

Almond





SCIENTIFIC NAME : *Prunus communis*

Prunus dulcis

FAMILY: *Rosaceae*

CHROMOSOME NUMBER: $2n = 28$

ORIGIN AND DISTRIBUTION:

- **Originated from south west and central Asia**
- **Major Growing Countries: California, Spain, Italy, Greece, Turkey, India**
- **California is the leading producer of almond in world with 489,879,76 ton**
- **India's production : 1,179,34 ton**
- **major states in India :**
 - **Jammu and Kashmir (Almond is the state tree of Jammu and Kashmir)**
 - **sub tropical varieties of almond is grown in North Indian conditions.**

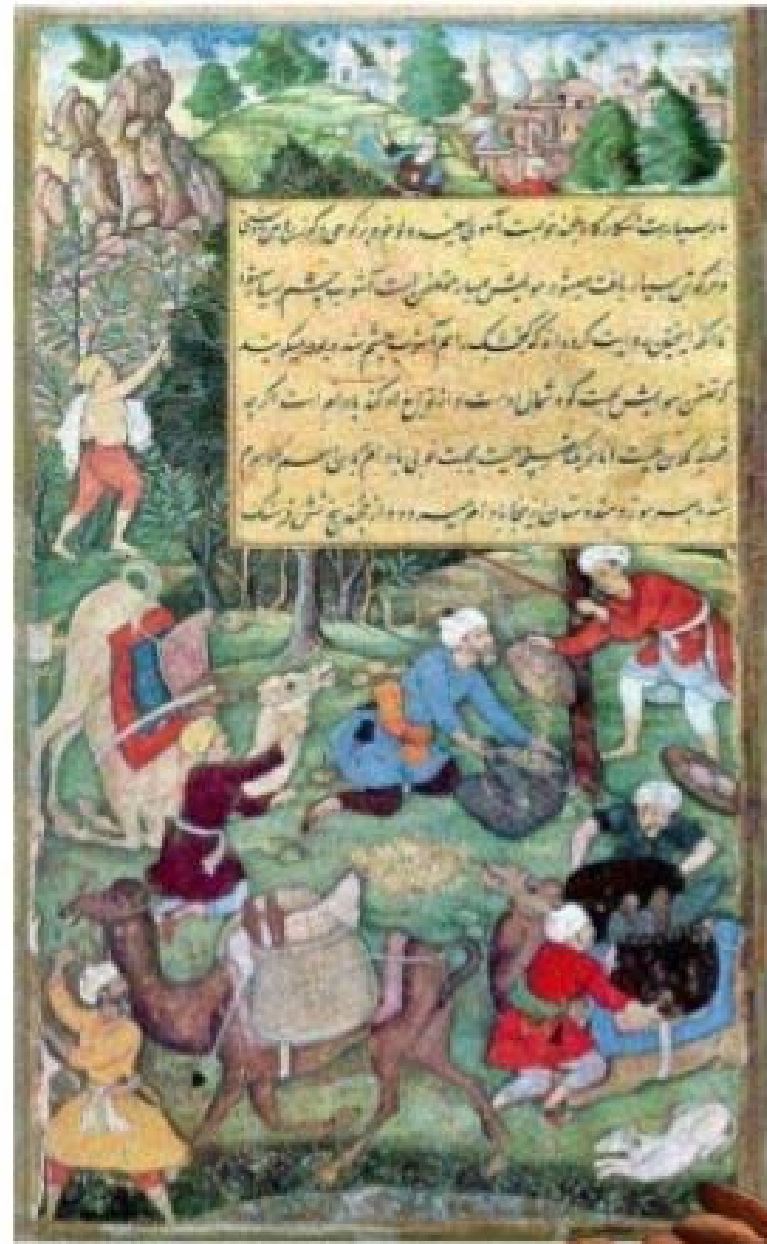
Almond History

- Prehistory
 - Wild almonds emerge on mountains separating China from Kazakhstan, Afghanistan and Iran
- 4,000 B.C.
 - Almonds cultivated in Central Asia and eastern Mediterranean
- 1,352 B.C.
 - King Tut takes handful of almonds to his grave
- 350 B.C.
 - Alexander the Great's armies bring almonds to Greece



Almond History

- 1500's
 - Harvest in the Fergana Valley Uzbekistan



Almond History

- 1700's
 - Brought to California from Spain by Franciscans
- 1840's
 - California growers experiment with almonds
- 1880's
 - California almond crop tops one million Lbs.
- 1986
 - "A Can A Week Is All We Ask" ad begins
- 2002
 - California almond crop tops one billion Lbs.
- 2014 +
 - California crop expected to top two billion Lbs.



Almond History



Blossoming Almond Tree - Vincent Van Gogh (1890)



Blossoming Almond Tree – iPhone Case (2013)



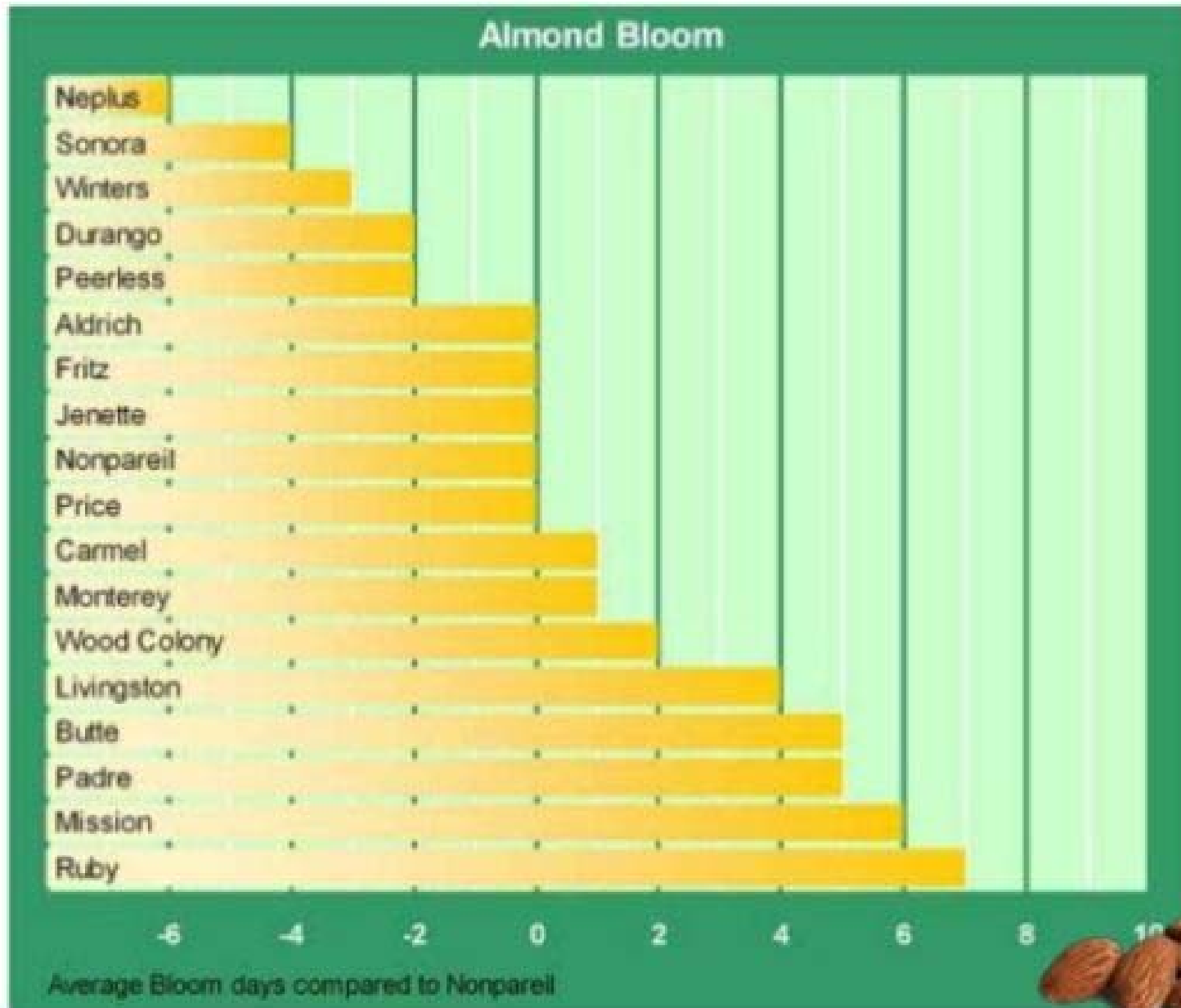
Almond Lifecycle

Production Items








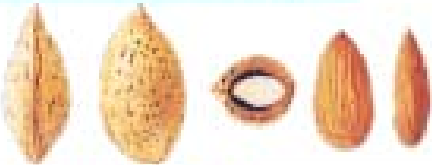



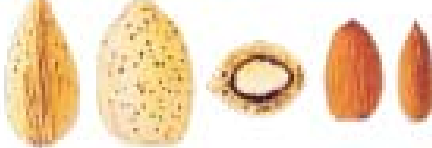
Almond Varieties

Click slide



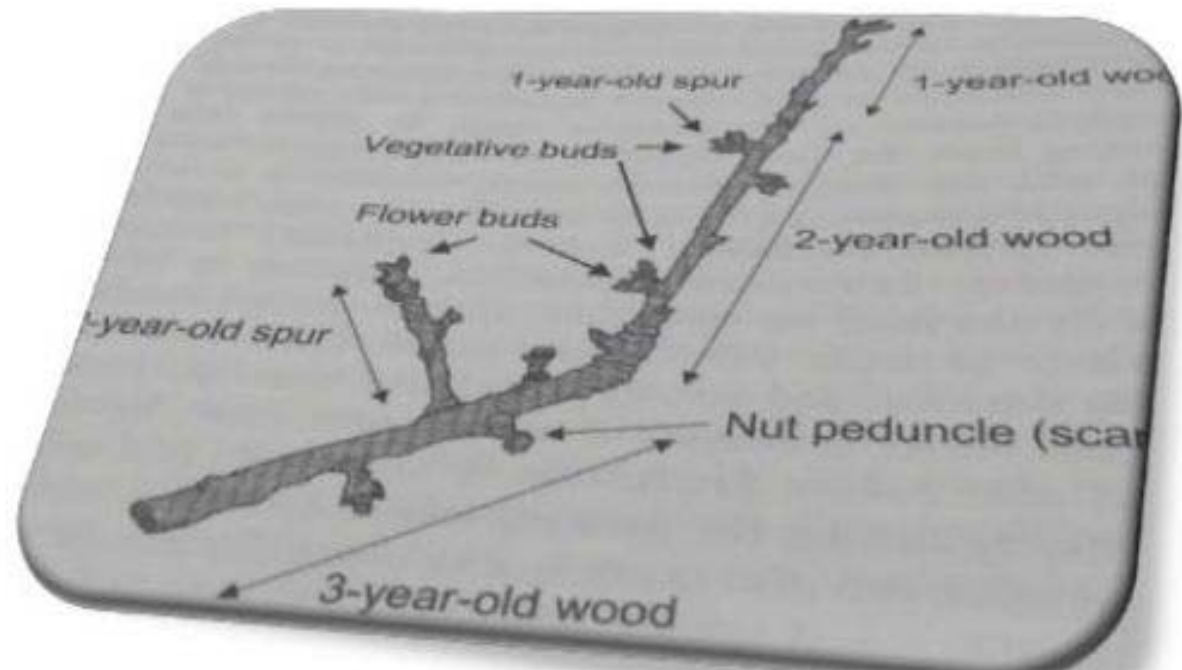
MAJOR CALIFORNIA ALMOND VARIETIES

variety	CHARACTERISTICS		CLASSIFICATION				
	LONG & FLAT	SHORT & PLUMP/ROUND	CALIFORNIA TYPE	MISSION TYPE	NONPAREIL	IN-SHELL HARD SHELL	
NONPAREIL (NP) 	SHELL Soft shell, light color, high suture opening	NUT Medium, flat shape, smooth surface	•			•	
CARMEL (CR) 	SHELL Soft shell, good shell integrity, fat suture opening	NUT Medium, narrow shape, slightly wrinkled surface	•	•			
BUTTE (BT) 	SHELL Semi-hard shell, light color, smooth surface, low suture opening	NUT Small, short plump shape, wrinkled surface		•	•	•	
PADRE (PD) 	SHELL Hard shell, good shell integrity, no suture opening	NUT Small, short wide shape, wrinkled surface		•	•	•	
MISSION (MI) 	SHELL Hard shell, good shell integrity, no suture opening	NUT Small, short wide shape, dark brown, deep		•	•		

		CHARACTERISTIC		CLASSIFICATION					
		LONG & SLAT	SHORT & PLUMP/ROUND	CULP ORIGIN TYPE	METHOD TYPE	MONOPERIL	IN-SHELL HARD SHELL		
MONTEREY (MT)		 <p>SHELL Hard shell, smooth surface, low suture opening</p> <p>NUT Large, long narrow shape, deeply wrinkled surface</p>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			
SONORA (SN)		 <p>SHELL Soft shell, dark brown color/rough surface, high suture opening</p> <p>NUT Large, long narrow shape, light color, smooth surface</p>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			
FRITZ (FR)		 <p>SHELL Semi-hard shell, good shell integrity, low suture opening</p> <p>NUT Small, medium plump shape, fairly wrinkled surface</p>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
PRICE (PR)		 <p>SHELL Soft shell, dark brown color/rough surface, high suture opening</p> <p>NUT Small, short narrow shape, fairly wrinkled surface</p>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			
PEERLESS (PL)		 <p>SHELL Hard shell, good shell integrity, smooth surface, no suture opening</p> <p>NUT Medium, wide shape, fairly wrinkled surface</p>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>

B O T A N Y

- Botanically Almond is a **Drupe**
- Edible part is **nut**
- Inflorescence come laterally on current season growth which bear fruit in following season.



Sometimes flower bud comes both terminally and laterally which is advantageous. Shoot bearing promotes PRECOCIOUS bearing while spur bearing increase bearing surface.



CONTD.....



- Almond produces **perygynous self-incompatible** flowers.
- It is **cross pollinated** mainly by Honey bee
- Flower differentiation takes place during summer and floral development continues into autumn to winter.
- Flowering is determined by the **chilling** and **subsequent heat requirement**.
- Bloosm opening in almond is a typical **sigmoid response curve**.



**INFLORESCENCE OF TEMPERATE
ALMOND**



**INFLORESCENCE OF SUB-TROPICAL
ALMOND**









Bud Break / Bloom

- February and March



Bloom



Bloom Sprays



Pollination

- Single most important yield factor
 - Hive management critical
 - 2 Hives per Acre at bloom
 - \$150 -\$200/Hive
- Colony Collapse Disorder
 - Varroa mites
 - Neonicotinoids
 - Habitat loss
 - Virus
 - American foulbrood disease



Pollination



Maturing Nuts

- April - June



Hull Split

- July - August



Harvest

- August - October
- Shaking
- Raking / Sweeping – Dry on orchard floor
- Pickup
- Hulling / Shelling
- Processing



Harvesting:

HARVESTING TIME: Early August to Late September

HARVESTING INDICES:

- Hull split of 95% of nuts
- Ripened nuts should be prevented from bird damage

HARVESTING METHOD:

Almond trees are knocked and falling nuts are collected in net

Almond Harvest

- **Shaking**



Harvest

- **Raking / Sweeping**



Harvest

- **Hulling**



HULLING AND DRYING:



HULLING



DRYING

- ❖ Hulling is the method of removal of hull which can be done manually or mechanically
- ❖ To prevent mould growth during storage drying is done under sun by spreading almonds in thin layer till they make brittle sound.

Harvest

- **Hulling**



Processing - Products





**INFLORESCENCE OF TEMPERATE
ALMOND**



**INFLORESCENCE OF SUB-TROPICAL
ALMOND**

CONTD.....



- Fruit Growth occur in three stages
- STAGE 1:** Pericarp, seed, nucellus develops
- STAGE 2:** Endosperm and embryo enlarge
- STAGE 3:** Dry weight of embryo increases
- Physiological process which accompanies fruit ripening includes :
 - dehiscence of hull or mesocarp**
 - **Hull split**
 - **Fruit abscission**
 - **Dehydration**

STORAGE:

- Before going for storage nuts should be treated at -17.8 °C for 48 hours to destroy the eggs and pest of previously applied naval orange pest
- Almond can be stored for * months under room temperature
- It can also be stored for more years if kept at 0 to 7 °C



Water Management

- Central Valley is a Mediterranean Climate
 - Cool, wet winters and warm, dry summers
- Limited Water Supplies
 - Drought conditions
 - Regulatory issues
- Use roughly 3.5 – 4.0 Acre Feet / Acre
 - Drip irrigation is method of choice
 - Soil amendments, fertilizers through drip



Irrigation

- Methods of Irrigation
 - Flood
 - Drip
 - Micro

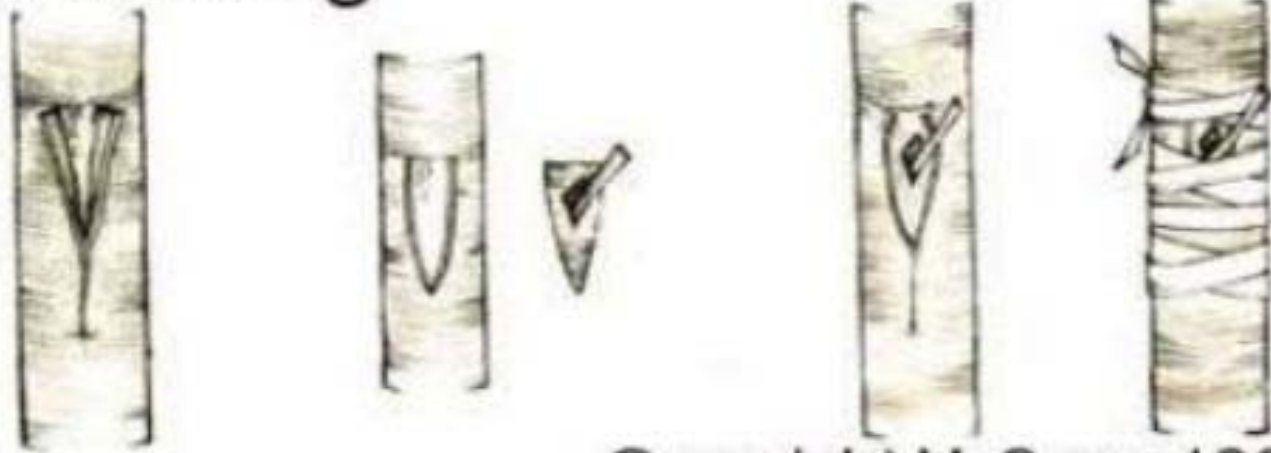


PROPAGATION:

TIME: Late spring, root stock grown in
autum

METHOD: T-Budding

T-budding



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Copyright V. Gray, 1999

RAISING OF ROOT STOCK:

- Peach, Plum or almond x Peach hybrids are taken as rootstocks
- Fruits are collected at hull split stage
- Seed extraction is done
- Seed soaking
- **Stratification**
- Sowing
- fungicide treatment



Cultivation

Planting

- Almond plants are planted in **1m x 1m x 1m** sized pits at a distance of **4.5 m x 4.5m** in January in square system.
- Most of the almond varieties are **self-unfruitful**. Therefore to plant **two or more cross-compatible varieties** which flower at the same time in alternate rows are essential.

Training and pruning

- Almond plants are trained according to **modified leader system**.
- It bears mostly on spurs which live for five years. Thus in young trees, only diseased, dry wood and the branches which are interfering with each other should be removed.
- Water sprouts arising on the stem should also be removed as early as possible.
- In old bearing trees, pruning is done to remove one-fifth of the growth every year.

FERTILIZATION AND IRRIGATION:

- As mesophytic origin crop it **required less water**.
- Irrigation should be done **thoroughly but not so frequently** as it is susceptible to water logging condition
- Irrigation should be with **holded prior to harvest** as the resulting water stress promotes abscission layer
- It mainly required Nitrogen application.
- Almond removes 45kg of actual N from soil
- Leaf analysis should be done during summer to identify deficiencies
- Under high yield cropping systems potassium and zinc may be applied as potassium easily fixed by clay become unavailable for root uptake
- Zinc or foliar spray of zinc sulphite in autumn helps to remove remaining leaves on tree as they go into winter dormancy