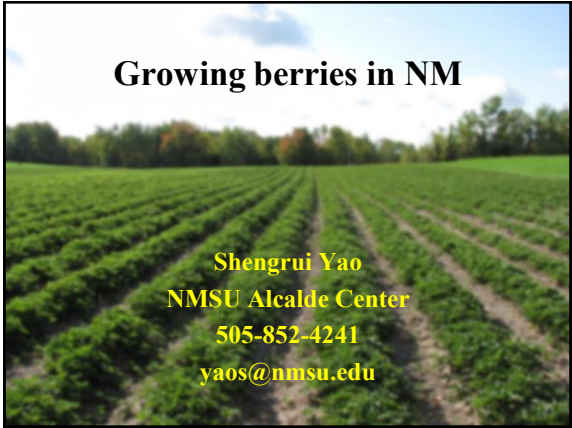


### Growing berries in NM

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### Strawberry



### Strawberry flower and fruit

- *Fragaria* × *ananassa* (garden strawberry)
- Rosaceae (Rose family)
- Aggregate-accessory fruit
- June bearing and ever bearing



### Matted Row System

Perennial system



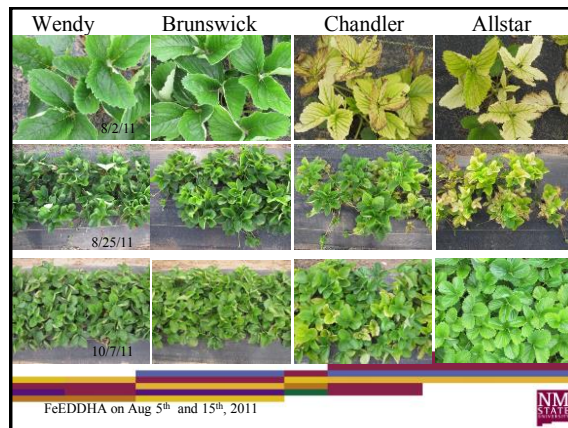
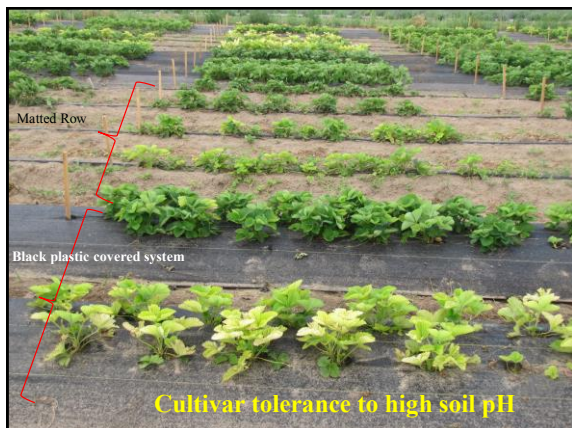
### Plasticulture System

Fumigation  
Raised bed  
Annual system



### Strawberry Cultivar evaluation 2011-13 16 cultivars with 2 planting systems





### Cultivar tolerance to high pH soil

- Sensitive cultivars: **Allstar, Chandler and Darselect**
- Tolerant cultivars: **Wendy, Brunswick, Cavendish, Jewel and Honeoye.**
- Mesabi has June yellow in the planting year and later the leaf color was acceptable after FeEDDHA treatment.
- \* Cultivar recommendation/selection is not only based on leaf color.

### Challenges of strawberry production in NM

- High pH soil- **FeEDDHA application**
- **Late frosts**
- Winter damage

### Frost Protection





### Challenges of strawberry production in NM

- High pH soil- **FeEDDHA application**
- Late frosts- **Overhead sprinkler and plants do have some compensation mechanism for frost damage.**
- **Winter damage**

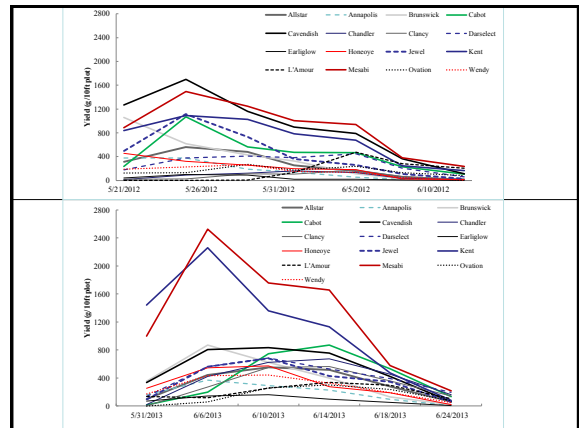


### Winter hardiness

- Winter hardy cultivars: Kent, Mesabi, Cavendish, Honeoye, Brunswick and Cabot
- Winter tender cultivars: **Wendy, Chandler, Clancy and Jewel**

### Challenges of strawberry production in NM

- High pH soil- **FeEDDHA application**
- Late frosts- **Overhead sprinkler and plants do have some compensation mechanism for frost damage.**
- **Winter damage: cultivar selection**



**Yields:**

Cultivar	2012		2013		2014		2012-2014	
	lb/acre	lb/acre	lb/acre	lb/acre	lb/acre	lb/acre	lb/acre	lb/acre
Mesabi	14,840	18,544	11,973	45,357				
Kent	11,568	16,165	11,207	41,940				
Cavendish	15,084	7,706	6,627	29,417				
Cabot	7,538	5,990	4,622	18,150				
Jewel	7,411	5,196	4,445	17,052				
Brunswick	6,228	5,746	7,121	19,095				
Darselect	4,940	5,985						
Albion	4,368	4,677	4,764	13,809				
Honeyoye	3,502	4,453	4,131	12,086				
L'Amour	4,691	2,994						
Chandler	1,370	5,655						
Wendy	2,444	3,883						
Earliglow	1,327	1,631						
Annapolis	2,786	2,743						
Ovation	2,738	2,239						
Earliglow	690	1,275						
Treatment								
Matted Row	6051a	6438a	8395	20,884				
Black Plastic Covered	5377b	5784b	6978	17,239				

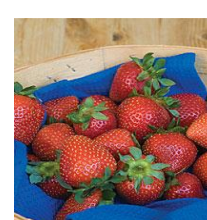
**Cultivar recommendation**

- Cultivars should be avoided: Allstar, Chandler, Darselect Earliglow, Ovation, Annapolis, and Clancy;
- Cultivars recommended: Mesabi, Kent and Cavendish.
- Matted Row yielded a little higher than Black Plastic Covered system; both should work in northern and central New Mexico. Avoid tender cultivars in BP system.
- FeEDDHA (Ferriplus) + a fertilizer program

**Further research topics for strawberry**

- How to improve fruit size and manage excessive runners
- Day neutral/ever bearing cultivars

**Day-neutral cultivars**



New cultivars: Evie 2, Albion

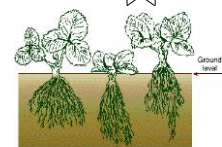
**Planting**



**Strawberry planting tool**



Tools with flat end or curved-in end to push the strawberry roots into the soil. (NC) Very efficient.

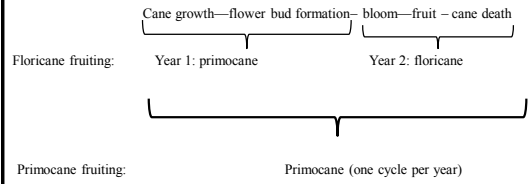


### Overhead irrigation for frost protection



### Raspberries

#### Two types of raspberries



### Floricane and Primocane Raspberries

#### Floricane fruiting type

- Two-year cycle
- First year primocanes do not produce flowers and fruit
- The second year floricanes produce flowers and fruits
- Prune out the fruited floricanes ONLY.

#### Primocane fruiting type

- One year cycle
- First year primocanes flower and produce fruits
- Fall raspberries, late in season
- Prune all primocanes to the ground

### Raspberry varieties

- Primocane raspberries:
  - Polana: early
  - Joan J: thornless, mid season
  - Caroline: late, productive
  - Autumn Britten
  - Kiwigold (gold) and Anne (yellow)

### Soil preparation

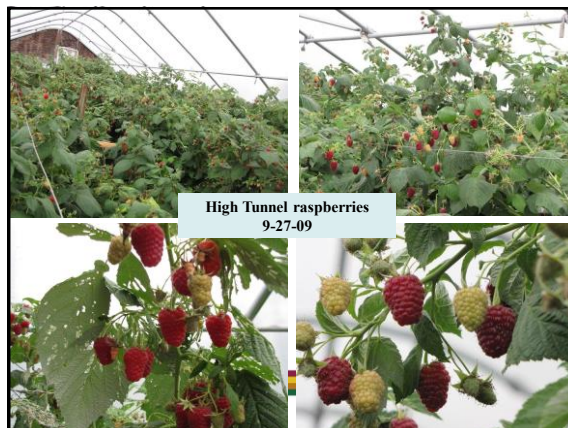


### Planting

**Planting depth is critical for raspberries!**



### Harvesting



### Raspberry pruning



2/13/2014

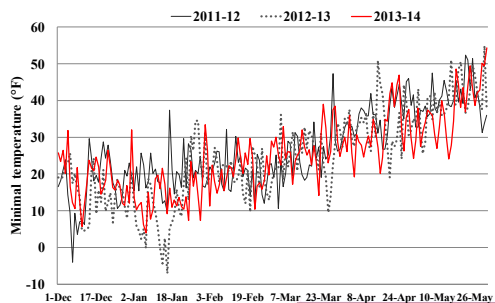


### Blackberry trial both in high tunnel and field

- Planted in 2011
- Cultivars:
  - Semi-trailing: Triple Crown and Chester
  - Free standing: Natchez, Ouachita, and Navajo
  - Fall blackberry: Prime Ark 45.
- Planting density:
  - Free standing: 2 x 5.5 ft
  - Semi-trailing: 5 x 8.5 ft



### Blackberries: adapt better to hot weather than raspberries



Daily Minimal Temperature at Alcalde, NM



### Blackberry winter hardiness

Type	Location	Cultivar	2012	2013
Trailing	Field	Chester	2.6	4.1
		Triple Crown	4.7	3.2
	High Tunnel	Chester	1.02	1.0
Erect	Field	Natchez	2.7	4.4
		Navajo	3.4	4.1
		Ouachita	2.1	3.3
	High Tunnel	Natchez	1.07	1.08
		Navajo	1.00	1.14
		<b>Ouachita</b>	1.00	1.00

1. All alive
2. One year old cane tip damaged
3. Cane alive but half way
4. Some canes only bottom part alive
5. All canes dead



### Blackberries before budding in 2013



2013 field (canes dried up)

2013 high tunnel (canes green and flexible)



### Blackberries before budding in 2014

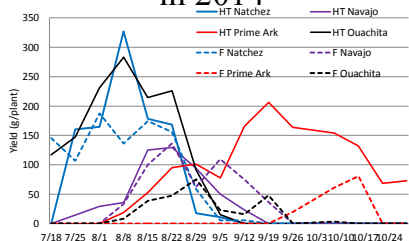


2014 field

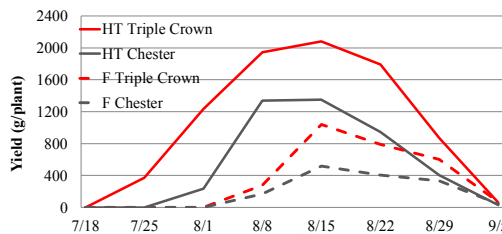
2014 high tunnel



### Free standing blackberry yield in 2014



### Trailing blackberry yields in 2014



### Blackberry Yield 2012 - 2014

		lb/acre			
	Cultivar	2012	2013	2014	2012-2014
HT	Prime Ark	1835	9606 a	11403 a	22844
HT	Ouachita	2311	4685 ab	11559 a	18555
HT	Natchez	3369	3691 ab	8961 ab	16021
HT	Navajo	182	1208 b	4377 b	5767
Field	Prime Ark	2033	1024 a	1412 b	4469
Field	Ouachita	216	463 b	2270 b	2949
Field	Natchez	332	330 bc	8516 a	9178
Field	Navajo	327	56 c	4824 ab	5207
<b>Trailing</b>					
HT	T Crown		816	19432	20248
HT	Chester		1914	10018	11932
Field	T Crown		45	6465	6510
Field	Chester		132	3426	3557



### Blackberry fruit size in 2014

	Free standing	HT	Field
Prime Ark		7.0 a	6.3 a
Natchez		6.8 ab	5.0 ab
Ouachita		6.6 b	4.8 ab
Navajo		4.0 c	3.0 b
Semi-trailing			
Triple Crown		7.4	6.0
Chester		3.1	3.3



### Triple Crown



### Free standing and primocane



### Blackberry trial summary

- Floricane blackberry is still risky in northern New Mexico.
- Select a protective area for your blackberries.
- If minimal temperature drops to 0°F, winter damage could occur.
- Primocane cultivar Prime Ark 45 has big fruit and reliable crops in high tunnels.
- Blackberries produced higher yield in high tunnels than in the field.
- High tunnel also extended fruit harvest season especially for primocane cultivars.
- Triple Crown produced twice the yield of Chester both in the field and in tunnel.
- Navajo was sensitive to high pH soil. Ouachita produced more fruit in high tunnel than Natchez while Natchez had higher yield than Ouachita in the field.

### Blackberry pruning



### Blackberry propagation



2/13/2014

### Blueberries

pH: 5.0-5.5





### Blueberry 2010 Alcalde

- Blueberries need acidic soil (pH:5.0-5.5).
- High pH soil is not suitable for blueberries.



### Table Grapes

- Himrod
- Reliance
- Venus
- Jupiter
- All over 19 lbs/plant
- (5 ton/acre) in 2004



2/13/2014



### Grapes



### Pest/disease problems

- Powdery mildew
- Wasps
- Bird damage- netting



### Gooseberry and currant

- From our demonstration plot, gooseberry performed better than currant.
- Gooseberry has better plants and produce higher yield than currants.
- Black currant '**Crandall**' was a good performer at Alcalde with very heavy crop.
- Red and white currants: juice and jelly? fresh eating
- Gooseberry: fresh eating, pie, jelly?



### Gooseberry at Alcalde 2012

- Tixia Poorman
- Hinomaki Invicta



	Yield/plant (g)	Fruit wt (g)	max yield (g)	Comments
Hinomaki	1727	1.86	2338	very productive, medium size, light purple in color
Invicta	1697	1.41	2126	productive, small size, dark purple in color bigger size than H and I, smaller than Tixia. Green color with pink, nice flavor
Poorman	681	2.6	1357	light yield, bigger size than others, not uniform though, up to 8-9g for the biggest
Tixia	317	2.7	867	



### Crandall-clove currant

- *Ribes odoratum* (not *R. nigrum*)
- Native to central U.S.
- First introduced in 1888
- Larger and milder than black currant
- Yellow flowers, bush 3-4 ft tall
- Very productive
- Full sun or part shade in the afternoon
- Can be eat fresh or used for juice, jelly, preserve or pie etc.



### Crandall-clove currant



### Goji Berries



### Alternative tree fruit crop-jujubes

- Bloom late and avoid late frosts
- Tolerate high pH soil and summer heat
- Nutritious fruit (Vitamin C 200-600mg/100g)
- Dried fruit stores well



### Multipurpose Plants

Fruits

- Fresh eat
- Drying
- Processing
- Culinary uses
- Drinks
- Wine
- **Medicinal uses** (including seeds- 'Suanzaoren')

Wood: very hard

Nectar plants (?)



### 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-lived 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.**



### Different sizes and shapes of jujubes at Alcalde, NM



Jujube cultivars at NMSU Alcalde in 2012

### When to harvest the fruit?

Green fruit → creamy in color (white mature stage) → half creamy/half red in color (half red stage) → fully red in color (fully red stage) →

Fully mature stage



### 2011 NMSU Alcalde importation

#### 1. Tooth shaped jujube



Three cultivars from the 2011 importation are tooth shaped with excellent fresh eating quality but small in size.

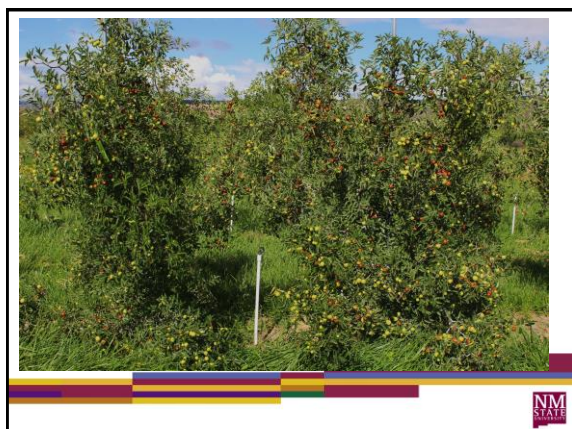
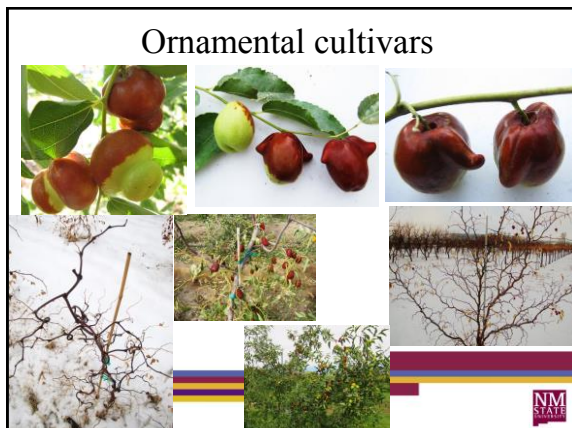


### Big fruited early cultivar



### Jinsi series cultivars





### References

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- H324: Home Garden Strawberry Production in New Mexico  
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- H330: Jujube: Chinese Date in New Mexico  
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- H333: Training Young Apple Trees to the Central Leader System  
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- H335: Jujube (*Ziziphus jujuba*) Grafting  
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