

# Jujube Basics and Cultivar Performance at three sites in New Mexico

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# Jujube- Chinese date

- **Family:** Rhamnaceae (buckthorn family)
- **Genus:** *Ziziphus*
- **Species:** *Ziziphus jujuba* Mill. (China 800/US 100)
- **Wild jujube:** *Ziziphus spinosa*
- **Indian jujube:** *Ziziphus mauritiana*
- **Edible part:** drupe fruit, pit with up to 2 seeds inside

# Classification

Same species with varied tree forms, fruit size and shapes, and maturity date. Cultivars are all by selections. Almost no hybrid cultivar yet.

By uses:

- Fresh eating
- Drying
- Multipurpose (Both fresh eating and drying)
- Processing
- Ornamentals

By maturity date:

- Early (70-90d)
- Mid-season (90-110d)
- Late (110-130d)

# Adaptability

- Wide adaptability to soil and weather conditions
- **Late season startup-leaf out in late April or May at Alcalde**
- Heat and drought tolerance
- **Precocious, reliable crop, and long-live plants**
- Varied tree shapes, fruit shapes and sizes
- Winter hardy in NM (-20°F?)
- NO insect and disease problems (so far)

**Avoid late cultivars in northern NM and high elevations.**



Drought tolerant!  
90 years in dryland at NMSU  
Tucumcari.



NMSU Tucumcari, 2012





Old jujube trees in China  
Jujube King: over 1000 years old



# Shoot structure and fruiting habit



- Primary shoot
  - Secondary shoots
    - Fruiting spurs
      - Fruit bearing shoots  
(branchlets)

# Shoots and buds

## **Four kinds of shoots:**

- Primary shoot (extension shoot)
- Lateral shoot
- Mother bearing shoot (fruiting spur)
- Fruit-bearing shoot (branchlet)

## **Three kinds of buds:**

- Main bud
- Lateral bud
- Dormant buds





**Lateral shoots:**  
permanent ,  
Base of fruiting structure

**Primary shoot:**  
One **terminal bud** on top,  
one **lateral bud** at the  
base of each lateral  
branch-keeping dormant  
most of the time. Can  
grow to primary shoot if  
stimulated.



Lateral shoot: thorn/spines on each node, extremely bad in nursery.







**Fruiting spurs (mother bearing shoots)** actually are **compacted shoots**. The associate buds around the main buds send out several branchlets each season to bear fruits.



[http://tupian.hudong.com/a2\\_32\\_79\\_01300000115459](http://tupian.hudong.com/a2_32_79_01300000115459)

## Old fruiting spurs and branchlets





**The main bud of fruiting spur can transform to primary shoot depending on cultivar or stimulation.**





**BRANCHLETS:** have leaves and flowers, drop at the end of the season.

**Abbeville**



**Jinsi**



# Function of shoots

- **Primary shoots:** form the scaffolds of the tree and responsible for the expanding of fruiting area.
- **Lateral shoots:** always accompany the primary shoot. Base of the fruiting structure.
- **Fruiting spurs:** also called *mother bearing shoots*, responsible for initiating fruiting structure. Could transform to primary shoot if stimulated.
- **Branchlets:** also called *fruit-bearing shoots*, fruiting structure.

# Pruning

- Minimum compared with other fruit species
- Do not response well as other tree fruit species like apples or peaches
- Do need attention especially for young trees
- Heading cut- need two cuts for jujubes (**one cut stops, two cuts sprout!**)
- Primary shoots from fruiting spurs on secondary shoots are preferred than those directly from the main trunk.
- Shorten secondary shoot to stimulate primary shoot
- Remove over crowded, damaged/diseased primary shoots
- Pruning and training vary by locations. In CA, Li trees produce well on one-year-old shoots.

## **Jujube training and pruning basics:**

[https://aces.nmsu.edu/pubs/\\_h/H337.pdf](https://aces.nmsu.edu/pubs/_h/H337.pdf)



**Shorten lateral branches to stimulate primary shoot**



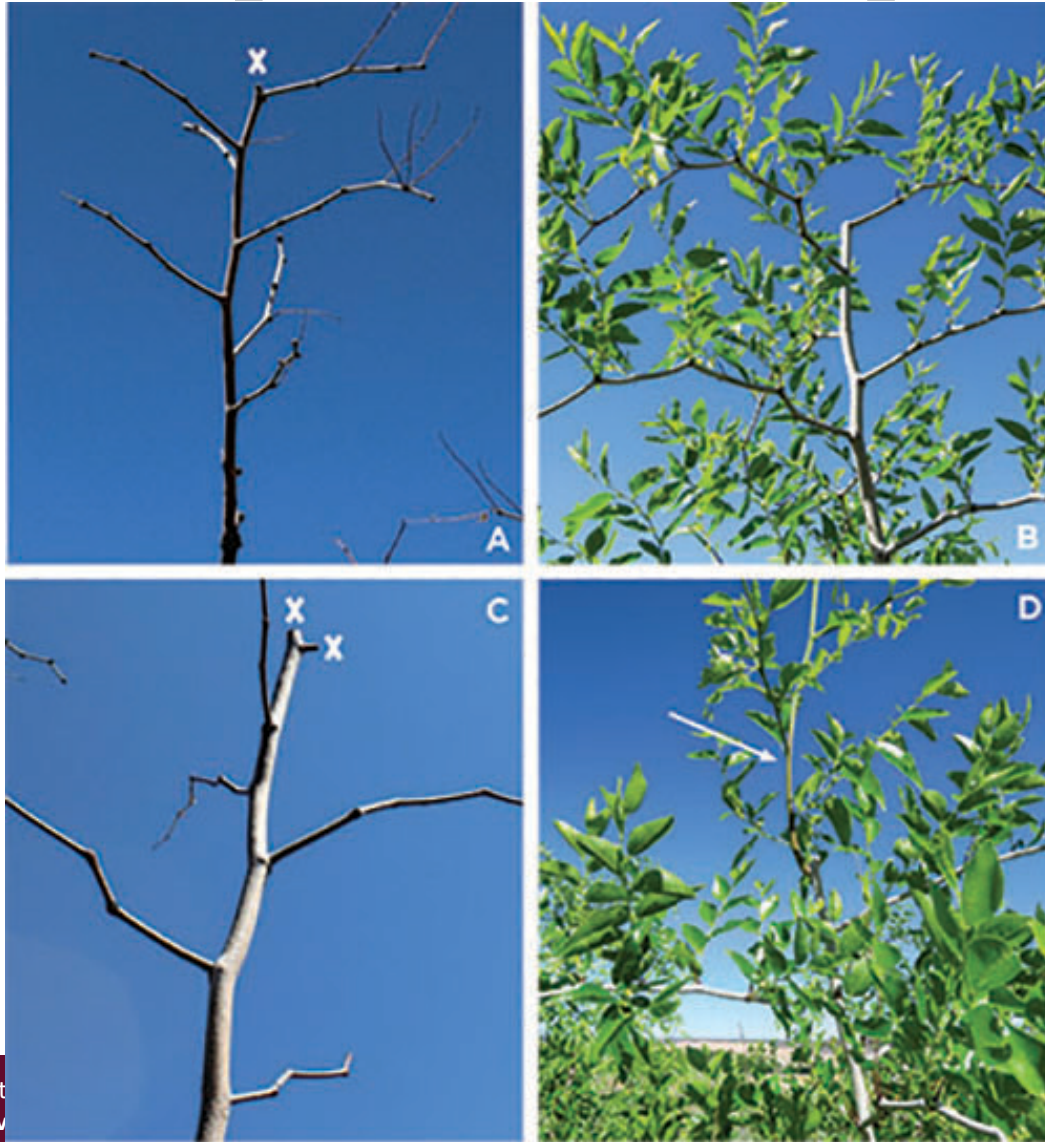


# Shoots from secondary branches are preferred!





# One cut stops, two cuts sprout!





# Cut secondary branches to 1-2 nodes before digging





# Training and pruning after planting

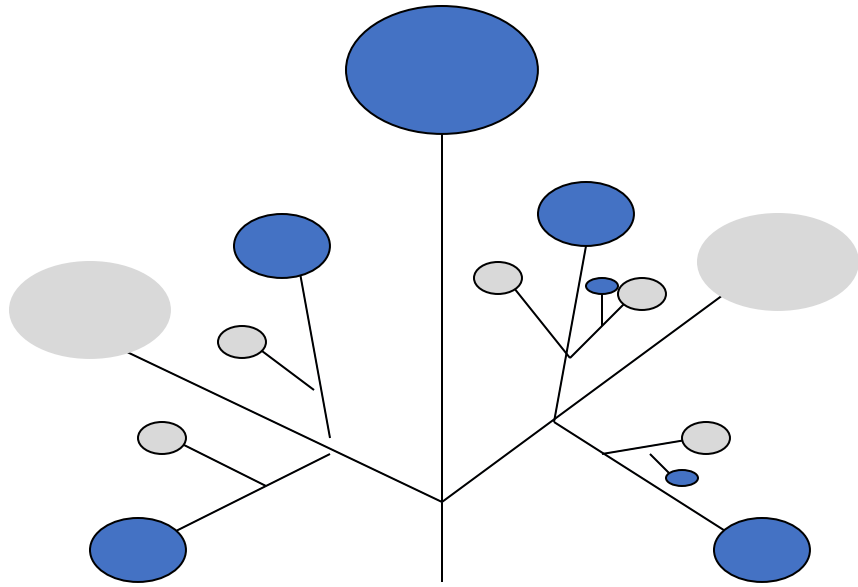


- Top the tree at 35-40 inch.
- Remove the first branch after topping to stimulate growth.
- Keep 3-5 side branches
- Remove branches lower than 2ft

# Flowering and fruiting

- For jujubes, branchlet growth, flower bud initiation, blooming, setting fruit and fruit development occur at the same time within the same branchlet. (**Nutrient competition!**)
- Jujubes finish flower bud initiation, blooming, setting fruit and fruit mature with **one growing season.**





Primary, secondary, tertiary, quaternary, quinary...



Fitzgerald

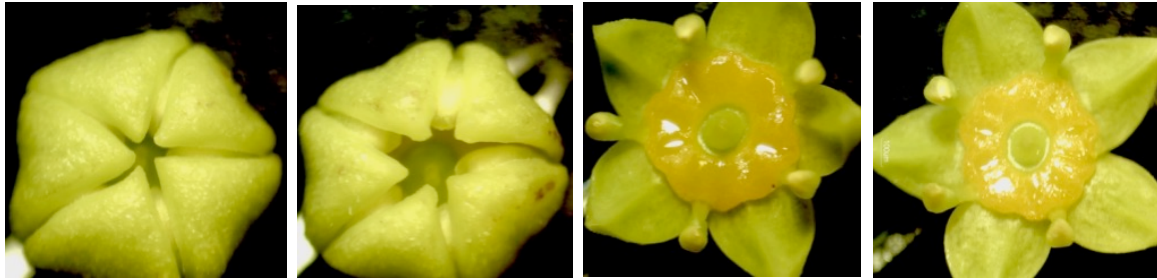
## Definite Inflorescence: Cyme, dichasium

# Flower initiation

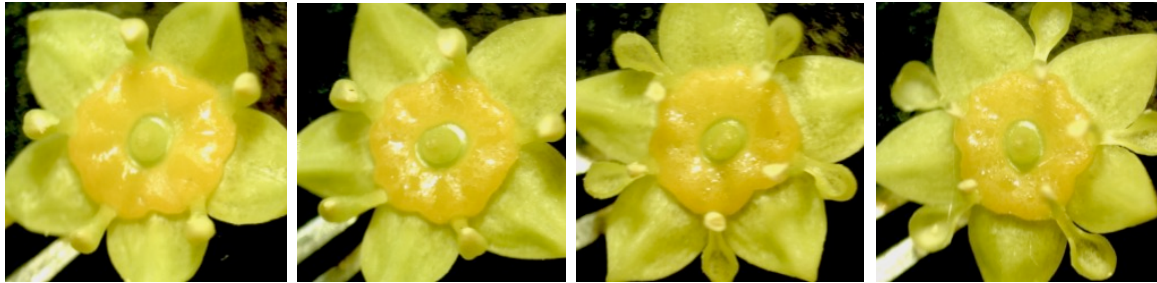




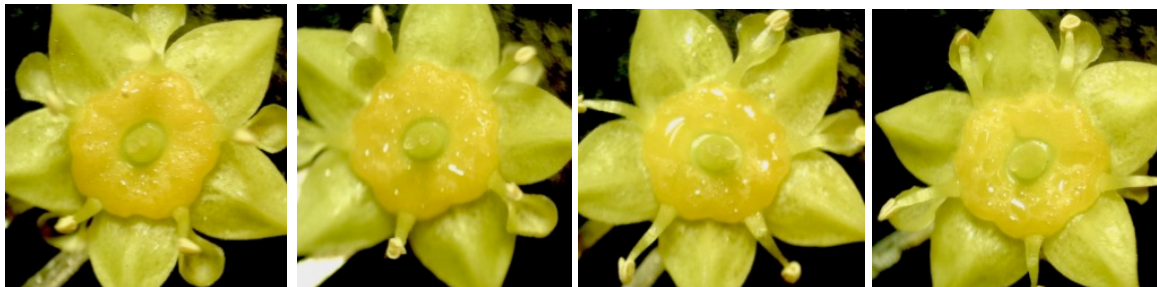
# Blooming process: 'Lang' - morning type



6am, 7am, 8am, and 9am



10am, 11am, 12pm and 1pm



2pm, 3pm, 4pm, and 5pm



# Fig. Cultivar Lang process

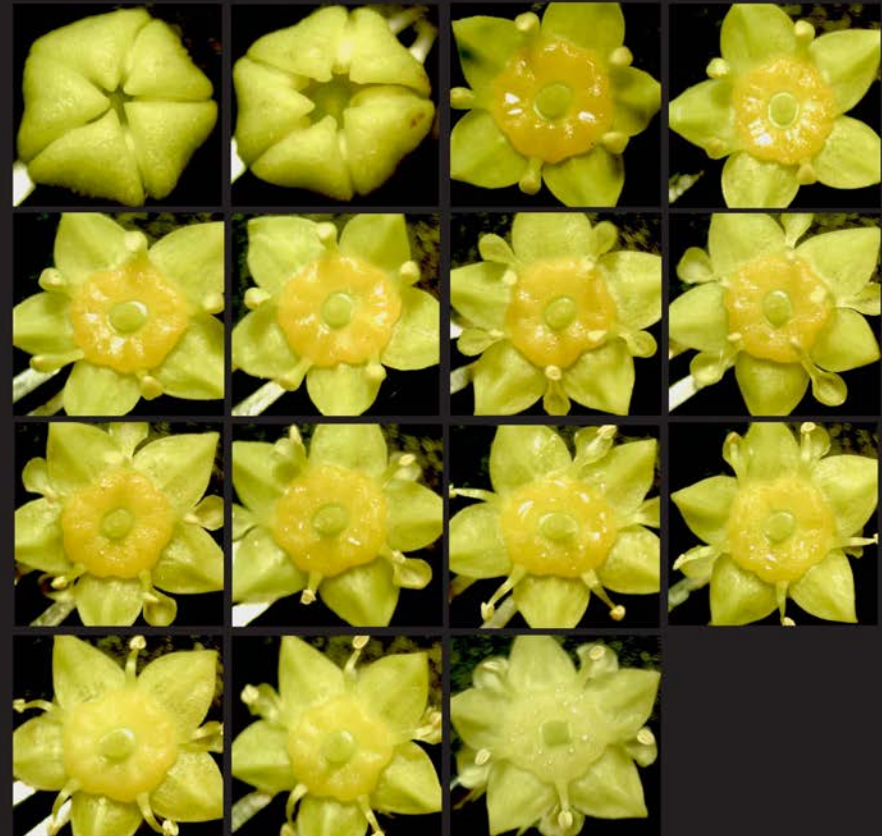


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JUJUBE (*ZIZIPHUS JUJUBA* MILL.)



BE BOLD. Shape the Future.  
New Mexico State University

HortScience 50: 839-845.

# Self fertility/self fruitfulness

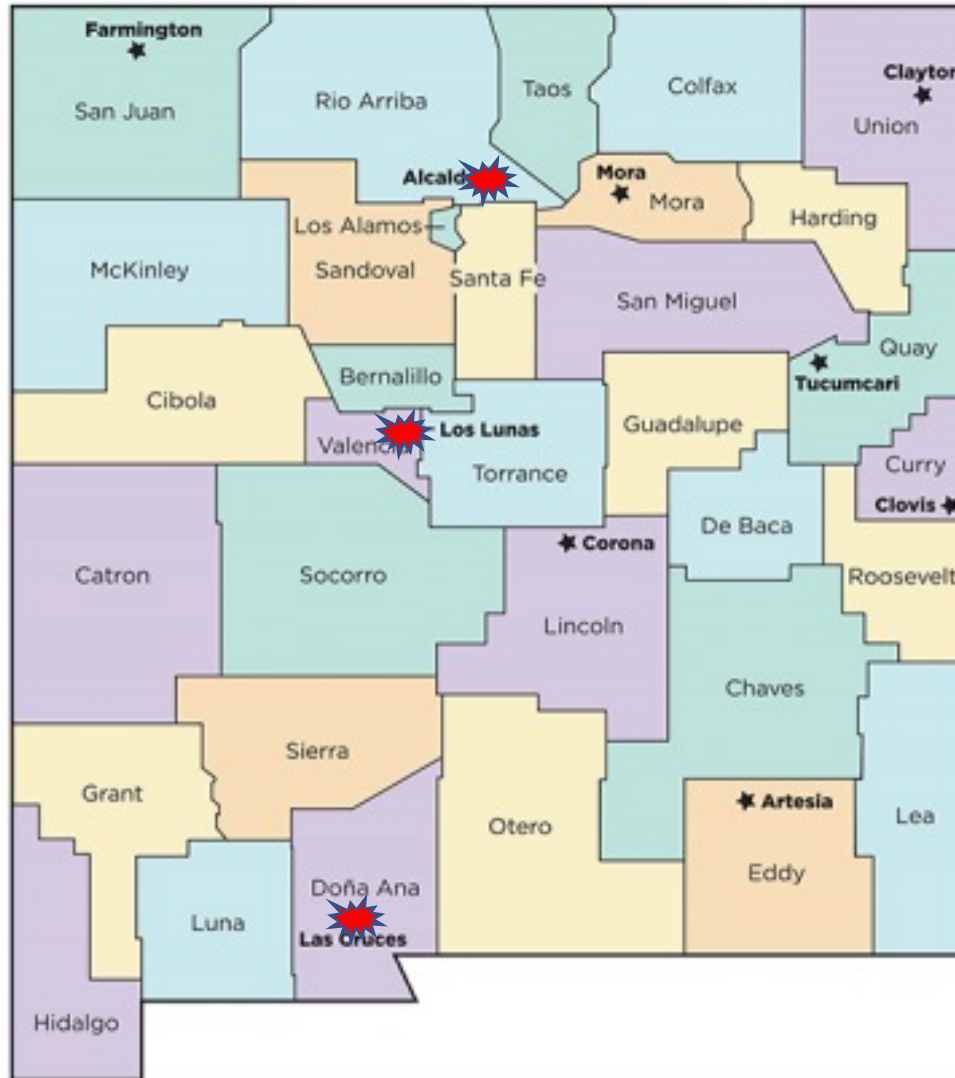
- Self pollination cultivars: Li, Li(2), Redland, Daguazao, Alcalde #1, Xiangzao, and Dabailing.
- Popular cultivar Lang was not self fruitful.

# Fruit set of jujube cultivars

- Cultivar
- Weather conditions (temperature and moisture)
- Cross pollination
- Insect activities
- Nutrient competition
- Cultural management

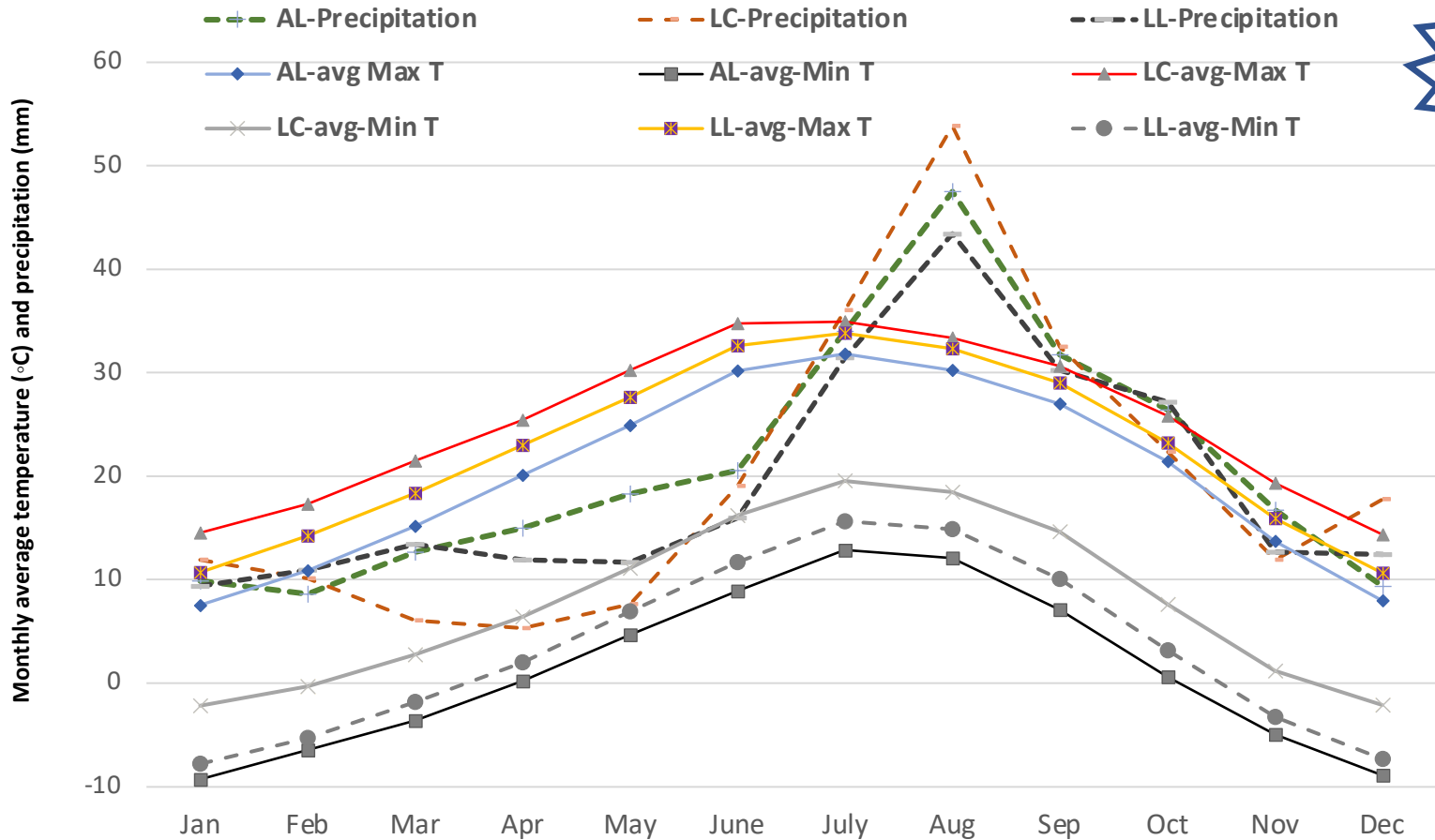


# Jujube Cultivar trial location in NM



- Alcalde (2015): USDA 6a;
- Los Lunas (2015): USDA 7a;
- Leyendecker (2017): USDA 8a.

# Historic weather data (monthly average max and min temperatures and precipitation) for Alcalde (AL, 1953-2005, 51°F/9.9"), Las Cruces (LC, 1959-2005, 61.7 °F/9.21") and Los Lunas (LL, 1923-2005, 55.4°F/9.1").



**Table 1. Fresh eating cultivar names, sources and their planting locations. AL-Alcalde, LL-Los Lunas, and LK-Leyendecker.**

|    | Cultivar                           | Plant source | Planting locations                         |
|----|------------------------------------|--------------|--|
| 1  | Alcalde #1(Qiyuexian) <sup>z</sup> | China        | AL, LL, and LK                             |
| 2  | Chico                              | California   | AL <sup>y</sup> , LL <sup>y</sup> , and LK |
| 3  | Dabailing <sup>z</sup>             | China        | LK   |
| 4  | Daguazao <sup>z</sup>              | China        | AL, LL, and LK                             |
| 5  | GA866                              | California   | AL, LL, and LK                             |
| 6  | Gaga <sup>z</sup>                  | China        | AL, LL and LK                              |
| 7  | Honeyjar                           | California   | AL, LL and LK                              |
| 8  | Jing 39 <sup>z</sup>               | China        | LK   |
| 9  | Li                                 | California   | AL, LL and LK                              |
| 10 | Kongfucui (KFC) <sup>z</sup>       | China        | AL, LL and LK                              |
| 11 | Maya <sup>z</sup>                  | China        | AL, LL and LK                              |
| 12 | Redland                            | California   | AL, LL and LK                              |
| 13 | Russian 2                          | California   | AL <sup>y</sup> , LL <sup>y</sup> and LK   |
| 14 | Sandia <sup>z</sup>                | China        | AL, LL                                     |
| 15 | Shanxi Li                          | China        | AL, LL and LK                              |
| 16 | Sugarcane                          | California   | AL, LL and LK                              |
| 17 | Zaocuiwang <sup>z</sup>            | China        | AL, LL and LK                              |

<sup>z</sup> Cultivars under trademark AmeriZao® series.

<sup>y</sup> Cultivars were tested as observation only, not in the replicated trials.

**Table 2. Jujube cultivar yields (g/tree) from 2016-18 at Alcalde and Los Lunas, NM**

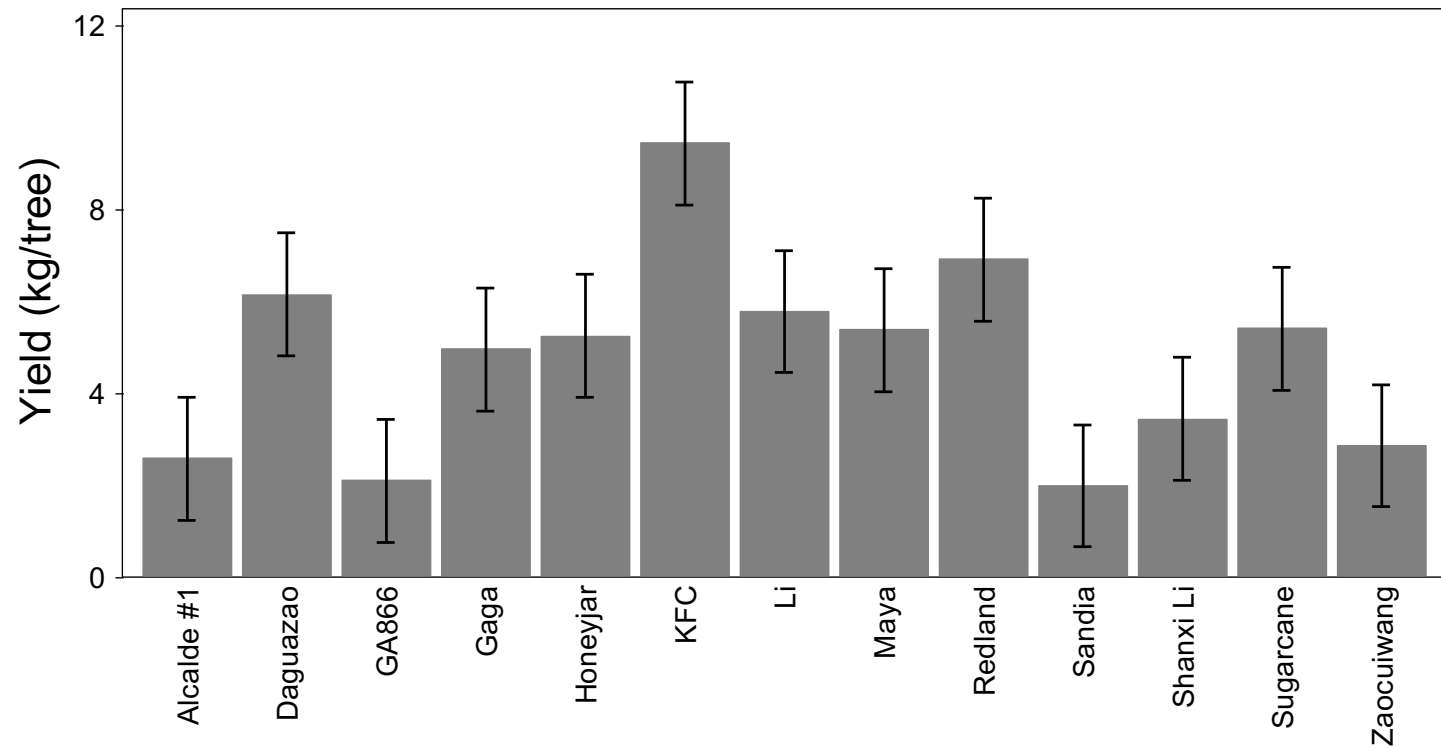
| <b>Cultivar</b>                   | <b>AL-2016</b> | <b>AL-2017</b> | <b>AL-2018</b> | <b>LL-2016</b> | <b>LL-2017</b> | <b>LL-2018</b> |
|-----------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| <b>Alcalde #1</b>                 | 451            | 1511           | 3202           | 892            | 607            | 4988           |
| <b>Daguazao</b>                   | 646            | 6547           | 9948           | 79             | 3070           | 5013           |
| <b>GA866</b>                      | 68             | 977            | 1797           | 311            | 1932           | 3658           |
| <b>Gaga</b>                       | 238            | 5953           | 6321           | 456            | 1835           | 5707           |
| <b>Honeyjar</b>                   | 1148           | 7470           | 6160           | 229            | 1642           | 5701           |
| <b>KFC</b>                        | 383            | 11572          | 13686          | 339            | 2696           | 9791           |
| <b>Li</b>                         | 80             | 4267           | 3756           | 210            | 6681           | 8377           |
| <b>Maya</b>                       | 538            | 5995           | 6432           | 643            | 2623           | 6446           |
| <b>Redland</b>                    | 431            | 6387           | 3985           | 1015           | 8265           | 8999           |
| <b>Sandia</b>                     | 18             | 132            | 2576           | 167            | 2060           | 3183           |
| <b>Shanxi Li</b>                  | 512            | 3503           | 1842           | 509            | 3870           | 4559           |
| <b>Sugarcane</b>                  | 423            | 6366           | 8500           | 868            | 2852           | 3882           |
| <b>Zaocuiwang</b>                 | 387            | 1659           | 925            | 209            | 2135           | 6734           |
| <b>Mean</b>                       | 409            | 4795           | 5318           | 456            | 3098           | 5926           |
| <b>Critical value<sup>z</sup></b> |                | 3427           | 2311           |                | 2217           | 4457           |
| <b>Chico<sup>y</sup></b>          | 32             | 859            | 2127           | 681            | 1892           | 4195           |
| <b>Russian 2</b>                  | 1700           | 4066           | 1160           | 1620           | -              | -              |

Table 3. Fruit size, mean fruit weight and soluble solids of different jujube cultivars at Alcalde and Los Lunas in 2017 and 2018.

|            | Fruit dimension-2017<br>(length x width, mm) |             | Mean fruit weight (g) |       |       |       | Soluble solids (%) <sup>z</sup> |       |       |       |
|------------|--|-------------|-----------------------|-------|-------|-------|---------------------------------|-------|-------|-------|
|            | AL   | LL          | AL-17                 | LL-17 | AL-18 | LL-18 | AL-17                           | LL-17 | AL-18 | LL-18 |
| Alcalde #1 | 51.8 × 36.6                                  | 48.8 × 38.1 | 29.8                  | 31.2  | 26.3  | 25.8  | 30.9                            | 32.8  | 32.8  | 28.9  |
| Chico      | 27.8 × 33.1                                  | 29.7 × 34.6 | 13.4                  | 14.3  | --    | --    | 22.7                            | 24.2  | --    | --    |
| Daguazao   | 39.3 × 38.0                                  | 39.5 × 41.9 | 22.9                  | 27.1  | 21.1  | 17.1  | 27.6                            | 28.7  | 27.0  | 25.4  |
| GA866      | 43.9 × 24.5                                  | 47.3 × 27.9 | 10.7                  | 14.8  | 12.9  | 14.1  | 27.9                            | 29.2  | 35.2  | 32.9  |
| Gaga       | 39.7 × 21.1                                  | 37.9 × 21.1 | 7.6                   | 8.8   | 6.6   | 7.4   | 35.3                            | 34.4  | --    | 29.5  |
| Honeyjar   | 24.1 × 25.0                                  | 24.7 × 24.9 | 7.3                   | 7.6   | 6.9   | 7.2   | 24.4                            | 33.6  | 27.9  | 32.3  |
| KFC        | 39.7 × 26.2                                  | 39.0 × 28.0 | 11.5                  | 12.6  | 10.1  | 14.2  | 29.0                            | 32.7  | 25.2  | 31.3  |
| Li         | 42.1 × 40.7                                  | 44.4 × 42.5 | 27.5                  | 29.0  | 25.0  | 30.2  | 23.6                            | 28.4  | 31.8  | 29.7  |
| Maya       | 39.4 × 20.6                                  | 39.2 × 21.5 | 7.0                   | 7.2   | 6.6   | 7.5   | 29.0                            | 33.7  | 30.5  | 28.7  |
| Redland    | 44.2 × 42.1                                  | 43.4 × 43.6 | 31.6                  | 26.8  | 22.3  | 27.9  | 28.7                            | 27.9  | 29.4  | 30.8  |
| Sandia     | 31.7 × 31.7                                  | 29.3 × 30.8 | 14.8                  | 14.3  | 9.5   | 16.4  | 33.0                            | 34.6  | 36.5  | 34.3  |
| Shanxi Li  | 43.8 × 39.6                                  | 42.1 × 41.4 | 27.3                  | 21.3  | 17.1  | 17.0  | 25.2                            | 29.9  | 28.7  | 32.1  |
| Sugarcane  | 34.1 × 26.6                                  | 31.1 × 25.0 | 11.7                  | 8.8   | 9.9   | 11.5  | 28.6                            | 27.5  | 27.1  | 30.5  |
| Zaocuiwang | 37.8 × 30.5                                  | 42.4 × 37.7 | 18.4                  | 20.8  | 19.83 | 25.4  | 30.1                            | 34.3  | 29.5  | 32.3  |

<sup>z</sup> The soluble solids were extracted with a garlic press and measured with a digital refractometer from a composite sample of 8–10 fruit per cultivar with a wedge from each fruit.

**Figure 1. Average yields of 13 fresh eating jujube cultivars at both Alcalde and Los Lunas across 2017 and 2018. The bars are 95% confident interval error bars and if they do not overlay, the different between two means are significant at  $P \leq 0.05$ .**



**Figure 2. Fruit pictures of different jujube cultivars in New Mexico. A-Alcalde #1, B-Chico, C-Dabailing, D-Daguazao, E-Gaga, F-Honeyjar, G-KFC, H-Li, I-Maya, J-Redland, K-Russian 2, L-Sandia.**





# Fresh eating cultivar summary

- Sandia/Dongzao had the best fresh eating quality in our collection.
- Honeyjar, Maya/Gaga and Russian 2 had excellent fruit quality, productive but small in fruit size, very suitable for home gardeners.
- Kongfucui, Li/Shanxi Li/Redland/Daguazao/Dabailing had big fruit and productive.
- Alcalde #1 was the earliest with big fruit, relatively small tree than others. Suitable for marginal regions.



**Table 1. Cultivars trialed at NMSU Alcalde, Los Lunas and Leyendecker Centers in New Mexico.**

| Cultivar            | Source     | Alcalde | Los Lunas | Leyendecker <sup>2</sup> |
|---------------------|------------|---------|-----------|--------------------------|
| Chaoyang            | China      | X       | X         |                          |
| Don Polenski        | California | X       | X         | 5                        |
| Jinkuiwang (JKW)    | China      | X       | X         | X                        |
| Jinsi 2             | China      | X       | X         | X                        |
| Jinsi 3             | China      | X       | X         | X                        |
| Jinsi 4             | China      | X       | X         | 8                        |
| Jixinzao            | China      | X       | X         | X                        |
| Junzao              | China      | X       | X         | X <sup>9</sup>           |
| Kongfucui (KFC)     | China      | X       | X         | X                        |
| Lang                | California | X       | X         | X <sup>11</sup>          |
| Pitless             | China      | X       | X         | X                        |
| Sherwood            | California | X       | X         | X <sup>12</sup>          |
| Sihong              | California | X       | X         | X                        |
| Xiangzao            | China      | X       | X         | X                        |
| Xingguang           | China      | X       | X         | X <sup>14</sup>          |
| Banzao <sup>2</sup> | China      | X       | X         | X <sup>15</sup>          |
| Globe               | California | X       | X         | X                        |
| Huizao              | China      |         |           | X                        |
| Shuimen             | California | X       | X         | X                        |

<sup>2</sup> Cultivars below the double line in the table are for observation only since there were not enough plants for full replications.

Table 2. Tree growth of drying and multipurpose cultivars at Alcalde (AL) and Los Lunas (LL) in March 2018 and Leyendecker (LK) in March 2020.

| Cultivar            | Tree height (cm) |     | Tree width (cm) |     | Uprightness |     | Branches |     | Cultivar           | Height (cm)        | Width (cm) | Uprightness | Branches |
|---------------------|------------------|-----|-----------------|-----|-------------|-----|----------|-----|--------------------|--------------------|------------|-------------|----------|
|                     | AL               | LL  | AL              | LL  | AL          | LL  | AL       | LL  |                    | LK                 | LK         | LK          | LK       |
| Chaoyang            | 290              | 296 | 194             | 131 | 3.0         | 1.8 | 5.0      | 2.7 | Banzao             | 298bc <sup>z</sup> | 198bc      | 3.0ab       | 8.8bc    |
| Don Polenski        | 255              | 283 | 189             | 123 | 3.3         | 2.0 | 5.5      | 3.0 | Jinsi 2            | 284bc              | 161c       | 3.0ab       | 7.1bcd   |
| JKW                 | 284              | 315 | 180             | 205 | 3.8         | 2.8 | 8.0      | 4.8 | Jinsi 3            | 301abc             | 184bc      | 3.0ab       | 7.3bcd   |
| Jinsi 2             | 231              | 271 | 168             | 134 | 3.0         | 2.5 | 4.7      | 3.0 | Jixin              | 334ab              | 196bc      | 2.4cd       | 5.3cd    |
| Jinsi 3             | 263              | 303 | 226             | 168 | 4.0         | 3.0 | 8.0      | 6.0 | JKW                | 361a               | 255a       | 3.3a        | 12.5a    |
| Jinsi 4             | 238              | 170 | 150             | 104 | 3.3         | 3.0 | 3.5      | 3.5 | KFC                | 270c               | 180bc      | 2.8abc      | 4.5d     |
| Jixin               | 326              | 308 | 219             | 140 | 3.0         | 2.0 | 4.5      | 3.8 | Lang               | 301bc              | 184bc      | 2.8bc       | 8.3bcd   |
| Junzao              | 245              | 253 | 185             | 105 | 3.3         | 2.0 | 5.3      | 2.8 | Sherwood           | 322abc             | 195bc      | 2.2d        | 9.5ab    |
| KFC                 | 339              | 308 | 245             | 155 | 3.3         | 2.3 | 5.3      | 4.5 | Sihong             | 336ab              | 202bc      | 2.2d        | 4.5d     |
| Lang                | 301              | 273 | 226             | 170 | 3.3         | 2.3 | 8.3      | 4.8 | Xiangzao           | 299bc              | 215ab      | 2.5cd       | 10.8ab   |
| Pitless             | 231              | 328 | 209             | 175 | 4.0         | 2.5 | 7.5      | 4.3 | Xingguang          | 279c               | 161c       | 3.0ab       | 8.3bcd   |
| Sherwood            | 373              | 367 | 208             | 125 | 3.0         | 1.1 | 7.5      | 2.0 | AVG                | 306                | 197        | 2.8         | 8.0      |
| Sihong              | 313              | 343 | 219             | 221 | 3.3         | 2.8 | 4.8      | 6.0 | Globe <sup>y</sup> | 328                | 196        | 2.5         | 8.5      |
| Xiangzao            | 313              | 299 | 200             | 166 | 3.0         | 2.3 | 6.0      | 3.8 | Huizai             | 193                | 73         | 2.2         | 2.0      |
| Xingguang           | 259              | 301 | 175             | 151 | 3.3         | 2.0 | 6.5      | 4.5 | Junzao             | 283                | 175        | 2.5         | 5.5      |
| AVG                 | 283              | 294 | 200             | 152 | 3.3         | 2.3 | 6.0      | 3.9 | Pitless            | 290                | 183        | 2.8         | 5.0      |
| Cultivar            | **               |     | **              |     | NS          |     | *        |     | Shuimen            | 314                | 191        | 3.3         | 11.5     |
| Location            | NS               |     | **              |     | *           |     | **       |     |                    |                    |            |             |          |
| Cultivar×location   | *                |     | **              |     | NS          |     | NS       |     |                    |                    |            |             |          |
| Banzao <sup>y</sup> | 295              | 288 | 173             | 160 | 2.5         | 2.5 | 6.0      | 5.5 |                    |                    |            |             |          |
| Globe               | 332              | 298 | 148             | 158 | 2.5         | 2.0 | 5.0      | 5.5 |                    |                    |            |             |          |
| Shuimen             | 327              | 320 | 201             | 203 | 3.5         | 3.0 | 10.0     | 4.5 |                    |                    |            |             |          |

Fig. 2. 2017 jujube cultivar yields from year three to year five after planting at Alcalde and Los Lunas and from year two to year three at Leyendecker site.

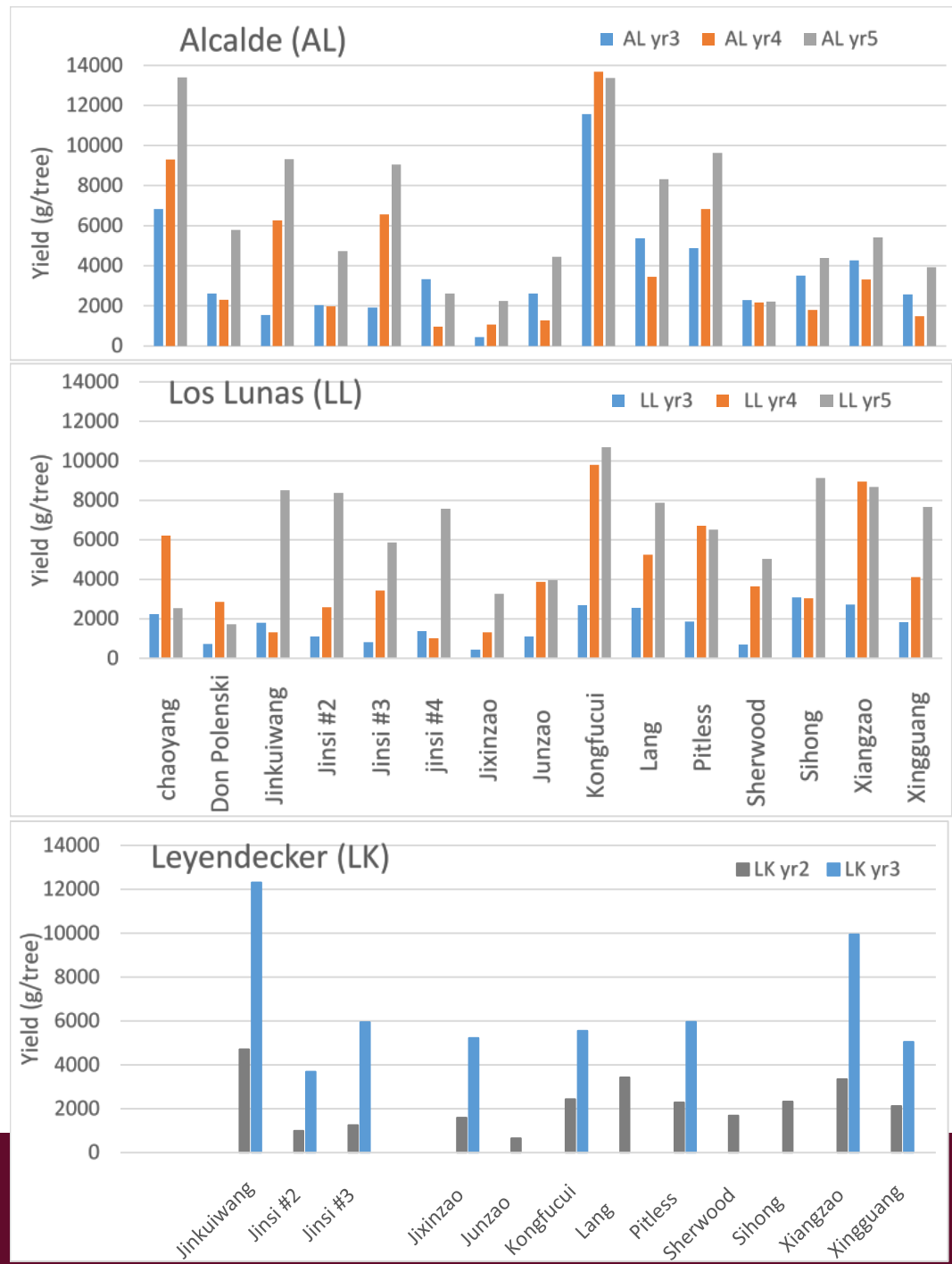




Table 4. Jujube fruit size, weight, and soluble solids content (SS) at different locations (AL-Alcalde, LL-Los Lunas, LK-Leyendecker).

| Cultivar   | Fruit length (mm) |             | Fruit width (mm) |             | Avg wt (g) 2017 |             | SS (%) 2017 |             | Avg wt (g) 2019 |             | SS (%) 2019 |             |
|------------|-------------------|-------------|------------------|-------------|-----------------|-------------|-------------|-------------|-----------------|-------------|-------------|-------------|
|            | AL                | LL          | AL               | LL          | AL              | LL          | AL          | LL          | AL              | LK          | AL          | LK          |
| Chaoyang   | 30.1              | 31.3        | 21.6             | 23.1        | 6.6             | 10          | 27.8        | 31.5        | 6.5             |             | 26.4        |             |
| Don P      | 45.8              | 43.6        | 30.7             | 30.3        | 17.8            | 16.2        | 31.8        | 35.3        | 17.5            |             | 31.1        |             |
| Globe      |                   | 31.2        |                  | 32.4        |                 | 18.4        |             | 28.3        |                 | 21.1        |             | 33.7        |
| Jinsi 2    | 30.7              | 30.2        | 23.2             | 24          | 8.0             | 8.7         | 34.3        | 33.7        | 8.7             | 9.1         | 31.1        | 36.1        |
| Jinsi 3    | 35.7              | 35.6        | 26.5             | 27.8        | 11.4            | 10.5        | 28.3        | 29.9        | 10.9            | 16.2        | 27.9        | 36.3        |
| Jinsi 4    | 27.1              | 31.2        | 18.7             | 22.5        | 6.6             | 7.7         | 28.7        | 36.9        | 4.2             |             | 27.8        | --          |
| Jixin      | 35.9              | 35.3        | 35.1             | 35.7        | 11.0            | 10.6        | 32.3        | 33          | 11.5            | 12.5        | 36.2        | 36.8        |
| JKW        | 35.7              | 38.3        | 26.2             | 29.3        | 10.3            | 13.8        | 29          | 27.1        | 11.5            | 15.3        |             | 38.2        |
| Junzao     | 43.5              | 45.1        | 29.9             | 30.6        | 14.5            | 14.6        | 25.3        | 36.2        | 16.0            |             | 28.4        | --          |
| KFC        | 38.7              | 39          | 26.1             | 28          | 11.2            | 12.6        | 30.7        | 32.7        | 9.4             | 13.6        | 28.2        | 30.7        |
| Lang       | 45.7              | 46.3        | 32.2             | 33.7        | 18.2            | 17.6        | 31.4        | 29.8        | 15.1            |             | 27.2        | --          |
| Pitless    | 28.6              | 27.4        | 20.8             | 20.9        | 4.9             | 5           | 36.2        | <b>42.3</b> | 6.0             | 5.8         | 31.1        | 35.7        |
| Sherwood   | 40.6              | 40.2        | 30.4             | 31.2        | 15.9            | 16.6        | 27.4        | 37.8        | 11.8            |             | 25.5        | --          |
| Shuimen    | 39.0              | 39.6        | 27.4             | 28.5        | 11.7            | 9.9         | 28.7        | 32.2        | 13.1            | 15.6        | 29.6        | 28.2        |
| Sihong     | 36.0              | 36.5        | 31.8             | 39.7        | 16.0            | 14          | 30.6        | 35.2        | 15.2            | 17.2        | 32.7        | 36.3        |
| Xiangzao   | 40.2              | 40.3        | 32               | 34.9        | 16.9            | 18          | 28.2        | 29.4        | 12.6            | 19.1        | 26.3        | 32.9        |
| Xingguang  | 43.2              | 43.1        | 28.7             | 30          | 14.5            | 14.2        | 29.7        | 32.2        | 14.6            | 15.8        | 32.2        | 30.1        |
| <b>AVG</b> | <b>37.3</b>       | <b>37.3</b> | <b>27.6</b>      | <b>29.6</b> | <b>12.2</b>     | <b>12.8</b> | <b>30.0</b> | <b>33.1</b> | <b>11.5</b>     | <b>14.7</b> | <b>29.4</b> | <b>34.1</b> |

Fig. 3. Cultivar dry fruit pictures. AL-Alcalde, LL-Los Lunas, LK-Leyendecker, O-oven drying, S or no extra mark is sun drying. Most pictures in the first two rows were samples from Alcalde in 2014, which was a relatively longer growing season.

First row: Globe-AL-2014, KFC-AL-2014, Jinsi 2-AL-2014, Jinsi 3-AL-2014, Jixin-AL-2014, JKW-AL-2014.

Second row: Lang-AL-2014, Shuimen-AL-2014, Sugarcane-AL-2015, Xiangzao-AL-2015, Sherwood-LL-2014.

Third row: Lang-LL-2018, Jinsi 3-LK-2018, Sihong AL vs. LK 2018, Jixin-LK-2018, Xiangzao-LL-



# Drying and multipurpose cultivar summary

- Jinsi 2, jinsi 4, Pitless and Huizao had smaller trees than others.
- Sihong and Jinkuiwang had bigger trees than others.
- Same cultivar, the trees in southern part are larger and produce high yield with bigger fruit and higher soluble solids than those in northern NM.
- Jinsi series, Sihong, Jixin had excellent drying quality
- Xiang was drying only cultivar, productive in southern part.
- KFC and Sherwood can be used for both fresh eating and drying purpose.



# Effect of extreme weather in 2019

- Alcalde only had 122 days of growing season vs. 150/146 d on average with the last frost on May 24 and first frost on Sept 23, 2019.
- Fruit and leaves were dried up on the trees with lots of green fruit.
- Even at Los Lunas, the season was also much shorter than normal, and some mid-season and late cultivars did not mature fully. Season ended on Oct 5.
- Trees at Leyendecker was not affected in 2019.
- In 2020, Alcalde had close to freezing temperature in Sept 8/9 which affected fruit development and leaves of some tree turned yellow.









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# Update in 2022

- 6<sup>th</sup> year trees at Leyendecker Center had an average of 40lb/tree with highest 100lb/tree, similar to 8<sup>th</sup> year trees at Los Lunas at density 10x15ft.







# Summary

- Threshold: annual average temperature of 50°F/10 °C
- USDA hardiness zone is not very helpful to determine jujube suitability since it is based on minimal winter temperature only. (Heat accumulation should be considered).
- In New Mexico, Espanola/Alcalde is the marginal region, can grow early to mid-season fresh eating cultivar, no late cultivar or drying cultivars for commercial growers.
- In southern New Mexico, both fresh eating and drying, from early to late in maturation, all grow and produce well.
- In central New Mexico, all fresh eating cultivars, and most drying cultivars are doing well except really late drying cultivars.



# References

- <https://jujube.nmsu.edu/> jujube one-stop shop
- Yao, S. 2019. Guide H337: Jujube training and pruning basics. [https://aces.nmsu.edu/pubs/\\_h/H337.pdf](https://aces.nmsu.edu/pubs/_h/H337.pdf)
- Yao, S. 2014. Jujube (*Ziziphus jujuba*) grafting. NMSU Cooperative Extension Service Publication H335. [http://aces.nmsu.edu/pubs/\\_h/H335.pdf](http://aces.nmsu.edu/pubs/_h/H335.pdf)
- Yao, S., R. Heyduck, S. Guldan and G. Sapkota. 2020. Early performance of drying and multipurpose jujube cultivars in the southwestern United States. *HortScience* 55:1804-1810. <https://doi.org/10.21273/HORTSCI15344-20>
- Yao, S., R. Heyduck, and S. Guldan. 2019. Early performance of jujube fresh eating cultivars in the southwestern United States. *HortScience* 54:1941-1946. <https://doi.org/10.21273/HORTSCI14312-19>
- Yao, S. and R. Heyduck. 2018. Ornamental jujube cultivar evaluation in the Southwestern United States. *HortTechnology* 28:557-561. <https://doi.org/10.21273/HORTTECH04073-18>
- Yao, S. 2016. Jujube, an alternative fruit crop in the Southwestern United States. *HortScience* 51:1329-1332. <https://doi.org/10.21273/HORTSCI10533-16>
- Yao, S. 2013. Past, present, and future of jujubes—Chinese dates in the United States. *HortScience* 48:672-680. <https://doi.org/10.21273/HORTSCI.48.6.672>



