

Pistachios: A Sustainable Alternative Tree-Crop in Southwest New Mexico?



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Are pistachios a sustainable crop for Southwest NM?

ANSWER: Yes! Pistachios *can* be grown sustainably in Southwest New Mexico.

But, there's more!

The genus *Pistacia*

- In the Cashew Family (Anacardiaceae):
 - Cashew (*Anacardium occidentale*)
 - Mango (*Mangifera indica*)
 - Marula (*Sclerocarya birrea*)
 - Marking tree, tar tree, Australian cashew (*Semecarpus* spp.)
 - Ambarella, yellow and red mombin (*Spondias* spp.)
 - Sumac (*Rhus* spp.)
 - Smoke tree (*Cotinus* spp.)
 - Poison ivy/oak (*Toxicodendron* spp.)



Source: Abhishek Jacob (en.wikipedia.org)



Source: Tritam Deyver (en.wikipedia.org)



Source: Gualtar (en.wikipedia.org)



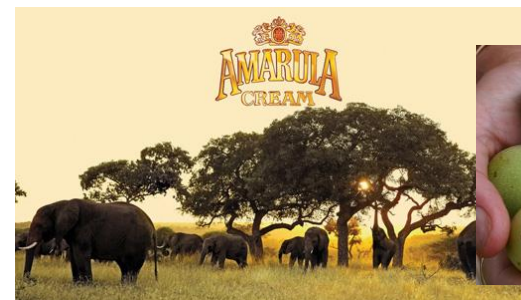
Source: El (en.wikipedia.org)



Source: Greg Hume (en.wikipedia.org)



Source: Jerry Friedman (en.wikipedia.org)



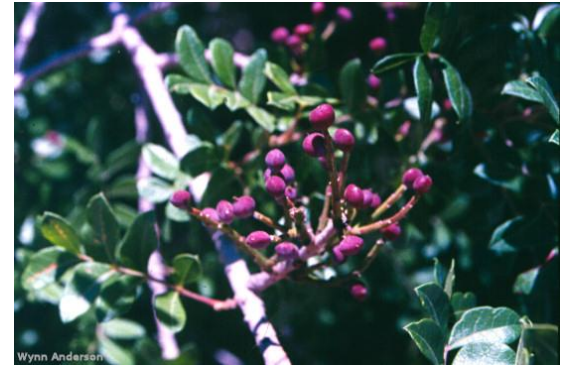
AMARULA
CREAM



Source: (en.wikipedia.org)

The genus *Pistacia*

- There are ~11 species in the genus
- Most are adapted to arid or semi-arid conditions.
 - Native to various parts of southern Asia, north Africa, and the Mediterranean region.
 - *P. mexicana* is native to Mexico and Texas.
- Some *Pistacia* species produce resins for turpentine and mastic.
- *P. chinensis* is a popular ornamental tree in the US.



Pistacia vera

Native to Southwestern Asia



P. vera

Native to Southwestern Asia

Pistachio forests
in Afghanistan



Photos courtesy of
Dr. Owen Burney



History of the US Pistachio Industry

- The USDA Plant Introduction Station at Chico, CA.
 - Dr. William E. Whitehouse collected seed from Asia in 1929.
 - Lloyd E. Joley began evaluation of varieties in 1940s.

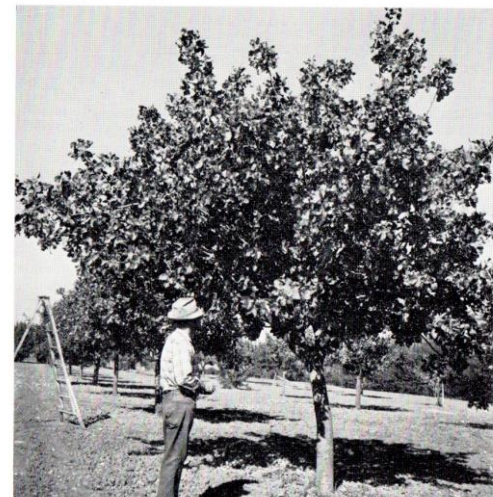
W.E. Whitehouse



L.E. Joley



Photos courtesy of Pioneer Nursery



Jaynes, 1970

FIGURE 2.—An 8-year-old Keiman pistachio tree on *Pistacia terebinthus* roots at the U. S. Plant Introduction Station, Chico, California.

History of the Pistachio Industry

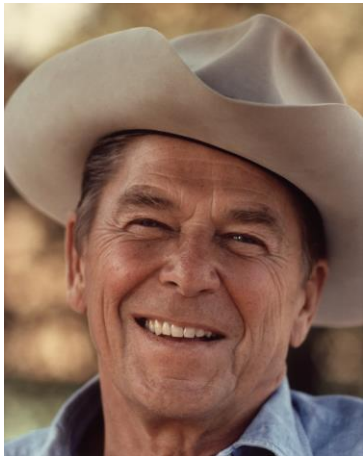
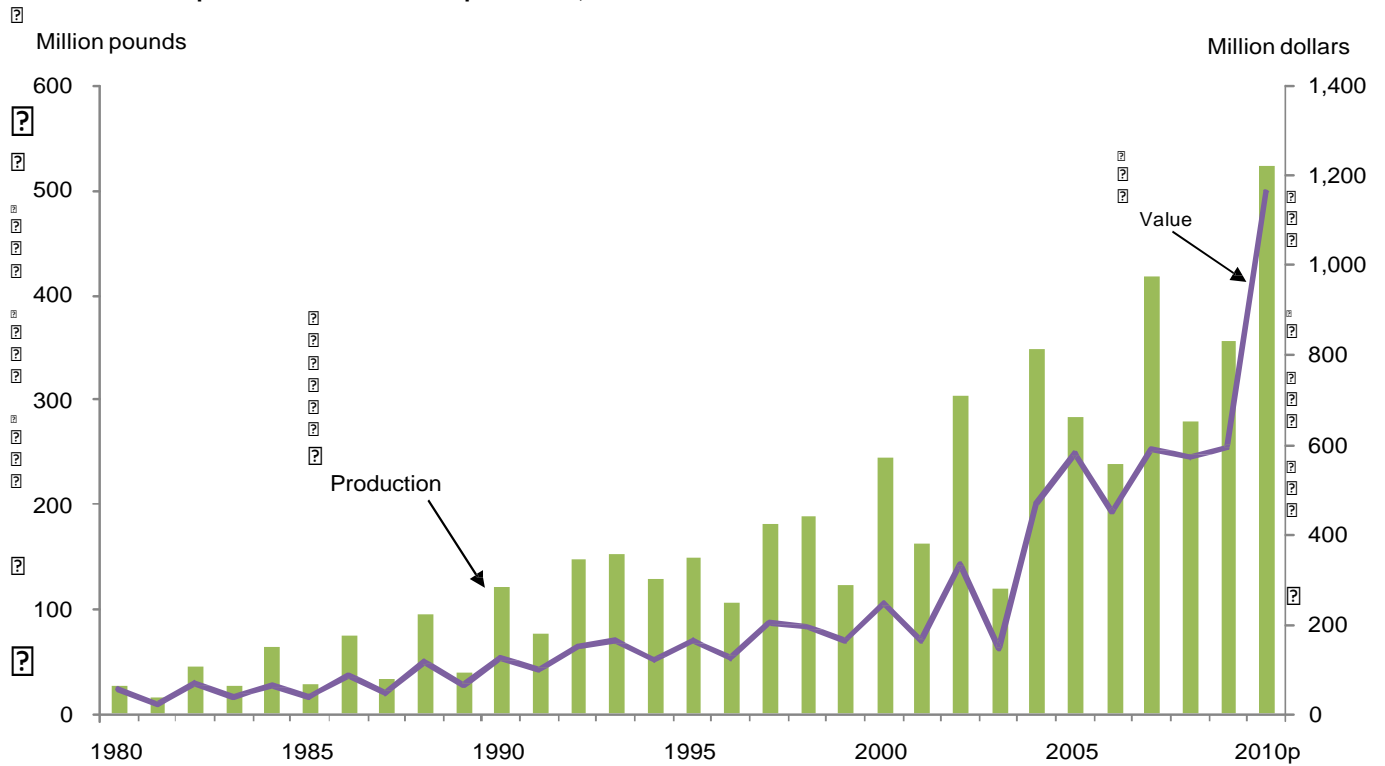


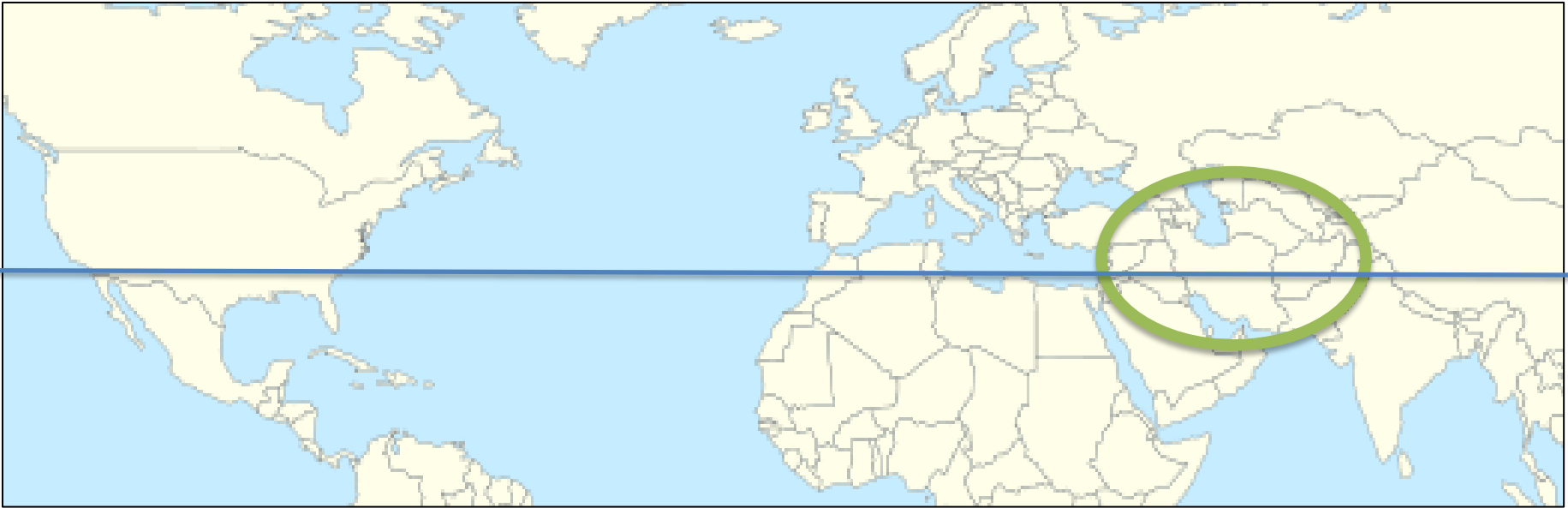
Figure 8
Pistachio total production and value of production, 1980-2010



P=preliminary.

Source: USDA, National Agricultural Statistics Service, *Noncitrus Fruits and Nut Summary*, various issues.

Pistachio's Climate Requirements



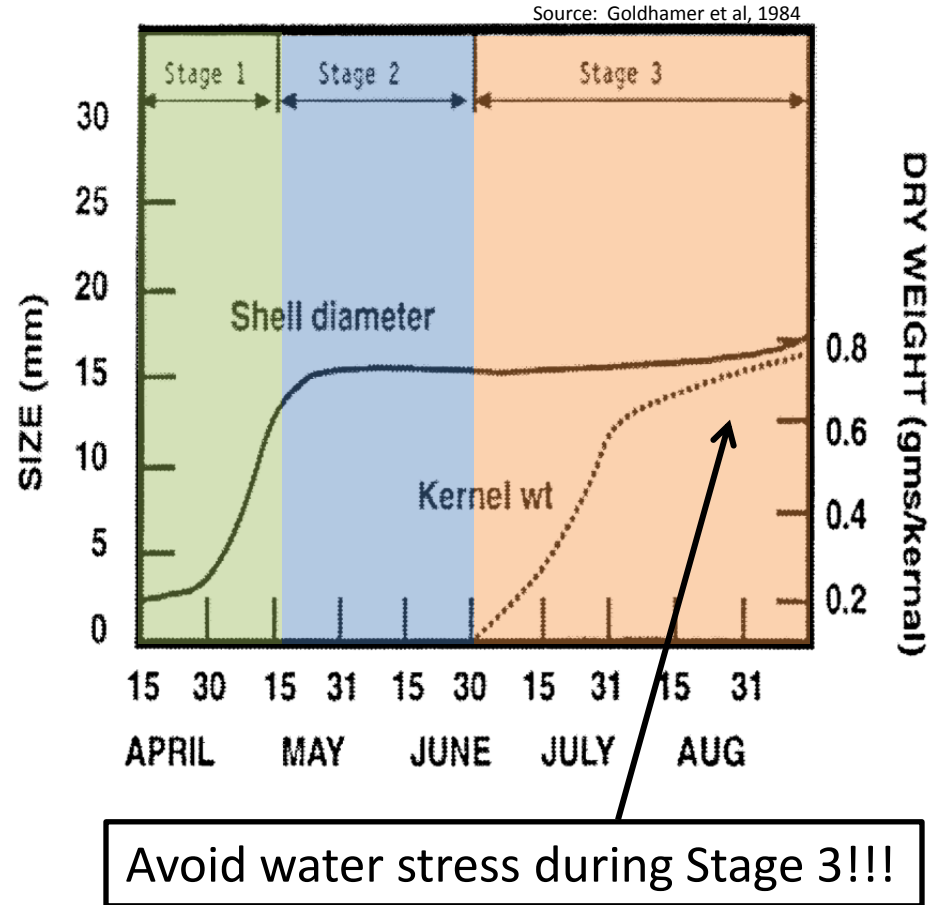
Kerman, Iran → 30°15' N latitude, 5,800 feet elevation.

Kerman, CA → 36°43' N latitude, 220 feet elevation.

Deming, NM → 32°15' N latitude, 4,300 feet elevation.

Regulated Deficit Irrigation

- Stage 1: water stress increases % split but reduces nut size.
- Stage 2: Split and yield insensitive to water stress.
- Stage 3: water stress reduces % splits and kernel growth.



Salinity

Pistachios are exceptionally salt tolerant for fruit trees.



Photo credit: Dr. Robert Flynn

- Soil
 - E_{Ce} of 9.4 dS/m → significant yield reduction (UCB-1 rootstock).
- Water
 - Pistachios can be irrigated with water as saline as 8 dS/m without yield loss.

Mineral Nutrition

Nutrient	Recommended Leaf Concentration
Nitrogen (N)	2.2-2.5%
Phosphorus (P)	0.14-0.17%
Potassium (K)	1.8-2.0%
Calcium (Ca)	1.3-4.0%
Magnesium (Mg)	0.6-1.2%
Manganese (Mn)	30-80 ppm
Boron (B)	150-250 ppm
Zinc (Zn)	10-15 ppm
Copper (Cu)	6-10 ppm
Chlorine (Cl)	0.1-0.3%

Source: UC Pistachio Production Manual



Boron Deficiency Symptoms

Cultivars

Pistachios are “dioecious”.

- Male and female flowers are borne on separate plants.
- It is necessary to plant male trees for pollination.



Female Cultivars

Fewer than 20 named female cultivars were ever imported to the US. Examples:

- ‘Red Aleppo’ (Syria)
- ‘Bronte’ (Italy)
- ‘Trabonella’ (Italy)
- ‘Sfax’ (Tunisia)
- ‘Kastel’ (Israel)
- ‘Rashti’ (Israel)
- ‘Kalehgouchi’ (Iran)
- ‘Aria’ (Iran)

A few commercial cultivars were developed in the US:

- ‘Kerman’ (USDA, 1957)
- ‘Lassen’ (USDA, 1962)
- ‘Joley’ (UC Davis, 1980)
- ‘Lost Hills’ (UC Davis, 2005)
- ‘Golden Hills’ (UC Davis, 2005)

Female Cultivars

'Golden Hills'



TABLE 1. Relative growth and production characteristics of tested varieties compared to 'Kerman' in northwestern Kern County

Characteristic	Cultivar			
	Golden Hills	Lost Hills	Kaleghouchi	Aria
Bloom date	Earlier	Earlier	Earlier	Earlier
Harvest date	Earlier	Earlier	Similar	Earlier
Alternate bearing	Later onset	Much less	Less	Much less
Annual yield	Greater	Similar	Similar	Less
Lanky growth	Similar	Similar	Greater	Similar
Split-nut percentage	Greater	Greater	Greater	Similar
Closed shell percentage	Less	Less	Less	Less
Nut size	Similar	Larger	Larger	Larger
Shell-hinge strength	Similar	Weaker	Slightly weaker	Much weaker
Insect damage	Less	Less	Similar	Similar

Source: Kallsen et al., 2009

Male Cultivars

- ‘Peters’
 - Selection by A.B. Peters.
 - California, early 1900’s.
 - The industry standard for ‘Kerman’
- ‘02-16’
 - Earlier blooming.
 - From Russia.
- ‘02-18’
 - Later blooming
 - From Russia.
- ‘Chico’
 - Originally collected from Syria.
 - USDA, 1962
- ‘Ask’ (Israel)
- ‘Nazareth’
- ‘Gazvin’ (Israel)
- ‘Randy’
 - UC Davis, 2005
 - Earlier blooming

‘Randy’ inflorescence



Kallisen et al., 2009

Rootstocks

- Pistachio cultivars are typically t-budded onto seedling or clonal rootstocks.
- Commercial rootstocks can be:
 - *P. terebinthus*
 - Cold tolerant, but Verticillium susceptible.
 - *P. atlantica*
 - Reasonably cold tolerant, but Verticillium susceptible.
 - *P. integerrima*
 - Verticillium tolerant, but susceptible to cold injury.
 - *P. atlantica* x *P. integerrima*
 - e.g., 'PGII' and 'UCB I'

Navel Orangeworm (*Amyelois transitella*)

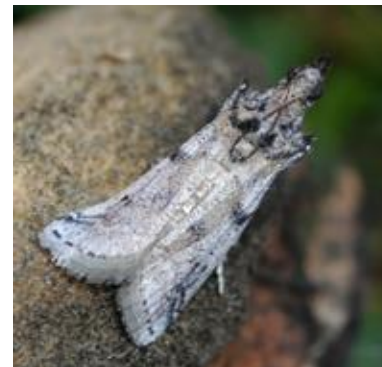
- The most serious insect pest in pistachios.
- Causes reduced nut yields and quality.
- *Dramatically* Increases aflatoxin contamination in nuts.
- Controlled by:
 - Sanitation
 - Prevention of early splits
 - Early harvest
 - Well-timed pesticide applications.



UC Statewide IPM Project
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<http://www.ipm.ucdavis.edu/PMG/r605300111.html>



Higbee and Siegel, 2009



<http://www.ars.usda.gov/Main/docs.htm?docid=18741>

<http://www.ipm.ucdavis.edu/>

[PMG/r605300311.html](http://www.ipm.ucdavis.edu/PMG/r605300311.html)



<http://www.ipm.ucdavis.edu/PMG/A/I-HM-AHIL-AD.001.html>



Stinkbugs & Leaf-footed Plantbugs

- Causes nut drop and kernel necrosis.
- Management:
 - Orchard sanitation
 - Trap crops
 - Pesticide applications (organic/"sustainable" options are very limited).

Stinkbugs & Leaffooted Plantbugs



Cotton Root Rot

- Caused by soil-borne fungus *Phymatotrichopsis omnivorum*.
- Fungus is known to occur in scattered locations around Southwest NM.
- Kills pistachio trees very quickly- with leaves remaining attached.
- No effective control methods. Avoid infested fields for pistachio plantings.

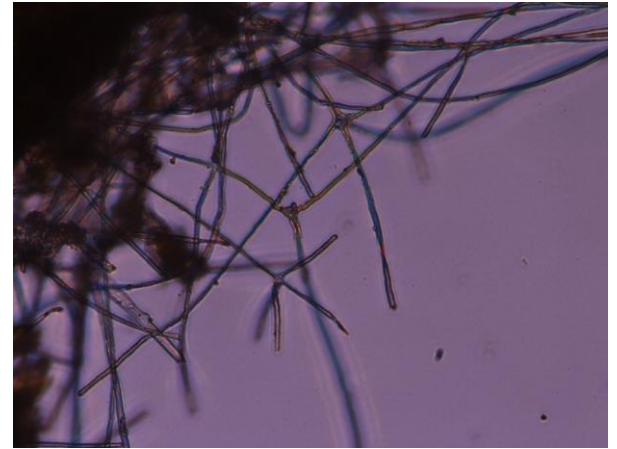


Photo courtesy of
Dr. Natalie Goldberg

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Dr. Natalie Goldberg

Alternaria Late Blight & Septoria Leaf Spot

- Fungal diseases first confirmed in southern NM pistachios in 2008.
- Both diseases are favored by high moisture in the growing season.
 - Not a major concern in most years.
- Management:
 - Orchard sanitation.
 - May require fungicide application in high rainfall seasons.

Septoria Leaf Spot



Alternaria Late Blight



Questions?



Sources & Further Reading

Ferguson, L. 2008. Pistachio Production Manual. Omnipress, Madison, WI.

Goldberg, N.P. 2005. Phymatotrichum root rot. New Mexico State University Cooperative Extension Service Guide A-229 (http://aces.nmsu.edu/pubs/_a/A229.pdf).

French, J., N. Golberg, R. Heerema, and B. Gordon. 2009. Septoria leaf spot and alternaria late blight on pistachio

Janick, J. and R.E. Paul. 2008. The Encyclopedia of Fruits and Nuts. Cambridge University Press, Cambridge, UK.

University of California IPM Online: <http://www.ipm.ucdavis.edu/index.html>.