

# **Promising New Pistachio Varieties**

**Ongoing Evaluations of two  
University of California and two  
Iranian Varieties.**

**Presented by Craig Kallsen, Farm Advisor  
U.C. Cooperative Extension**

## **Many thanks to:**

**The management and staff of Paramount Farming Company including but not limited to Eric Mercure, Joe MacIlvaine, Don Castle, Dennis McCoy, Dennis Elam, Brenda Hansen, Bernard Puget, Acario Garza, Berna Vega, Kirk Mouser and Rosie Gill.**

**The management and staff of Primex Farms including but not limited to Ali Amin, Ron Warren, Erik Haarsager, and Tiffany Weldin.**

**The management and staff of S&J Ranch, including and not limited to, Kevin Olsen and James Bettiga.**

**Dr. Mehdi Orandi for donating selections of Kaleghouchi and Aria budwood and Reza Rasekh and Herb Taylor of RAM management.**

**Brian Blackwell, Pioneer Nursery and crop consultant Carl Fanucchi and Tejon Ranch of Kern County.**

**Dr. Louise Ferguson, Pomology Extension Specialist at UC/Davis and the Kearney REC.**

**The California Pistachio Commission for their financial support of the UC breeding-evaluation project.**

# Varieties (Cultivars)

The variety (scion) is the part of the tree that grows on top of the rootstock.

Probably 97% or more of the pistachio acreage in California is planted to the *Pistacia vera* female cultivar called 'Kerman' and a *P. vera* male called 'Peters'.



Kerman female



Peters male

It's hard to evaluate something new unless you know what you have now.

## **Short History of Kerman**

- **selected, in 1929, from seed imported from Rafsanjan, Iran**
- **named in 1952**
- **released for trial in 1957**
- **grown on 1700 acres in 1977**
- **grown on approximately 140,000 acres in California in 2005.**

# **Kerman Traits in California (irrigated, fertilized)**

## **Yield**

- **bears significant fruit in 6<sup>th</sup> leaf.**
- **alternate bearing (average 2200 - 3500 lbs/acre  
CPC yield per year over 2-year cycle)**

## Kerman Tree Characters in CA

- moderate vigor (trainable trees)
- trees have upright spreading growth habit
- precocious (bears fruit early in life cycle)
- open nut clusters
- harvestability (nuts stay on tree until shaken)
- late nut maturity (September to mid-October)
- begins bloom in late March or early April
- high chilling requirement

# Kerman Nut Characters

- 'round' nut shape (short and wide)
- unstained shells
- firm, crisp, purple and yellowish-green kernel
- split-nut weight averages from 1.0 to 1.6 grams/nut annually
- good split percentage and strong shell-hinge strength (does not fall apart in processing or later in the bag and still achieves 65 – 90% split nuts when split % expressed as weight of edible split inshell nuts divided by CPC weight).
- high blank percentage and closed inshell some years

**Kerman has a long (60 year) track record in California.**

**We know its strengths and weaknesses.**

## Peters Male

- **found by A. B. Peters from Fresno, CA. (originally may have come from Armenia)**
- **good producer of durable pollen**
- **bloom period continues for three weeks**
- **initial spring bloom usually slightly ahead of Kerman. Bloom period coincides with Kerman fairly well most years.**



Peters  
scorch

# Evaluation of Two New Varieties from the U.C. Pistachio Breeding Program



The pistachio breeders -  
Dr. Dan Parfitt and Farm Advisor Joe  
Maranto

The seedling test plot where selections were made. The seedling test plot was planted in 1990 and 1991, from seeds germinated in 1989 and 1990.



Golden Hills



At the current time,  
two selections appear  
to have commercial  
value and budwood  
was released to the  
industry in July, 2005.

Lost  
Hills



2005 – Northwestern  
Kern County

**These two female varieties were chosen for release based on their performance in a test plot budded in 1997 on the west side of the San Joaquin Valley in Kern County.**

**The initial performance of these two varieties has been similarly acceptable in a second plot budded in 1999 located on the east side of the Valley in Madera County.**

# Golden Hills



# Lost Hills



Picture by Eric Mercure, 2004



Picture by Eric Mercure, 2004

# Kerman 2003 and 2004



# Randy early male

Budwood released to industry in 2005



Winter, 2005



July, 2003



March 27, 2003



# Randy early male

- **first flowers appear 10 to 15 days before ‘Peters’**
- **provides good quantities of relatively durable and viable pollen.**
- **is more precocious than ‘Peters’ flowering one year before ‘Peters’.**
- **Bloom period overlaps that of ‘Kalehghouchi.’**
- **In combination with ‘Peters’ provides excellent bloom overlap with ‘Golden Hills’ or ‘Lost Hills’.**

## **Estimated date of full bloom for Kerman, Golden Hills, Lost Hills, Peters and Randy, western Kern county 2003-2006.**

<b>Year</b>	<b>Kerman</b>	<b>Golden Hills</b>	<b>Lost Hills</b>	<b>Peters (male)</b>	<b>Randy (male)</b>
<b>2003</b>	<b>April 5</b>	<b>March 31</b>	<b>March 30</b>	<b>April 4</b>	<b>March 29</b>
<b>2004</b>	<b>April 2</b>	<b>March 29</b>	<b>March 27</b>	<b>March 31</b>	<b>March 23</b>
<b>2005</b>	<b>April 1</b>	<b>March 26</b>	<b>March 24</b>	<b>April 1</b>	<b>March 25</b>
<b>2006</b>	<b>May 1</b>	<b>April 24</b>	<b>April 28</b>	<b>April 30</b>	<b>April 28</b>

**Note: Experimental site was treated with oil to advance bloom in 2003.**

# Flowering of Lost Hills, Golden Hills and Kerman, 2005



# Randy versus Peters, 2005



## **Average harvest date for Kerman, Lost Hills and Golden Hills in Kern and Madera Counties.**

<b>Variety</b>	<b>Kern County</b>	<b>Madera County</b>
<b>Kerman</b>	<b>Sept. 15</b>	<b>Sept. 22</b>
<b>Golden Hills</b>	<b>Sept. 1</b>	<b>Sept. 6</b>
<b>Lost Hills</b>	<b>Sept. 1</b>	<b>Sept. 8</b>

**Kern County data averaged 2002-2006**

**Madera County data averaged 2004-2006**

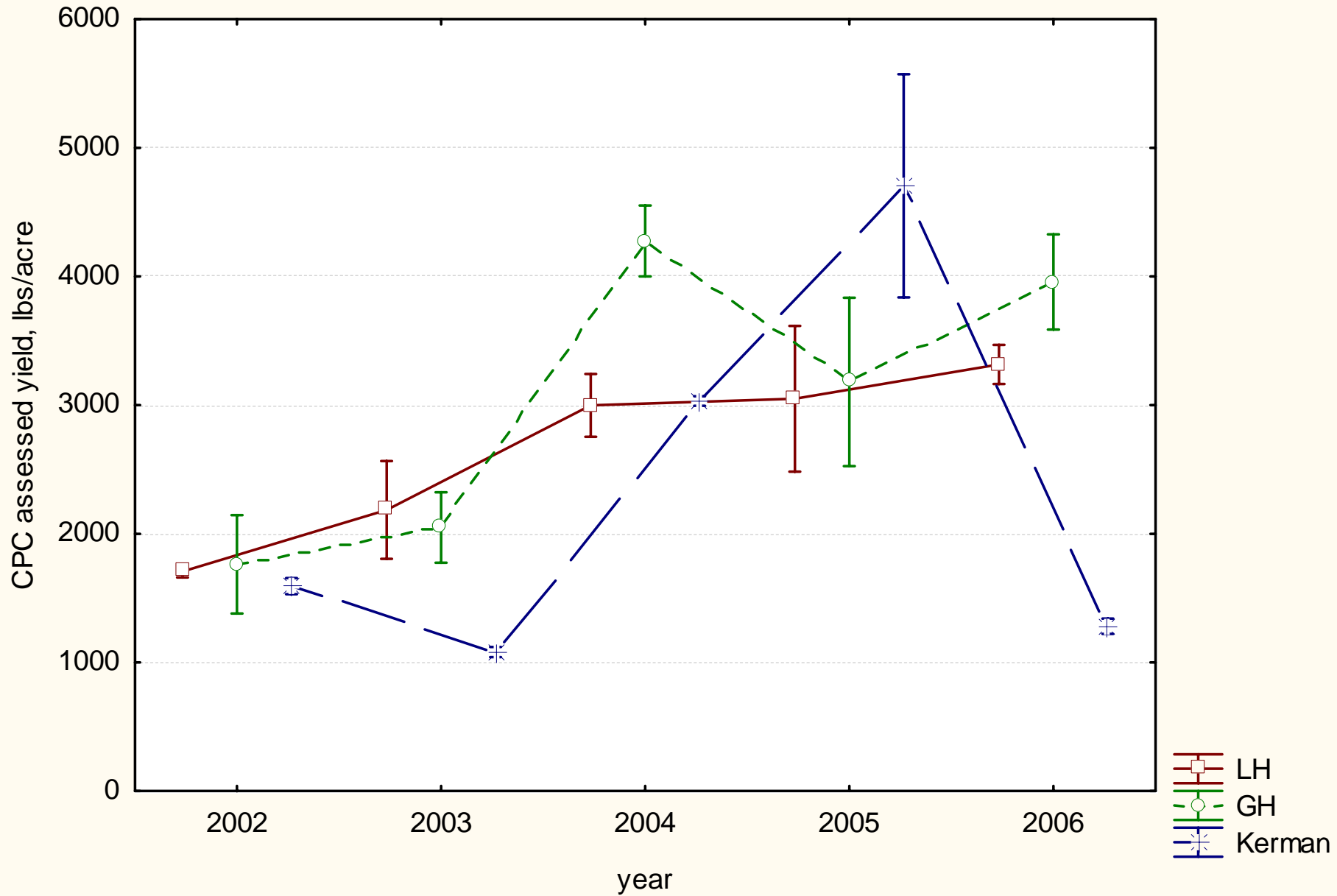
**Cumulative Yield and average nut quality characters of Kerman, Lost Hills and Golden Hills from 6<sup>th</sup> leaf (2002) to 10<sup>th</sup> leaf (2006) west side, Kern County**

<b>Variety</b>	<b>CPC yield, lbs/acre</b>	<b>Split nut yield, lbs/acre</b>	<b>Split nut, %</b>	<b>Shelling stock, %</b>	<b>Closed shell, %</b>
<b>Kerman</b>	<b>11,692 a</b>	<b>9,544 a</b>	<b>68 a</b>	<b>2.8 a</b>	<b>27.9 b</b>
<b>Golden Hills</b>	<b>15,225 a</b>	<b>13,559 a</b>	<b>84 b</b>	<b>3.0 a</b>	<b>12.2 a</b>
<b>Lost Hills</b>	<b>13,256 a</b>	<b>11,995 a</b>	<b>85 b</b>	<b>5.8 b</b>	<b>8.3 a</b>

**Percentages based on percent of hulled nut weight.**

**Values under the same column heading followed by different letters are significantly different at  $P \leq 0.05$  by Fisher's protected LSD test.**

Yearly variation in yield, western Kern county  
error bars equal plus or minus one standard error



Farm Advisor Brent Holtz, and his crew in Madera County have been instrumental in collecting yield data in the Madera County variety evaluation plot.

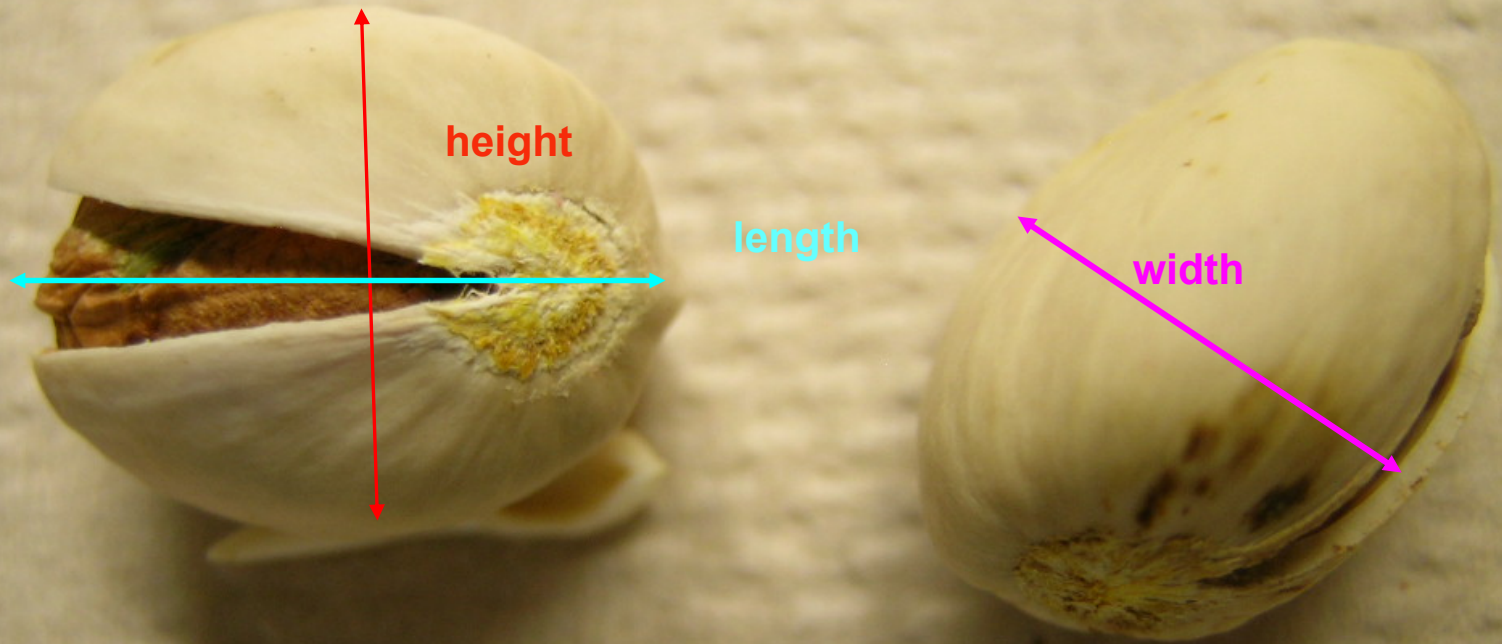
**Cumulative Yield and average nut quality characters of Kerman, Lost Hills and Golden Hills from 6<sup>th</sup> leaf (2004) to 8<sup>th</sup> leaf (2006) Madera County. Values are average performance of trees on both UCB1 and PG1 rootstocks.**

<b>Variety</b>	<b>CPC yield, lbs/acre</b>	<b>Split nut yield, lbs/acre</b>	<b>Split nut, %</b>	<b>Shelling stock, %</b>	<b>Closed shell, %</b>
<b>Kerman</b>	<b>2,818 a</b>	<b>2,250 a</b>	<b>66 a</b>	<b>9.2 a</b>	<b>17.6 b</b>
<b>Golden Hills</b>	<b>4,151 a</b>	<b>3,633 a</b>	<b>80 a</b>	<b>10.5 a</b>	<b>6.3 a</b>
<b>Lost Hills</b>	<b>4,062 a</b>	<b>3,553 a</b>	<b>78 a</b>	<b>10.8 a</b>	<b>6.8 a</b>

**Percentages based on percent of hulled nut weight.**

**Values under the same column heading followed by different letters are significantly different at  $P \leq 0.05$  by Fisher's protected LSD test.**

## Nut dimensions illustrated



## Average nut weight and dimensions (2002-2006) for Kerman, Golden Hills and Lost Hills in western Kern County.

variety	weight of one nut, g	nut length, mm	nut width, mm	nut height, mm
<b>Kerman</b>	<b>1.27 a</b>	<b>18.6 a</b>	<b>13.3 a</b>	<b>12.5 a</b>
<b>Golden Hills</b>	<b>1.29 a</b>	<b>19.5 a</b>	<b>13.5 a</b>	<b>13.1 b</b>
<b>Lost Hills</b>	<b>1.49 b</b>	<b>21.2 b</b>	<b>14.0 b</b>	<b>12.9 b</b>

Nut weight measured 2002-06, nut length measured from 2004-06, nut height from 2005-06

# Short Summation of Possible Alternatives to Planting Kerman

## Lost Hills, compared to Kerman (so far)

- Earlier full bloom (about 8 days on average)
- Earlier harvest (about 2 weeks on average)
- Greater split percentage, weaker shell-hinge strength
- Larger nut size
- Similar (or better) cumulative total yield, edible split inshell, grower paid weight
- Less alternate bearing?
- Use Randy and Peters males as pollinators

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Evaluations are based only on trees that are, at most, 9 years old (10<sup>th</sup> leaf). Any initial plantings should be very conservative in nature.

# Short Summation of Possible Alternatives to Planting Kerman

## Golden Hills, compared to Kerman (so far)

- Earlier full bloom (about 6 days on average)
  - Earlier harvest (two weeks on average)
  - Similar nut size
  - Greater percentage of split nuts, less closed shell.
  - Similar (or greater) cumulative total yield, edible split inshell yield, grower paid weight
  - Did well in taste tests.
  - Less alternate bearing?
  - Use Randy and Peters males as pollinators
- 

Evaluations are based only on trees that are, at most, 9 years old (10th leaf). Any initial plantings should be very conservative in nature.

# UCCE Iranian Variety Evaluation in California

**Two sites: Each; planted in 1998, randomized complete block exp. design, with 4 reps. Contain Kerman, Kalehghouchi, and Aria varieties**

## **Site 1 - Northwestern Kern County**

- **25 trees per rep, PG1 rootstock, boric and calcareous soil**

## **Site 2 - Highway 65 near Tulare County line in Kern County (i.e. east side of San Joaquin Valley.**

- **5 trees per replication, Kresha rootstock, clay loam soil in citrus belt.**



ARIA



Early split nuts in Aria



Sun burned nuts



Big floppy leaves



Early bloom and leaf out

# Kalehghouchi



## **Estimated date of full bloom for Kerman, Aria and Kalehghouchi, Peters and Randy, western Kern County 2003-2006.**

<b>Year</b>	<b>Kerman</b>	<b>Aria</b>	<b>Kalehghouchi</b>	<b>Peters (male)</b>	<b>Randy (male)</b>
<b>2003*</b>	<b>April 4</b>	<b>March 29</b>	<b>March 31</b>	<b>April 2</b>	<b>March 29</b>
<b>2004</b>	<b>April 1</b>	<b>March 23</b>	<b>March 24</b>	<b>April 1</b>	<b>March 23</b>
<b>2005</b>	<b>April 2</b>	<b>March 20</b>	<b>March 24</b>	<b>April 1</b>	<b>March 24</b>
<b>2006</b>	<b>May 1</b>	<b>April 19</b>	<b>April 28</b>	<b>May 1</b>	<b>April 28</b>

**\*Note: Experimental site was treated with oil to advance bloom in 2003.**



**Most advanced flower buds for varieties or selections shown.**

**Average harvest date for Kerman, Aria and Kalehghouchi on the west side and east side of the San Joaquin Valley in Kern County, 2004-2006.**

<b>Variety</b>	<b>West side</b>	<b>East Side</b>
<b>Kerman</b>	<b>Sept. 20</b>	<b>Sept. 24</b>
<b>Aria</b>	<b>Sept. 5</b>	<b>Sept. 24</b>
<b>Kalehghouchi</b>	<b>Sept. 17</b>	<b>Sept. 24</b>

**Cumulative Yield and average nut quality characters of Kerman, Aria and Kalehghouchi from 5th leaf (2002) to 9th leaf (2006) west side, Kern County. Crop was not harvested in 2003 due to very poor yields.**

<b>Variety</b>	<b>CPC yield, lbs/acre</b>	<b>split nut yield, lbs/acre</b>	<b>edible, split nut, %</b>	<b>shelling stock, %</b>	<b>closed shell, %</b>
<b>Kerman</b>	<b>6,796 a</b>	<b>5,877 a</b>	<b>74.2 a</b>	<b>2.4 a</b>	<b>20.5 b</b>
<b>Aria</b>	<b>8,150 a</b>	<b>7,250 a</b>	<b>78.7 b</b>	<b>10.9 c</b>	<b>9.1 a</b>
<b>Kalehghouchi</b>	<b>8,277 a</b>	<b>7,553 a</b>	<b>83.4 c</b>	<b>6.7 b</b>	<b>9.1 a</b>

**Percentages based on percent of hulled nut weight.**

**Values under the same column heading followed by different letters are significantly different at  $P \leq 0.05$  by Fisher's protected LSD test.**

**Cumulative Yield and average nut quality characters of Kerman, Aria and Kalehghouchi from 7th leaf (2004) to 9th leaf (2006), east side San Joaquin Valley, Kern County.**

<b>Variety</b>	<b>CPC yield, lbs/acre</b>	<b>split nut yield, lbs/acre</b>	<b>edible, split nut, %</b>	<b>shelling stock, %</b>	<b>closed shell, %</b>
<b>Kerman</b>	<b>3031 b</b>	<b>2636 b</b>	<b>74.9 b</b>	<b>2.3 a</b>	<b>22.3 b</b>
<b>Aria</b>	<b>2596 a</b>	<b>1803 a</b>	<b>53.4 a</b>	<b>15.5 c</b>	<b>23.9 b</b>
<b>Kalehghouchi</b>	<b>3787 c</b>	<b>3457 c</b>	<b>85.5 b</b>	<b>5.3 b</b>	<b>8.7 a</b>

**Percentages based on percent of hulled nut weight.**

**Values under the same column heading followed by different letters are significantly different at  $P \leq 0.05$  by Fisher's protected LSD test.**

**Loose kernels and shells from normal handling.**

**Not good.**



**Aria, east side –  
Kern County 2006**



**Aria, west side –  
Kern County 2006**

## **Average nut weight and dimensions for Kerman, Aria and Kalehghouchi (2004-2006) in western Kern County.**

<b>variety</b>	<b>weight of one nut, g</b>	<b>nut length, mm</b>	<b>nut width, mm</b>	<b>nut height, mm</b>
<b>Kerman</b>	<b>1.25 a</b>	<b>19.0 a</b>	<b>13.3 b</b>	<b>12.6 b</b>
<b>Aria</b>	<b>1.35 b</b>	<b>20.7 c</b>	<b>12.9 a</b>	<b>12.1 a</b>
<b>Kalehghouchi</b>	<b>1.45 c</b>	<b>19.8 b</b>	<b>13.6 c</b>	<b>13.7 c</b>

**Nut weight, length and width measured 2004- 06, nut height 2005-06.**

2005



KERMAN



KALEHGOUCHI



ARIA

# Short Summation of Possible Alternatives to Planting Kerman

## Kalehghouchi, compared to Kerman (so far)

- Earlier bloom (1 week on average)
- Harvest earlier or slightly later (3 days earlier on average)
- Larger nut size
- Higher split percentage
- Greater cumulative yields and grower paid weight.
- More difficult to train trees
- Ability to shake as trees get older?
- Randy male overlaps bloom very well.

Evaluations are based only on trees that are, at most, 8 years old (9th leaf). Any initial plantings should be very conservative in nature.

## Kalehghouchi and Aria Budwood

**Budwood from these two varieties  
is available from Dr. Orandi.**

**If interested, contact him at**

**650 – 521- 1945**

## **Budwood Concerns.**

**Ensure that the budwood from your selected cultivar will come from a reputable source. Fortunately ninety-nine percent of the industry is reputable.**

**However, there have been instances of theft of budwood from young orchards (aka 'midnight collections').**

**In the past, stolen budwood did not, generally, adversely affect the grower that was unknowingly receiving stolen budwood. Kerman trees, the desired variety, ended up in the new orchards.**

**However, with new varieties becoming more common, much more oversight, even for the majority of budwood which is obtained legally, is going to have to go into ensuring that the right budwood goes into the right orchard.**

**Budwood from UC varieties is protected under patent laws and requires a royalty payment for tree propagation.**