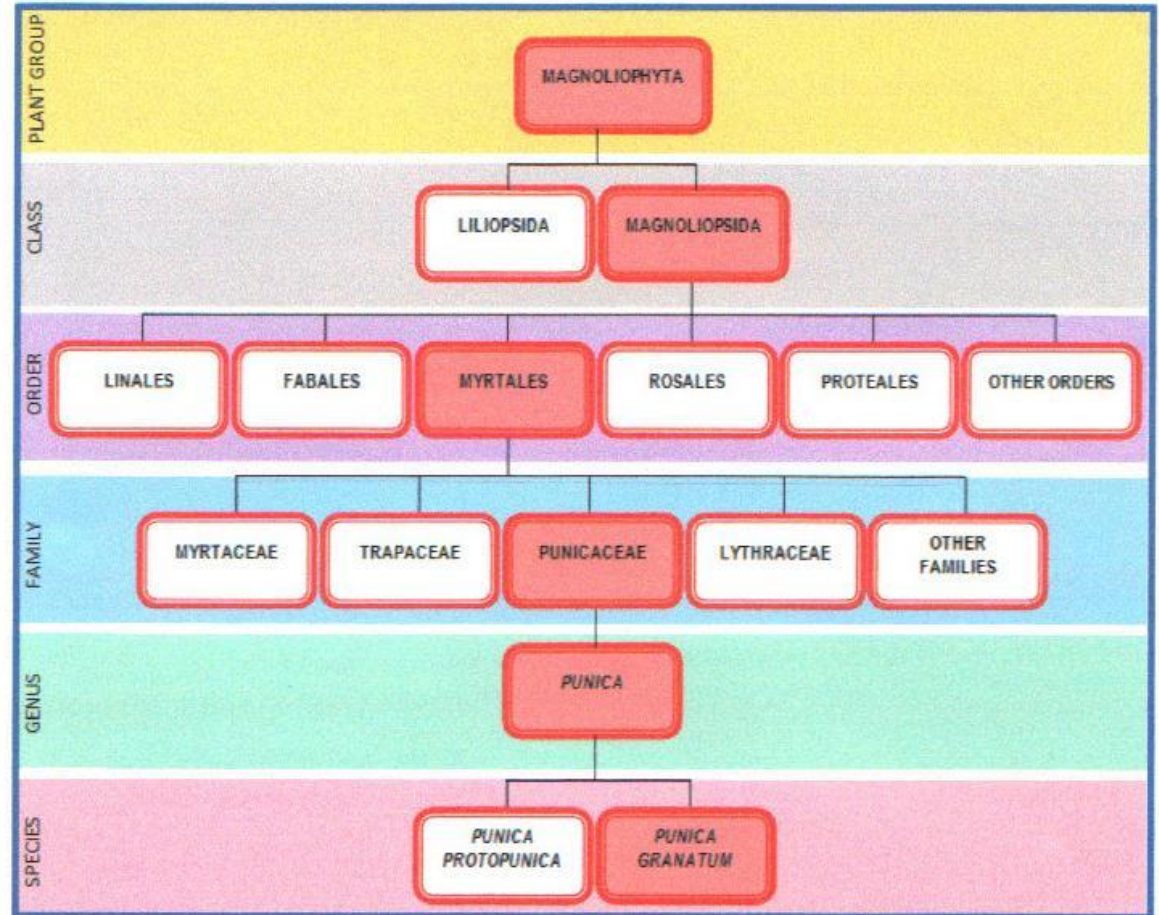


Brief Taxonomy Information

How animals are classified



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Brief Taxonomy Information

species

Two species:

❑ ***Punica protopunica***

- found wild in Socotra Island(Yemen)

❑ ***Punica granatum***: 2 subspecies

- *Chlorocarpa* - found in Trans Caucasus
- *Porphyrocarpa* - found in Central Asia

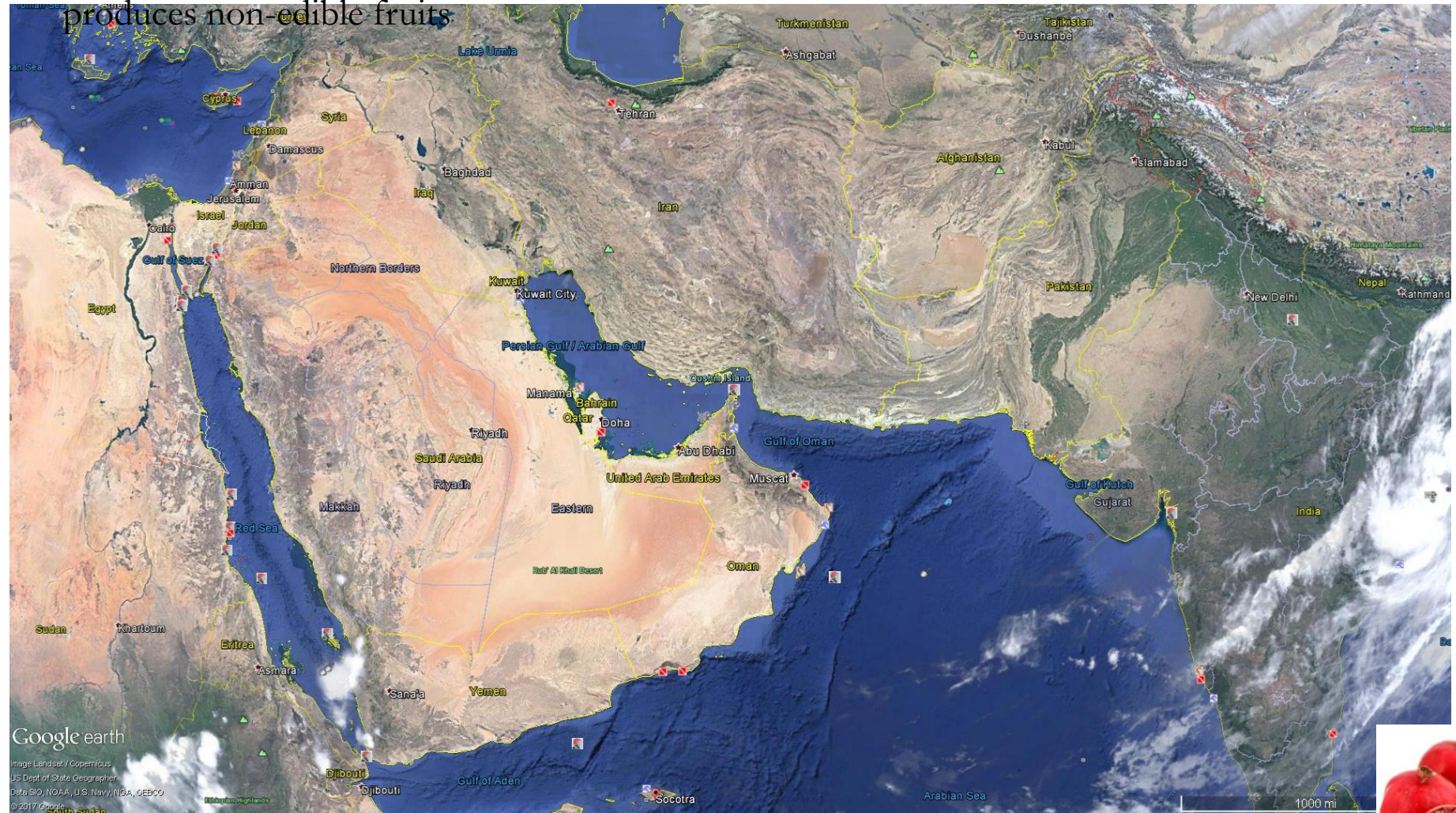


Punica granatum

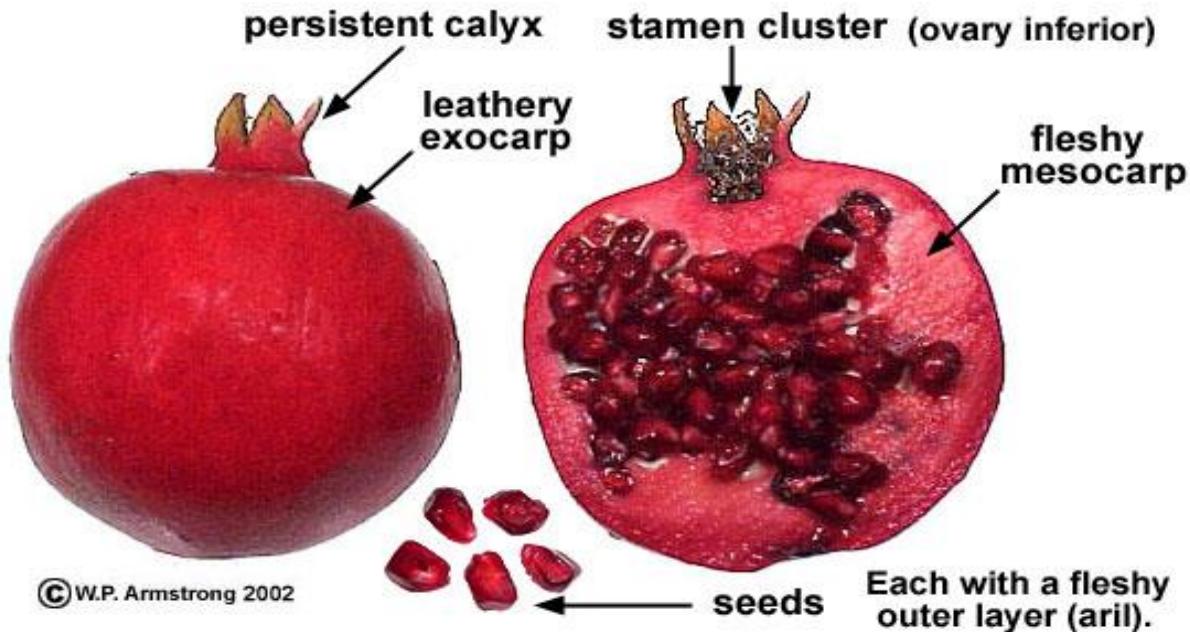


Punica Protopunica*.

*Endemic to Socotra Island (Yemen) and is the only relative of the pomegranate that produces non-edible fruits



Brief Botanical Information



Pomegranate (*Punica granatum*): A many-seeded berry.



Few Facts of the Pomegranate

- Pomegranate (*Punica granatum* L., Punicaceae) is an ancient, beloved plant and fruit. The name “pomegranate” follows the Latin name of the fruit *Malum granatum*, which means “grainy apple.”
- The generic name *Punica* refers to Phoenicia (Carthage) as a result of mistaken assumption regarding its origin.
- The pomegranate and its usage are deeply embedded in human history, and utilization is found in many ancient human cultures as food and as a medical remedy.



Few Facts of the Pomegranate

- The pomegranate tree requires a long, hot and dry season in order to produce a good yield of high-quality fruit.
- Highly adaptive to a wide range of climates and soil conditions.
- These findings have led to a higher awareness of the public to the benefits of the pomegranate fruit, particularly in the western world, and consequently to a prominent increase in the consumption of its fruit and juice.
- New orchards are now planted in the traditional.



Few Facts of the Pomegranate

- The development of industrial methods to separate the arils from the fruit and improvement of growing techniques resulted in an impressive enlargement of the extent of pomegranate orchards.
- An important fact, in case I already mentioned just once, it is one of my favorite fruits. I currently have 19 cultivars, I lost several recently.



Overview of Pomegranate Cultivars

Facts:

- Garrigala Experimental Agricultural Station in the Submar Valley of the South West Kopet Dagh mountains, Turkmenistan, close to the border with Iran once housed the world's largest collection of pomegranates, **1,117 varieties from 27 countries**, amassed over 40 years by Dr Gregory M. Levin (*Pomegranate Roads; A Soviet Botanist's Exile from Eden* by Dr. Gregory Moiseyevich Levin).
- But when the Soviet Union collapsed and state funding for research dried up, Levin was forced to abandon his agricultural station in 2002 and immigrate to Israel.

Overview of Pomegranate Cultivars

Facts:

- However, Dr. Levin foresaw the safety of the collection and sent most of the cutting to Israel, some to Florida, California, and Paris.
- After state funding for research expired, the Turkmen government bulldozed the research station (Levin, 2006).
- Pomegranates that he sent to Israel while thriving, were identified by numbers instead of the names he had given to these selected, superior varieties making his successes inaccessible to other researchers wishing to propagate them.
- Garrigala pomegranates make up 51% of the University of Davis collection in California.

Overview of Pomegranate Cultivars

Facts:

- The Garrigala Experimental Agricultural Station is now a rice field.

Overview of Pomegranate Cultivars

Problems:

- For example, some of the Cultivars at the agricultural research center of Yazd in the southwest of **Iran**:

- | | |
|--|--|
| <ul style="list-style-type: none">• Shirin Shahvare Yazd (SSY),• Gorche Shahvar Yazdi (GSY),• Malase Yazdi (MY),• Vahshe Kane Tehran (VKT),• Mesri Torshe Kazeron (MTK),• Jangali Pust Germeze Rodbare Torsh (JPGRT),• Torshe Mamoli Lasjer (TML), | <ul style="list-style-type: none">• Ardestani Torshe Semnan (ATS),• Khoram Dizin Torshe Gorgan (KDTG),• Toghe Gardan (TG),• Zaghe Yazdi (ZY),• Tabo Larze Mehr Mahi (TLMM),• Sefeede Robi Aval Brojen (SRAB),• Pust Syahe Yazd (PSY),• and Malase Porbarij Stahban (MPS). |
|--|--|

Overview of Pomegranate Cultivars

- The pollen morphology of 55 cultivars of pomegranate from eight eco-geographical populations in **China** was examined...
- There were 14 cultivars in the first group including:
 - 'Tianlvzi', 'Suanguangyan' and 'Tianguangyan' of Yunan population, 'Qingpishiliu' of Sichuan population, 'Tianhongdan', 'Sanbaisuan' and 'Dahongsuan' of Shanxi population, 'Hongmanaozi' of Anhui population, 'Qingpidazi', 'Dahongpitian' and 'Bingtangdong' of Shandong Zaozhuang population, 'Sanbaitian' and 'Sanbaisuan' of Shandong Tai'an population, and 'Piyamanerhao' of Xinjiang population.
- Eight cultivars were in a second group:
 - 'Yushiliuerhao' of Henan population, 'Huangpi' and 'Jingpitian' of Shanxi population, 'Gangliu' and 'Daqingpisan' of Shandong Zaozhuang population, 'Dazisuan', 'Dazitian' and 'Luokesihao' of Xinjiang population.
- The third group contained 25 cultivars:
 - 'Suanlvzi' and 'Tianshazi' of Yunan population, 'Hongpishiliu', 'Jiangyishiliu' and 'Huangpisan' of Sichuan population, 'Luyvdan' of Shanxi population, 'Tiepi', 'Yushiliuyihao' and 'Nana' of Henan population, 'Daqingpitian' and 'Chongbanyuejishiliu' of Shandong Zaozhuang population, 'Lanbaoshi' and 'Taishanhong' of Shandong Taian population, 'Taihanghong', 'Mantianhongtian' and 'Mantianhongsuan' of the Hebei population, 'Ruanzierhao', 'Huaibeidaqingpi', 'Dahongpao' and 'Yushizi' of Anhui Huaibei population, 'Wanliuyihao', 'Hongfepitian', 'Honghuayushizi', 'Dabenzi' and 'Hongfepisan' of Anhui Huaiyuan population. There were six cultivars in the fourth group including 'Houpi' of Yunnan population, 'Hongpimayatian', 'Nigra', 'Qingpimayatian', 'Xiehuatian' and 'Xiaoqingpisan' of Shandong Zaozhuang population.
- The other two groups included:
 - 'Linxuanerhao' of Shanxi population and 'Sanbaitian' of Anhui Huaibei population, respectively.





Types of Pomegranate in India

- ✓ Alandi
- ✓ Bedana
- ✓ Dholka
- ✓ Kabul
- ✓ Kandahari
- ✓ Musket Red
- ✓ Paper shell
- ✓ Poona
- ✓ Spanish ruby
- ✓ Vellodu

Overview of Pomegranate Cultivars

- ❑ **Balegal**
- ❑ **Cloud**
- ❑ **Crab**
- ❑ **Early Wonderful**
- ❑ **Fleshman**
- ❑ **Green Globe**
- ❑ **Home**
- ❑ **King**
- ❑ **Phoenicia:(Fenecia)**
- ❑ **Sweet**
- ❑ **Utah Sweet**
- ❑ **Wonderful**
- ❑ **Francis**
- ❑ **Granada**
- ❑ **Green Globe**

Concerns of Pomegranate Cultivars

Problem:

- Each country names “their” pomegranates.
- People “discover” a “new” pomegranate and names to their discretion.
- The same cultivar has or may have many different names.
- Names a “translated” to the language.
- This has created a nightmare for those that want to collect them.



Concerns over Pomegranate Cultivars

A solution:

- Build a DNA database of all pomegranates.
- That is to genetically, identify each pomegranate, assign an identification number with the know names.
- Suggestions?





India

Spain

Yemen

Prominent varieties

Description of Some Commercially Grown Varieties

Dholka: Popular variety of Gujarat with fruits of large size, rind greenish yellow, flesh aril pinkish white seeds soft, juice acidic, suitable for processing

Jodhpur Local: Medium sized fruit with hard rind, fleshy aril light pink, sweet, juicy, seed moderately hard

Bassein Seedless: from Karnataka. Flowers throughout the year. Fruit medium to large in size, rind brownish green, fleshy aril, TSS 16-17 ° Brix

Ruby: Multiple Hybrid from IIHR, yield 16-18t/ha

In South India, 'Paper Shell', 'Spanish Ruby', 'Muscat Red' & 'Velladu' have shown promise

Description of Some Commercially Grown Varieties

Ganesh: This variety has pinkish yellow to reddish yellow rind color, having light pink arils and soft seeds. Fruit weighs between 225-250 gr with medium T.S.S.

Ruby: The fruit skin is red in color and weighs between 225-275 gr. The grains are soft, having high T.S.S.

Arakta: Fruits are dark red in color with soft seeds and with high T.S.S.

Bhagwa: The fruit is glossy red in color with soft seeds and high T.S.S.

The History of the Pomegranate Collection

Currently, the Repository holds 260 accessions from 12+ countries

- 50+ years ago the trees that make up the “old block” C came from the Chico Plant Introduction Station to WEO.
 - Pre- 1990 “new block” A was planted with 5 (mostly ornamental accessions): DPUN0001-0005
 - 1990 received 5 ornamental Japanese varieties: DPUN0007-0011
 - 1995 received 7 varieties collected from the Turkmenistan Experimental Station of Plant Genetic
 - Resources, Garrygala by then Curator Dr. George White and Dr. Dan Parfitt: DPUN0013-0019
 - 1996 received 19 accessions of various backgrounds from Todd Kennedy: DPUN0022-0040
-

The History of the Pomegranate at the UC Davis Repository

- 1996 + 1997 received 15 accessions from John LaRocca and John Chater: DPUN0041-0045 and DPUN0048-0057
 - 1997 received 22 accessions from Michael Hotchkiss in Byron Georgia. 17 originally came from Turkmenistan and 5 from the Safiabad Research Center in Iran. DPUN0059-0080
 - 1997 Todd Kennedy and Dr. George White went through “old block” and assigned accession numbers to 13 trees based on Dr. John Lovell Fruit Gardener article: DPUN0081-0092, DPUN0167
 - 1999 received 65 accessions from Dr Gregory Levin at the Turkmenistan Experimental Station of Plant Genetic Resources, Garrygala with cooperation from Dr. William R. Feldman at the Boyce Thompson Southwestern Arboretum: DPUN0099-0163
-

The History of the Pomegranate at the UC Davis Repository

- 2006 received accessions from Georgia and 11 from Armenia collected by then Curator Dr. Ed Stover and Joseph Postman: DPUN0175-0190
 - 2006 received 5 accessions with various backgrounds from David Silverstein: DPUN0193-0197
 - 2007 received 5 accessions from India from Dr. Dharam Sharma: DPUN0298-0202
 - 2007 received 16 accessions from Azerbaijan collected by Dr. Malli Aradhya: DPUN0207-0222
-

Pomegranate Distribution Over the Last 14 Years

• 1996	9	accessions,	1	order
• 1997	43	accessions,	7	orders
• 1998	40	accessions,	8	orders
• 1999	25	accessions,	7	orders
• 2000	60	accessions,	9	orders
• 2001	81	accessions,	14	orders
• 2002	50	accessions,	13	orders
• 2003	116	accessions,	19	orders
• 2004	782	accessions,	336	orders
• 2005	263	accessions,	42	orders
• 2006	398	accessions,	73	orders
• 2007	763	accessions,	102	orders
• 2008	1169	accessions,	117	orders
• 2009	1279	accessions,	124	orders



Take a Bite Out of the Science of Taste

- Taste...
- A sense that adds flavor to our world, is a complicated but very important part of life.
- Taste is a very complex sensory system.
- When we talk about taste, we think about the tongue.
- However, the tongue detects five different tastes: sweet, sour, bitter, salty or fifth taste referred to as umami (the taste of glutamate, best described as brothy, full-bodied, meaty, and savory)
- So why one person loves blue cheese and another cringe at the thought?
- Why some people like black licorice over red licorice, or why people like Pepsi over Coke?



Take a Bite Out of the Science of Taste

- Smell...
- flavor is not the same as taste, the distinctive flavor of most foods and drinks comes more from smell than it does from the taste.
- Amoore molecule structure model, which uses the characteristic
- shapes of molecules, it says that every odorant has a different molecular shape (circular, oval, bottle shape, *etc.*) that will fit into its respective pore of the olfactory cell to produce a neuro-signal specific to its odor.
- When we drink coffee, we expect a certain aroma, coffee may be bitter, it's aroma is also all about flavor.
- the tongue provides the five basic tastes to enjoy thousands of flavors.
- Apples!



Take a Bite Out of the Science of Taste

- Visual...
- We expect certain flavors when we see food, a yellow candy, that could be banana flavor, lemon flavor. This comes from experience.
- See the shape of a pepper or smell a dish...



Take a Bite Out of the Science of Taste

- Sound...
- When we eat celery, it has to crunch.



Take a Bite Out of the Science of Taste

- nature and nurture...
- Includes multiple factors, including genes (receptors), past experience (upbringing), expectation, and age.



Take a Bite Out of the Science of Taste

- Training your Taste...
- Repeat exposure to a food can decrease dislike, it can also increase liking.
- Love salt in your food?
- If you really hate something, having it over and over again may not change it.
- Caviar as an acquired taste.



Take a Bite Out of the Science of Taste

- So...
- So why one person loves blue cheese and another cringe at the thought?
- Why some people like black licorice over red licorice, or why people like Pepsi over Coke?



Take a Bite Out of the Science of Taste

- Because each one of us is unique...
- Your interpretation of the taste and flavors are different.
- Therefore, I cannot recommend any of the pomegranates available to us. All I can do is tell you which ones I like.
- I have friends the own wineries in Mexico that have asked me if there is an instrument that can classify their wines by taste. My answer is no, one can analyze all the different molecules in the wine but that will not tell me if I am going to like it before I buy it. There may be a pattern of those chemicals, but I would need to know them.



Qualification of Pomegranates

High yield (1.5-3 t/ha)
High yield of standard fruit
Resistance to pests and diseases
Resistance to cracking of fruits
Resistance of fruit to sunburn
Long keeping of fruits more)
Large fruit (500 g)
Short (or absent) neck calyx of fruit
Thin pericarp of fruit (1-2 mm)
Coarse grain (500 mg)

Small seed
High taste
High juice yield (>60% of fruit weight)
High juice quality
High pulp matter (in juice) (>19%)
High sugar content (in juice) (20%)
High ascorbic acid content (in juice)
(<320 mg/100 g)
Dwarf
Early

These are measurable characteristics ...



Grade	Grade requirements	Grade tolerances
Extra class	<ul style="list-style-type: none"> • superior quality • shape, and colour typical of the variety • free of defects 	5% (no. or wt.) not satisfying the requirements of the grade, but meeting those of class I grade
Class I	<ul style="list-style-type: none"> • good quality • a slight defect in shape, colour and skin (i.e. scars, scratches, scraps and blemishes) not exceeding 5% of the total surface area 	10% of pomegranates not satisfying the requirements of the class, but meeting those of class II
Class II	Defects as above not exceeding 10% of the total surface area	10% by of pomegranates not satisfying the requirements of the grade, but meeting the minimum requirements

Highest Rated Pomegranates in the World...

- In alphabetical order...



Table 1. Summary of primary characteristics for pomegranate cultivars that are indicated as “important” in the literature and for which there are reported data.

Cultivar	Fruit size (g)	Traits	Origin	Reference
Agridulce de Ojós 4	524	Red arils with hard seeds, bitter/sweet, medium acid	Spain	Amoros et al., 2000
Alandi (or Vadki)		Deep-pink arils and very hard seeds, sweet/sour	India	Morton, 1987
Asinar	505	Large fruit, red arils, sweet/sour, soft seeds	Turkey	Gozlekci & Kaynak, 1997
Bedana		Medium-large, brownish white rind, pink-white arils, seeds soft, sweet	India	Morton, 1987
Borde de Albaterra	370	Deep-red arils with hard seeds, bitter, high acid	Spain	Amoros et al., 2000
Dholka		Large, yellow-red rind, white arils and hard seeds, sweet	India	Morton, 1987
Early Foothill		Deep-red arils, medium-hard seeds, sweet/sour	USA, 2-4 weeks earlier than 'Wonderful'	LaRue, 1980
Early Wonderful		Deep-red arils, medium-hard seeds, sweet/sour	USA, 2 weeks earlier than 'Wonderful'	California Rare Fruit Growers, 1997
Eksilik		Sour (5% TA), red arils	Turkey	Gozlekci and Kaynak, 1997
Emar		Dark-red skin, red arils, sweet with low TA	Turkey	Gozlekci and Kaynak, 1997
Eversweet		Pink to red fruit with pink arils, soft, seeds, sweet even when immature	USA	Dave Wilson Nursery, 2005; Karp, 2006
Fellahyemez		Large pink arils, sweet with low TA, soft seeds	Turkey	Gozlekci and Kaynak, 1997
Ganesh		Yellow-pink rind and pink-red arils, very soft seeds, sweet/sour	India	L.S. Dinkar, pers. comm.
Golden Globe	“Very large”	Golden green fruit with pink blush, pink to red arils, soft, small seeds, sweet	USA	Karp, 2006
Granada		Deep-red arils, medium-hard seeds, sweet/sour	USA, redder, 1 month earlier sport of 'Wonderful'	California Rare Fruit Growers, 1997
Hicaznar		Dark-red skin, red arils, sweet/sour	Turkey	Gozlekci and Kaynak, 1997
Kandhari (also called Arakta)		Large fruit, deep-red rind, with deep-pink to blood-red arils, hard seeds, sweet/sour	India	Morton, 1987
Katirbasi	517	Large fruit, large red arils, sweet/sour	Turkey	Gozlekci and Kaynak, 1997
Mollar de Elche 15	272	Deep-red arils with soft seeds, sweet, low acid	Spain	Amoros et al., 2000
Mollar de Orihuela	414	Red-pink arils with soft seeds, sweet, low acid	Spain	Amoros et al., 2000
Piñón Tierno de Ojós 9	405	Red-pink arils with soft seeds, sweet, low acid	Spain	Amoros et al., 2000
Valenciana		Small, early, but not top quality	Spain	Costa and Melgarejo, 2000
Wonderful		Deep-red arils, medium-hard seeds (we would call medium-soft), sweet/sour	USA	Morton, 1987

TA, titratable acidity.



Highest Rated Pomegranates in the U.S.

- In random order:

- **Balegal**

- **Cloud**

- **Crab**

- **Early Wonderful**

- **Fleshman**

- **Green Globe**

- **Home**

- **King**

- **Phoenicia:(Fenecia)**

- **Sweet**

- **Utah Sweet**

- **Wonderful**

- **Francis**

- **Granada**

- **Green Globe**



Highest Rated Pomegranates in California

- In alphabetical order:
 - Ariana
 - Desertnyi
 - Ink
 - Molla-nepes
 - Palermo
 - Parfianka
 - Purple Heart
 - Sirenevyyi
- Popular Indian varieties of pomegranate are Ganesh, Arakta, Mrudula, Bhagwa, and Muskati Red



Focus on your taste of pomegranates

- I do not agree entirely with these list...



Highest Rated Pomegranates for José

- In random order:
 - Sweet
 - Desertnyi
 - Ink
 - Podarok
 - Kara-Kalinskii
 - Purple Heart
 - Sirenevyyi
 - Vkusnyi
 - Wonderful*

- NOT Parfianka!!



How to select YOUR Pomegranate

- It is up to you to decide which ones you like.
- The only way that you will know is by YOU tasting before you purchase any fruit tree.
- Otherwise, you will end up having a fruit that you do not like.
- Pomegranate testing events are the best way.
- However, what I have experienced is that they something are not at their peak.
- The spreadsheet...



Properties (use of a spreadsheet)

- Background on the spreadsheet
- What it is...
- How to uses, examples.



Propagation

Seedlings:

- Variation in characters
- Low yield
- Poor quality fruits
- treatment with 10000ppm IBA in lanolin as carrier was found to improve rooting.

Propagation

Seedlings:

- Variation in characters
- Low yield
- Poor quality fruits

Air layering:

- treatment with 10000ppm IBA in lanolin as carrier was found to improve rooting.

Cutting:

- Hardwood cutting is most common
- One year old fully mature wood are utilised or
- Suckers which arise from the base of the stem
- Cuttings are 20-25cm long
- IAA 200ppm or IBA 50ppm increased the rooting percentage
- Set in beds with 1-2 buds above the soil for 1 year

Micropropagation

- Depends on factors such as genotype, explant, season, media and growth regulators
- Mahisi *et.al.* (1991)- shoot tip as explant
- Drazeta (1997)- apical vegetative bud as explant
- Yang and Ludders(1993)- nodal leaf and stem as explant
- Complete protocol for in vitro regeneration using cotyledonary nodes reported by Naik *et.al.* (2000)

Breeding and Improvement

Three methods:

1. Collection of superior germplasm from indigenous and exotic sources
2. Improvement by selection
3. Controlled hybridization

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Modern Uses

- Powerful Antioxidant
- Has strong degree of free radical scavenging, absorbs oxygen radicals, lowers LDL levels in the blood
- Shows *in vitro* anticancer properties



Commercial Sources and Handling [2]

- Fresh/Dried Pomegranates
 - Seeds, Pulps, Peels
- Roots/bark/leaves for teas
- Powder, pills, oil extracts, and juices

