

CALIFORNIA ALMONDS

technical information



CALIFORNIA ALMONDS

Since ancient times, almonds have been prized throughout the world for their delicious taste, crunchy texture and, increasingly, for their nutritional value.

California is the world's largest producer of almonds. With its ideal growing conditions, including a mild climate (hot dry summers and cool rainy winters), rich soil and abundant sunshine, this area produces about 80% of the global almond supply, exporting to nearly 90 countries. To ensure a consistent, high-quality, wholesome product year-round, state-of-the-art equipment and specialized techniques for growing, harvesting, processing and packaging are used.

The California Almond industry respects the environment and keeps consumer health in mind, with food safety and quality assurance programs in the orchard and in processing and packaging.

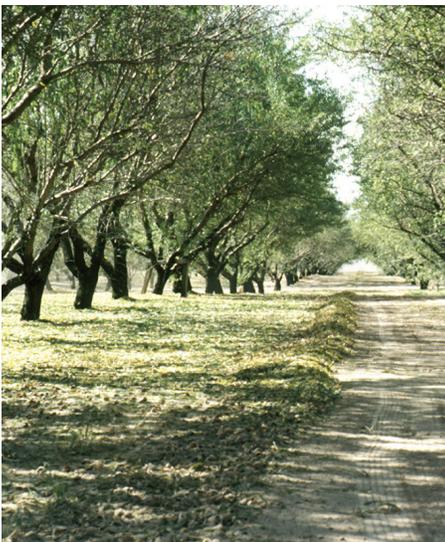
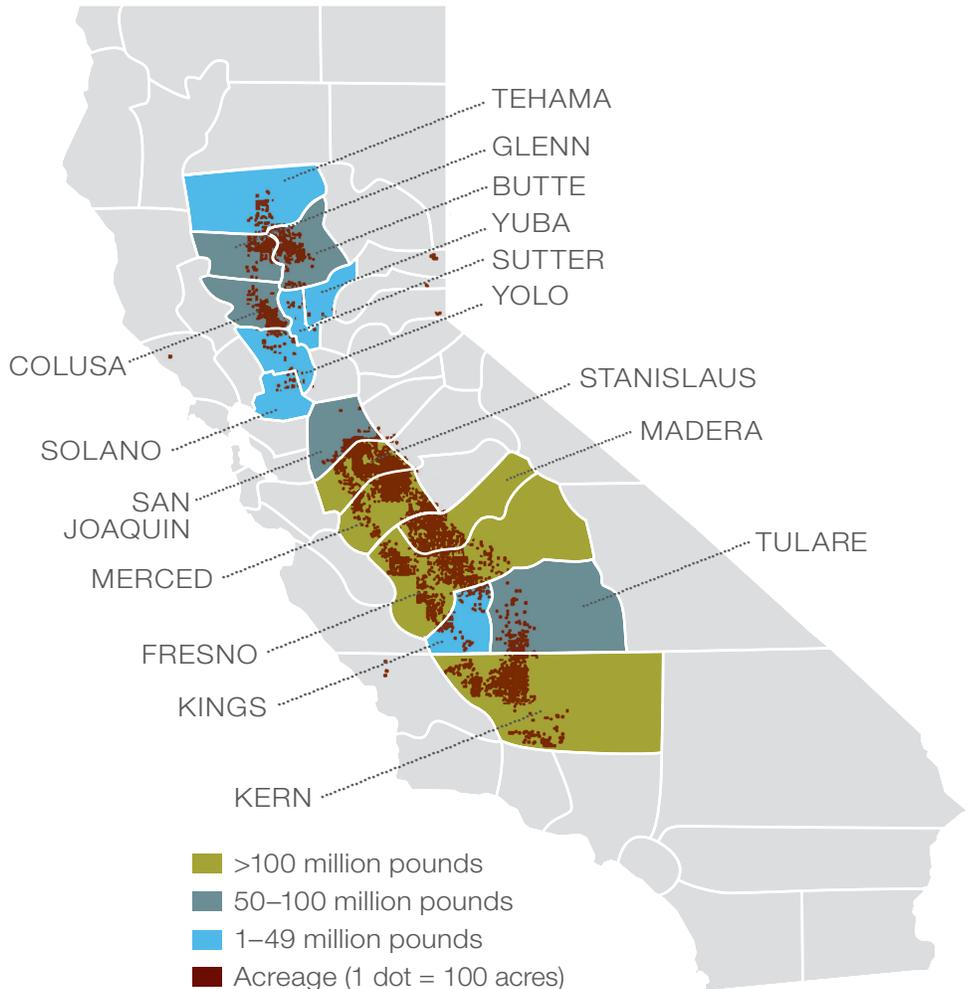
California Almonds are highly versatile and available in numerous varieties and forms suitable for diverse product applications. Use this guide to help determine the most suitable variety, size, form and grade of almond for your needs.



OVERVIEW OF THE CALIFORNIA ALMOND INDUSTRY

More than 6,000 growers carefully tend more than 1,020,000 acres (412,780 hectares) of almond orchards throughout central California, a region noted for its ideal growing conditions.

ALMOND PRODUCTION BY COUNTY (2013/2014)





ALMOND BOARD OF CALIFORNIA

- Almond Board of California was established in 1950 by the U.S. Congress to administer a grower-enacted Federal Marketing Order under the supervision of the U.S. Department of Agriculture (USDA).
- The Almond Board's mission is to make California Almonds essential to customers and consumers worldwide through innovative research, market development and industry support.
- Efforts focus on expanding domestic and international distribution, consumption and usage of almonds by funding a variety of generic activities that benefit the industry as a whole.
- Almond Board is funded by an annual assessment on the marketable kernel pound weight of almonds.
- Program activities include such critical functions as domestic and international marketing; nutrition, production and environmental research; food quality and safety initiatives; monitoring trade and market access issues; and analysis and dissemination of industry statistics. Almond Board of California does not establish commodity prices.

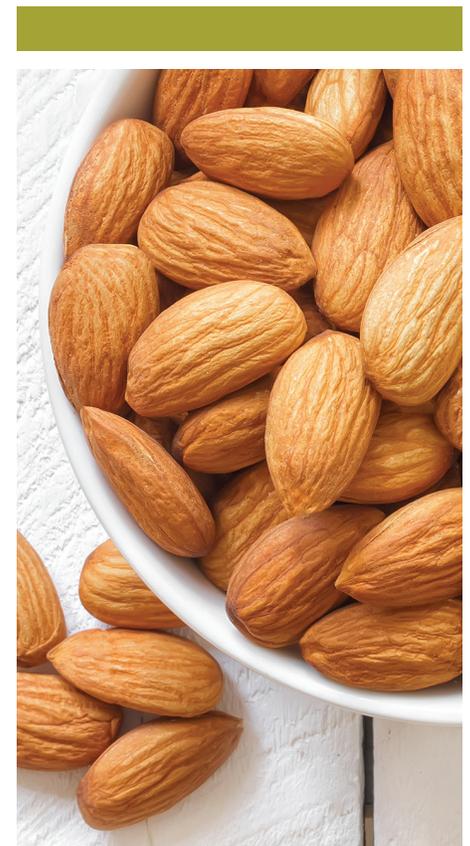
ALMOND SEASONS

Like nectarines, peaches and plums, the almond is categorized botanically as a fruit. Almonds are classified as either sweet (*Amygdalus communis* L. var. *dulcis*) or bitter (*Amygdalus communis* L. Var. *amara*), but only sweet are grown in California.

Almonds grow on trees that bloom from mid-February through March. Most of these trees are not self-pollinating, so bees play an important role. For the trees to produce, at least two different almond varieties must be planted in alternating rows. New almond varieties are being developed, which are considered self-pollinating (needing fewer bees).

Almonds develop in a shell that is surrounded by a hull (analogous to the fleshy part of a peach). Over the summer, as the nuts mature, the hull dries and splits open, revealing a shell that encases the nut. The nuts dry naturally in this shell before they are harvested.

Between mid-August and October, almonds are harvested by mechanical tree shakers, which knock the almonds, still in their hulls, to the ground. The nuts are then gathered and delivered for processing, where the next stage of cleaning and grading occurs. Finally, they are sold to millions of people around the world.





STANDARDS & GRADES

USDA grades for natural almonds are voluntary minimum standards. The California Almond industry can supply almonds to customers' unique specifications, both in terms of sizes and grades, based on the intended applications.

USDA grades establish tolerances for various quality factors. Depending on the ultimate use, different grades may be more relevant than others. Other terms like "Supreme" are also used in the industry when referring to particular grades. Be sure to speak with your supplier about your specifications.

1 U.S. ton = 0.907 metric ton
1 metric ton = 2,204.6 pounds
1 pound = 453.6 grams
10 oz. = 283.5 grams

- No limit established.
- Also included in "Other Defects."
- Includes max. 2% under 20/64 inch.
- Includes max. 5% under 20/64 inch. % also included in "Chip & Scratch."

USDA GRADES OF SHELLED ALMONDS

USDA GRADES	WHOLE KERNELS	MINIMUM DIAMETER (IN INCHES)	DISSIMILAR	DOUBLES	CHIP & SCRATCH	FOREIGN MATERIAL	PARTICLES & DUST	SPLIT & BROKEN	OTHER DEFECTS	SERIOUS DEFECTS	UNDER SIZE
U.S. FANCY	—	—	5%	3%	5%	0.05%	0.1%	1%	2%	1%	—
U.S. EXTRA NO. 1	—	—	5%	5%	5%	0.05%	0.1%	1%	4%	1.5%	—
U.S. NO. 1 (SUPREME)*	—	—	5%	15%	10%	0.05%	0.1%	1%	5%	1.5%	—
U.S. SELECT SHELLER RUN	—	—	5%	15%	20%	0.1%	0.1%	5%	3%	2%	—
U.S. STANDARD SHELLER RUN	—	—	5%	25%	35%	0.2%	0.1%	15%	3%	2%	—
U.S. NO. 1 WHOLE & BROKEN	30%	20/64 UOS†	5%	35%	x	0.2%	0.1%	x	5%	3%	5%
U.S. NO. 1 PIECES	x	8/64	x	x	x	0.2%	1%	x	5%	3%	5%

*U.S. No. 1 is commonly referred to by industry as Supreme. However, Supreme is not a USDA grade.
 †UOS = Unless Otherwise Specified.

UNDERSTANDING USDA GRADES

The different grades are defined by the allowable minimum standards/tolerances for each grade of almonds. The higher the percentage listed on the chart, the higher the tolerance for that particular grade factor.

Almonds are a natural product, so there can be variations within grades and among shipments. For example, while U.S. Fancy cannot have more than 5% dissimilar almonds, depending upon the conditions of that crop year, the actual percentage in the shipment could range from 0 to 5%.

CALCULATION OF GRADING PERCENTAGES (EXAMPLE)

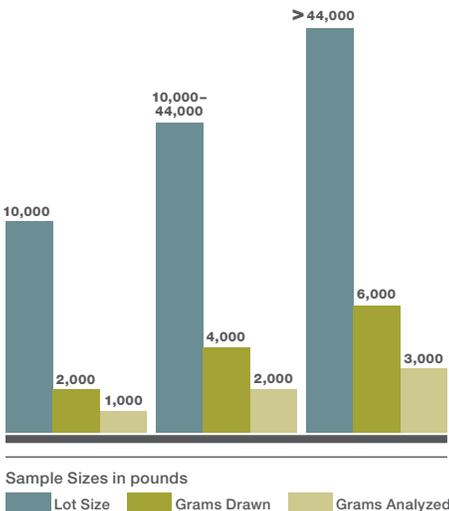
$$\% \text{ [DISSIMILAR KERNELS]} = \frac{\text{WEIGHT OF [DISSIMILAR KERNELS] (G)} \times 100}{\text{WEIGHT OF TOTAL SAMPLE (G)}}$$

USDA GRADES OF IN-SHELL ALMONDS

USDA GRADES	MEDIUM	EXTERNAL DEFECT	DISSIMILAR	UNDER SIZE	FOREIGN MATERIAL	INTERNAL (KERNEL) DEFECT
U.S. NO. 1*	28/64	10%	5%	5%	2%	10%
U.S. NO. 1 MIXED	28/64	10%	—	5%	2%	10%
U.S. NO. 2	28/64	10%	5%	5%	2%	10%
U.S. NO. 2 MIXED	28/64	10%	—	5%	2%	10%

- Includes max. 5% serious, no live insects in shell.
- Includes max. 1% less than 24/64 by weight. All others by count.
- Additional 20% for discoloration of shell.

*U.S. No. 1 is commonly referred to by industry as Supreme. However, Supreme is not a USDA grade.



UNDERSTANDING USDA SHELLLED GRADES

More rigorous specifications are typically negotiable to meet customer's application requirements.



U.S. FANCY

The highest grade—typically appropriate for products where the visual appeal of the almond is critical to the application.



U.S. EXTRA NO. 1

Similar to U.S. Fancy—ideal for food applications where the appearance of the almond is very important.



U.S. NO. 1

Sometimes referred to as Supreme, and often used for whole almond applications or for further processing like blanching and roasting.



U.S. SELECT SHELLE RUN

Mid-quality grade—good choice for applications where the almonds with minimal sorting/processing can be incorporated with other ingredients; for example, inside a confectionery product a higher level of chipped and scratched kernels is accepted. Also appropriate for further processing, such as blanching, grinding, roasting, dicing and slicing.



U.S. STANDARD SHELLE RUN

Good grade for further processing, such as blanching, dicing, grinding or paste, particularly where a higher level of split and broken kernels is not a concern.

USDA GRADING PARAMETERS

The following is the breakdown of parameters that affect the grading for almonds, regardless of the variety or size.

DISSIMILAR

Different varieties of almonds in one load. Used for whole almond applications or for further processing, such as blanching and roasting.



DOUBLES

Two kernels developing in one shell. One side of a double kernel is flat or concave.



CHIP & SCRATCH

Loss of kernel skin as a result of mechanical processing. Greater than 1/8" (3.2mm) in diameter, is defined as injury; if affecting, in aggregate, greater than 1/4" (6.4mm) in diameter, it is defined as defect.



FOREIGN MATERIAL

Pieces of shell, hulls or other foreign matter that will not pass through a round-opening screen measuring 8/64" (3.2mm) in diameter.



PARTICLES & DUST

Fragments of almond kernels or other material that will pass through a round-opening screen measuring 8/64" (3.2mm) in diameter.



SPLIT & BROKEN

Seven-eighths or less of complete whole kernels that will not pass through a round-opening screen measuring 8/64" (3.2mm) in diameter.



OTHER DEFECTS

Any defect that materially detracts from the appearance of the individual kernel or the edible or shipping quality of the almonds. The defects include gum, shrivel, brown spot and discolored.



SERIOUS DEFECTS

Any defect that makes a kernel or piece of kernel unsuitable (includes decay, rancidity, insect injury and damage by mold).



UNDERSTANDING USDA IN SHELL GRADES

U.S. NO. 1

Similar varietal characteristics. Free from loose, extraneous and foreign material.

Shells are clean, fairly bright, fairly uniform in color and free from damage caused by discoloration, adhering hulls, broken shells or other means. Kernels are well dried, free from decay, rancidity, damage caused by insects, mold, gum, skin discoloration, shriveling, brown spots or other means.

LOOSE FOREIGN MATERIAL

2%, including 1% passing through a 24/64" screen (this is also by weight).

INTERNAL DEFECTS

10%, including 5% serious damage.

U.S. NO. 1 MIXED

U.S. No. 1 grade, except that two or more varieties are mixed.

U.S. NO. 2

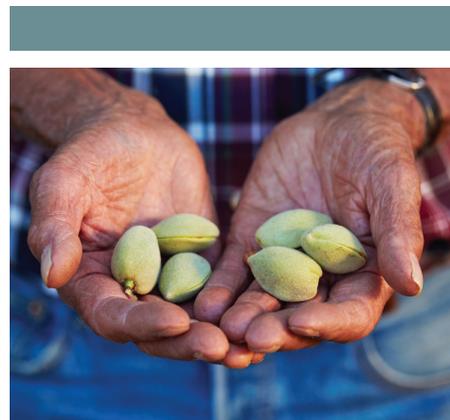
Consists of almonds in the shell that meet the requirements of U.S. No. 1 grade, except that an additional tolerance of 20% shall be allowed for almonds with shells damaged by discoloration.

U.S. NO. 2 MIXED

Consists of almonds in the shell that meet the requirements of U.S. No. 2 grade, except that two or more varieties of almonds are mixed.

SIZE

Unless otherwise specified, 28/64" in thickness.



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CALIFORNIA ALMOND HANDLING TIPS

California Almonds are relatively low-moisture, high-oil-containing nuts with a long shelf life when properly handled. Almond quality and shelf life can be influenced by three general factors: the product characteristics, the environment during distribution and storage, and the packaging. The most important aspect to preserving the incredible quality of California Almonds is maintaining controlled conditions. Elevated temperatures and moisture can significantly reduce quality and shelf life. For that reason, almonds are normally held in bins, silos or other bulk containers that are stored in cool, dry conditions.

Processing can also affect the shelf life of almonds. In general, cutting (dicing, slivering, slicing, grinding) and blanching increases the exposed surface area and begins the oxidative process, which can reduce shelf life.

Because both oil-roasting and dry-roasting subject almonds to higher temperatures, roasted products must be protected from oxygen. In addition, it is good practice to avoid exposure to direct sunlight, which can darken the surface of the nut.

COMMON PACKING FOR CONTAINER SHIPMENT

PRODUCT	NATURAL ALMONDS	CUT ALMONDS	ROASTED ALMONDS	IN SHELL ALMONDS
VOLUME	25 LBS (11.3 KG) 50 LBS (22.7 KG) 2,200 LBS (1 MT)	25 LBS (11.3 KG) 1,000 LBS (454 KG) 1,500 LBS (681 KG)	25 LBS (11.3 KG) 50 LBS (22.7 KG)	50 LBS (22.7KG)
CONTAINER	Cardboard cartons, boxes, fiber bins or tote bags	Cartons with plastic liner, fiber bulk bin with plastic liner	Cartons with vacuum-packed foil bags	Sacks

QUALITY ASSURANCE & FOOD SAFETY PROGRAMS

Ensuring the wholesomeness of California Almonds begins in the orchard and is carried through to the manufacturer. California Almonds are produced with consideration for quality control and food safety standards. Careful practices have been instituted by the California Almond industry's growers and processors.

Almond industry quality assurance and food safety programs are central to maintaining the industry's reputation. Programs are proactively reassessed when new research or agricultural conditions suggest that practices could be further improved. The ultimate objective is to provide customers around the world with the highest level of confidence in California Almonds.



STORAGE RECOMMENDATIONS

- Store under cool and dry conditions (<10°C/50°F and <65% relative humidity).
- Almond moisture should be maintained at 6% or less.
- Avoid exposure to strong odors as almonds can absorb odors of other materials if exposed for prolonged periods.
- Protect from insects and pests.
- Roasted products must be protected from oxygen by using packaging with an oxygen barrier property and packaged under vacuum or nitrogen flash.
- If kept under cold storage conditions (<5°C/41°F and <65% relative humidity), whole natural almonds can be stored for about two years with no significant loss in quality.
- Rotate stock to optimize shelf life.



QUALITY ASSURANCE

The California Almond industry has developed, with the help of university and industry experts, the following quality assurance programs:

- Good Agricultural Practices (GAPs), which provide guidelines to growers on how to minimize potential hazards, such as pathogens, contaminants and pest management materials during production and harvest
- Sanitation Standard Operating Procedures (SSOPs), which ensure a clean and sanitary environment in the processing facility
- Good Manufacturing Practices (GMPs), which define procedures to be used by handlers to process, pack, store and distribute almonds under sanitary conditions
- Hazard Analysis Critical Control Point (HACCP), which provides a systematic approach to identify, assess and control the risk of biological, chemical and physical hazards
- Environmental monitoring/post-process contamination control, which targets control of microorganisms in the processing environment with an emphasis on the prevention of post-process recontamination

Together, these programs provide a complete food quality and safety program.



Pasteurization

Pasteurization is a process all almonds sold within North America must undergo.

- **Pasteurization processes are widely used to ensure the safety of almonds sold within North America.**
- **High standards have been set to ensure the optimal attributes of each almond's quality (crunch, taste) as well as its nutritional value are maintained.**

For further information, please contact your supplier.

Moisture Management

Initial moisture and relative humidity (rH) of the surrounding environment can affect texture, microbial stability and the shelf life of various almonds.

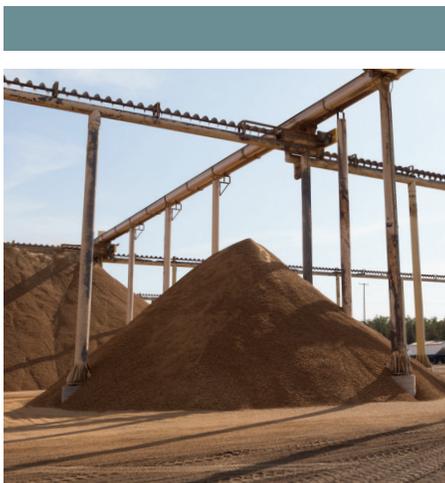
Two simple solutions to stop moisture migration are:

- **Moisture-barrier packaging**
- **Reducing the humidity of the environment in which the almonds are stored**

Ideal moisture levels for almonds exist within a range of 3% to 5%, which can be achieved in an environment with 20% to 55% rH. Studies at the University of California Davis have found:

- **Whole almond kernels and pasteurized or unpasteurized almonds interact similarly with environmental rH.***
- **Roasted and blanched almonds interact with environmental rH differently from whole almond kernels.***

*Taitano, L.Z. and R.P. Singh. 2012. Moisture adsorption and thermodynamic properties of California-grown almonds (varieties: Nonpareil and Monterey). International Journal of Food Studies 1: 61–75.



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CHEMICAL & MICROBIOLOGICAL PARAMETERS

Almond Board of California does not have recommendations on chemical and microbiological standards for raw almonds. These standards are normally defined between the supplier and the buyer. The adjacent chart lists parameters commonly quoted in the industry.

DELIVERY PROCEDURES

Proper handling and transportation may affect the quality and shelf life of almonds.

Equally important are storage conditions upon arrival at destination. It is important to maintain proper storage conditions throughout the supply chain to ensure optimal quality.

Chemical

MOISTURE	3.5-6%
FREE FATTY ACIDS	1.5%
PEROXIDE VALUE	5 meq/kg

Microbiological

AEROBIC PLATE COUNT	<50,000 cfu/g
COLIFORMS	<1,000 cfu/g
E. COLI	<10 cfu/g or <3MPN/g
YEAST AND MOLDS	<5,000 cfu/g
SALMONELLA	Negative/25g or /375g
STAPHYLOCOCCUS	Negative/g
STREPTOCOCCUS	<100 cfu/g

CROP PROTECTION

California Almond growers use a variety of methods to provide a safe, high-quality product to consumers and customers around the world. Used responsibly, pesticides are one of several tools that reduce potential damage by pests and other organisms. The almond industry has been a leader in the responsible use of pesticides, funding considerable research that has led to an industry-wide reduction in the use of pesticides and more emphasis on alternative integrated pest management (IPM) practices.

The California Almond industry has been honored twice for its IPM initiatives by the U.S. Environmental Protection Agency (EPA) with the agency's pesticide Environmental Stewardship Program award. Almond Board of California was also recognized by the California Department of Pesticide Regulation (CDPR). The awards were for demonstration research projects that showed growers how to reduce the use of certain pesticides through better monitoring and timing and the training materials developed for growers to improve the implementation of IPM.



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California's Pesticide Regulation

For crops grown in California, all pesticides used must also be registered by the California Department of Pesticide Regulation (CDPR). The CDPR provides strict oversight of product evaluation, product registration, environmental monitoring, residue testing and local use enforcement.

Pesticide manufacturers who want to distribute their products in California must first submit results from tests and studies to the CDPR for evaluation. CDPR determines whether the chemicals can be safely used under the specific and sometimes unique growing conditions found in California. Since all U.S. almond production is in California, any compound used on almonds will have undergone this rigorous dual evaluation prior to approval.

While similar to the EPA, the CDPR review occasionally requires additional specific data, for example, on worker exposure and environmental effects.

Once registered and approved for use, pesticides are subject to periodic reevaluation to determine if there have been any changes in the conditions of use or in risks.

LICENSING & MONITORING ADD PROTECTION

To ensure the safe, environmentally sound and effective use of pesticides in California, regulations require that (1) licensed professionals recommend and apply pesticides, or (2) growers and/or their employees who apply pesticides are properly trained and certified.

Since 1990, the CDPR instituted a program of "100% use reporting." This means that all growers must report every pesticide application they make to the county in which they farm. The report must include

the name of the product, the amount applied, the size of the treated area, and the date and location of the application.

The CDPR compiles these pesticide-use reports, and the results are available online at www.cdpr.ca.gov under "databases," then "pesticide use." Application information is not available for individual farms. It usually takes CDPR about 9 to 12 months to complete the review of the pesticide reports and make them publicly available.



PESTICIDE-USE ENFORCEMENT

County agricultural commissioners' offices provide both education and oversight of pesticide applications. The CDPH oversees licensing and certification of dealers, pest control advisers, pest control businesses and applicators. California regulators administer the nation's largest state pesticide residue monitoring program among other enforcement duties.

Altogether, the use of pesticides by California growers is highly regulated and monitored to protect the health and welfare of growers, workers, the public, the environment and the consumer.



Global Access

Almond Board of California works closely with U.S. regulators in monitoring MRLs in other countries. Through these efforts, Almond Board identifies changes in foreign government pesticide regulations as well as where differences exist between U.S. MRLs and MRLs of other countries. Almond Board also identifies where relevant data should be provided to ensure more consistent results.

PESTICIDE APPROVAL

Before pesticides can be marketed and used in the United States, the EPA evaluates them thoroughly to ensure that they meet federal safety standards to protect human health and the environment. The compounds that meet the requirements are granted a license, or "registration," that permits their sale and use according to specific directions and requirements stated on the product label.

During the registration process, registrants are required to submit results from more than 100 different scientific studies that demonstrate the safe use of the product. Maximum residue limits (MRLs) are established for each pesticide and for the crops on which they may be used.

The entire content of a pesticide label must be approved by the EPA before the pesticide can be sold or distributed in the United States. The label provides clear directions for effective use while minimizing

exposure to workers and the environment. It is a violation of federal law to use a pesticide in a manner inconsistent with its labeling.

Pesticides are periodically reviewed by the EPA to ensure that older compounds meet current safety standards or in recognition of changes in usage patterns. This process ensures that registered pesticides continue to meet the safety standards required by current policy and law.





VARIETIES & SIZES

There are approximately 50 almond varieties produced in California orchards. Twelve varieties represent approximately 95% of production. Almond varieties are categorized according to several broad classifications for marketing purposes, based on distinguishing characteristics such as size, shape and “blanchability.” The majority of almond production in California falls into the following three major classifications: Nonpareil, California and Mission. It is important to understand that some varieties may fall under more than one classification because they have characteristics of one type (such as Mission) but are also blanchable (a characteristic of the California classification). All California Almond varieties have been developed using traditional breeding methods; **genetically modified almond varieties are not planted or available in California.**

Inshell almonds are broken down into two types: hard shell and soft shell. When deciding on soft-shell almonds, important considerations are shell thickness and the opening along the seam of the shell (suture).

When purchasing California Almonds, it is possible to order either by classification type or by specific variety, depending on what best suits the ultimate usage. Working with your supplier, you will be able to better define your product needs. For example, ordering California type without further information could result in delivery of various almond varieties that also fall under the Mission type, such as the Butte, Padre or Fritz, which may be a different shape than you need for your application.

Marketing classifications are grouped by general size and shape. Only varieties that constitute in excess of 1,000,000 pounds as of July 2014 are listed. Other varieties that are not listed are still produced; if you have any questions about where they are classified for marketing purposes, please contact your supplier.

It is important to remember that these classifications are for reference only. Your handler can provide specific information since they may classify market varieties differently.

ALMOND PURCHASING CONSIDERATIONS

FACTOR	PARAMETERS	COMMON TERMINOLOGY
VARIETY	Shape, color, skin texture or smoothness, blanchability	Nonpareil, Monterey, Carmel, Butte, Fritz, Padre, Aldrich, Wood Colony, Price, Sonora
SIZE*	Count range of whole almond kernels per ounce (28.35 grams)	18/20, 20/22, 23/25, 25/27, 27/30, 30/32, 32/34, 34/36, 36/40, 34/40, 40/50 or customer-specified range
GRADE	Dissimilar, doubles, chipped and scratched, foreign material, particles and dust, split and broken, other defects, and serious damage	Fancy, Extra No. 1, No. 1 (Supreme), Select Sheller Run, Standard Sheller Run, No. 1 Whole and Broken, No. 1 Pieces
INSHELL	Shell hardness, shell integrity, suture opening, kernel quality, crack out	Market specific, depending on how inshell will be ultimately sold to consumers, for example: Traditional: sold in the shell—semi- or hard shell acceptable, cracked with a mechanical nut cracker Snack: sold in the shell—soft shell with greater suture opening to allow seasonings to permeate the shell Hand Crack: sold as kernels—soft shell preferred to allow manual cracking

*Individual whole kernel size may vary from year to year as a result of variations in weather, growing conditions and production yields; therefore, availability of specific sizes may be limited in some years.

NONPAREIL

With the widest range of uses among the marketing categories, Nonpareil are readily blanchable (skin removal) and sliced and cut for processed forms. A thin outer shell and smooth kernel allow for easy, blemish-free processing. As a result, Nonpareil are used anywhere an attractive appearance or a strong almond identification is important.

CALIFORNIA

This classification includes varieties that are generally blanchable and used primarily in manufactured products. California type almonds have a wide range of shell hardness, kernel shapes, skin color and surface characteristics. As a result, they are quite adaptable and well suited for nearly any process or application.

MISSION

Mission type almonds have hard shells, and their kernels are small, wide and often plump. The kernel skin is generally darker than Nonpareil and wrinkled, which enhances salt and flavor adherence. Blanching is not as common for this type.

CARMEL

Carmel is a relatively long, narrow, large, light-colored kernel. All Carmel types are also listed as California types.

INSHELL - HARD SHELL

Peerless is the principal variety sold to consumers as an inshell-hard shell product, although it can be cracked out and blanched. These inshell varieties are characterized by an attractive closed shell with a firm outer “cork,” which protects the kernel against worm damage and other contamination. The inshell-hard shell market is firmly established but has a relatively limited volume in relation to other marketing outlets.

INSHELL - SOFT SHELL

This group is market specific. The snack market prefers soft-shell varieties with greater suture openings to allow seasonings to permeate the shell. There is also a hand cracking market, which prefers soft-shell varieties that can be cracked out locally and sold as kernels. Please consult your supplier to determine the right soft-shell variety for your needs.

ALDRICH

18/20 20/22 23/25 25/27 27/30 30/32 32/34



SHELL
Soft shell, good shell integrity, fair suture opening

NUT
Medium, narrow shape, slightly wrinkled surface

CLASSIFICATION
California type, Carmel type

CHARACTERISTICS
Long and flat



BUTTE

18/20 20/22 23/25 25/27 27/30 30/32 32/34



SHELL
Semi-hard shell, light color, smooth surface, low suture opening

NUT
Small, short plump shape, wrinkled surface

CLASSIFICATION
California type, Mission type

CHARACTERISTICS
Short and plump/round



CARMEL

18/20 20/22 23/25 25/27 27/30 30/32 32/34



SHELL
Soft shell, good shell integrity, fair suture opening

NUT
Medium, narrow shape, slightly wrinkled surface

CLASSIFICATION
California type

CHARACTERISTICS
Long and flat



FRITZ

18/20 20/22 23/25 25/27 27/30 30/32 32/34



SHELL
Semi-hard shell, good shell integrity, low suture opening

NUT
Small, medium plump shape, fairly wrinkled surface

CLASSIFICATION
California type, Mission type

CHARACTERISTICS
Short and plump/round



INDEPENDENCE

18/20 20/22 23/25 25/27 27/30 30/32 32/34



SHELL
Soft shell, light color, high suture opening

NUT
Medium, flat shape, smooth surface

CLASSIFICATION
Nonpareil type, California type

CHARACTERISTICS
Long and flat



MARCONA

18/20 20/22 23/25 25/27 27/30 30/32 32/34



SHELL
Hard shell, very thick, dark color, no suture opening

NUT
Medium, short and plump shape, smooth surface

CLASSIFICATION
Mission type, Other type

CHARACTERISTICS
Short and plump



MONTEREY

18/20 20/22 23/25 25/27 27/30 30/32 32/34



SHELL
Hard shell, smooth surface, low suture opening

NUT
Large, long narrow shape, deeply wrinkled surface

CLASSIFICATION
California type

CHARACTERISTICS
Long and flat



NONPAREIL

18/20 20/22 23/25 25/27 27/30 30/32 32/34



SHELL
Soft shell, light color, high suture opening

NUT
Medium, flat shape, smooth surface

CLASSIFICATION
Nonpareil type

CHARACTERISTICS
Long and Flat



PADRE

18/20 20/22 23/25 25/27 27/30 30/32 32/34



SHELL
Hard shell, good shell integrity, no suture opening

NUT
Small, short wide shape, wrinkled surface

CLASSIFICATION
California type, Mission type

CHARACTERISTICS
Short and plump/round



PRICE

18/20 20/22 23/25 25/27 27/30 30/32 32/34



SHELL
Soft shell, dark brown color, rough surface, high suture opening

NUT
Small, short narrow shape, fairly wrinkled surface

CLASSIFICATION
California type

CHARACTERISTICS
Long and flat



SONORA

18/20 20/22 23/25 25/27 27/30 30/32 32/34



SHELL
Soft shell, dark brown color, rough surface, high suture opening

NUT
Large, long narrow shape, light color, smooth surface

CLASSIFICATION
California type, Nonpareil type

CHARACTERISTICS
Long and flat



WOOD COLONY

18/20 20/22 23/25 25/27 27/30 30/32 32/34



SHELL
Soft shell, good shell integrity, fair suture opening

NUT
Medium, narrow shape, slightly wrinkled surface

CLASSIFICATION
California type, Carmel type

CHARACTERISTICS
Long and flat

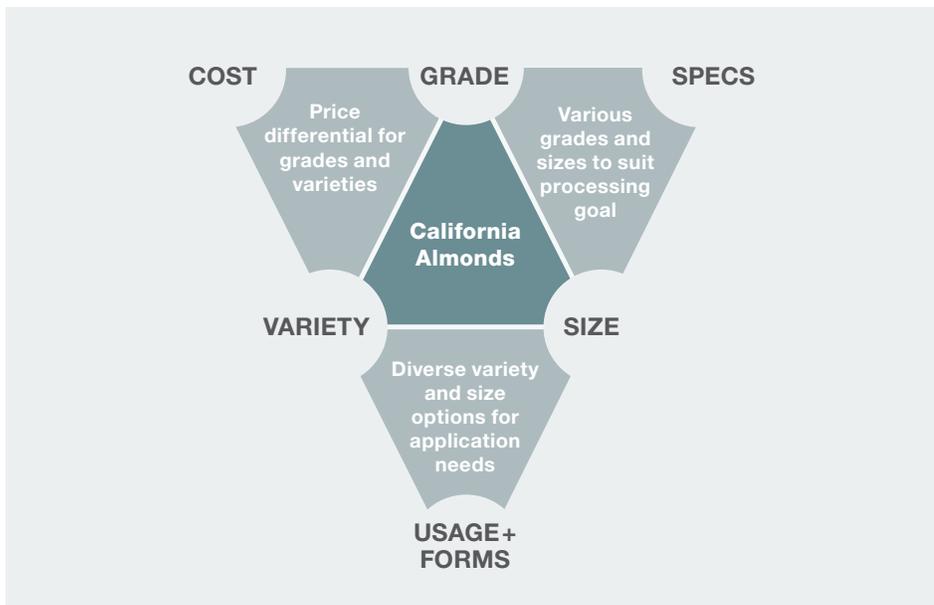


ALMOND VARIETY MARKET CLASSIFICATION MATRIX

VARIETY	SHELLED TYPES					INSHELL TYPES		APPEARANCE	
	NONPAREIL TYPE	CALIFORNIA TYPE	CARMEL TYPE	MISSION TYPE	OTHER TYPES	INSHELL HARD TYPES	INSHELL SOFT TYPES	LONG + FLAT	SHORT + PLUMP
ALDRICH		●	●				●	●	
AVALON		●	●				●	●	
BUTTE		●		●		●			●
BUTTE/PADRE		●		●		●			●
CARMEL		●	●				●	●	
FRITZ		●		●		●			●
INDEPENDENCE	●	●					●	●	
LIVINGSTON		●	●			●		●	
MARCONA				●	●	●			●
MISSION				●		●			●
MONTEREY		●	●				●	●	
NONPAREIL	●	●					●	●	
PADRE		●		●		●			●
PEERLESS		●				●			●
PRICE		●	●				●	●	
RUBY		●		●		●			●
SONORA	●	●					●	●	
WINTERS		●					●	●	
WOOD COLONY		●	●				●	●	

Please work with your supplier in evaluating your purchasing considerations.

ALMOND KERNEL SELECTION



Almonds.com

FORMS

California Almonds are an exceptionally versatile, value-adding ingredient. Available in more forms than any other tree nut, almonds are easy to work with from a formulation perspective. Because they are available in whole, sliced, slivered, chopped, diced and ground forms, with either the skin still on (natural) or removed (blanched), the application opportunities are unlimited. The selection of a particular almond form can vary the appearance, texture, flavor and application potential of the finished product.

California Almonds also complement a wide array of food flavors and applications, including confectionery, bakery, dairy, prepared foods and snacks.

Adding almonds as an ingredient, whether it's a snack, a topping on a treat or mixed in with other ingredients, can be a welcome blast of flavor to infuse into everyday eating.



Recommended Forms

Chocolate

- **Natural or blanched, diced, chopped, whole**
- **Consumers surveyed worldwide believe almonds make chocolate more satisfying, uplifting and relaxing***

*SRG Global Chocolate Study 2014.

Snack Bars

- **Natural or blanched, diced or slivered**
- **Snack bars with almonds garner popularity as they are often viewed as crunchier, more nutritious and tastier**
- **Taste, protein (6 grams per ounce), fiber (4 grams per ounce) and filling are among the main reasons people choose to have snack bars that include almonds**

Snacking

- **Natural or blanched, whole, diced, chopped, slivered, oil or butter/paste**
- **Mix almonds into yogurt or granola, or spread fruit slices with some almond butter**

Visit the recipe center at [Almonds.com/food-professionals/recipe-center](https://www.almonds.com/food-professionals/recipe-center) for fresh ideas and almond inspiration.

TEXTURE/CRUNCH

California Almonds have a hearty, crunchy texture that is retained across a wide range of applications. Entrées, sweets, fruits and creamy dairy products all benefit from the added satisfying crunch of almonds. Some almond forms can also be used to thicken sauces or as a coating for meat and seafood.



Almonds.com

CONSUMER POPULARITY

California Almonds have broad consumer popularity around the world. Foods that contain almonds, like chocolate and baked goods, are perceived as more upscale and more delicious. Adding almonds also enhances the nutritional profile of foods, offering marketing advantages for today's increasingly health-conscious consumers.

Almonds have also increased in popularity in products that provide a great alternative for some dietary concerns, such as:

- **Gluten free; using almond meal in baked goods**
- **Lactose free; almond milk beverages as an alternative to dairy**

FLAVOR/TASTE

California Almonds blend well with other ingredients. Their subtle buttery taste makes them ideal for seasoning with sweet or savory flavors. Almonds can be roasted by hot air or oil to enhance their flavor and crunch.

AESTHETIC APPEAL

Natural almonds and darker roasted almonds create a beautiful color accent against lighter backgrounds. Blanched almonds contrast wonderfully against colorful foods like chocolates, fruits and vegetables.

MAJOR CALIFORNIA ALMOND FORMS

WHOLE, NATURAL OR BLANCHED

COMMON SPECIFICATIONS

USDA grades for natural almonds; processor or customer specifications for blanched almonds

TYPICAL APPLICATIONS

- Natural, roasted or flavored snacks
- Embedded or enrobed in chocolate
- Ingredients for confectionery, energy bars, bakery
- Inputs for processing



DICED, NATURAL OR BLANCHED

COMMON SPECIFICATIONS

Large: 28/18.....28/64" & 18/64" (11.1 & 7.1 mm)
 Medium: 22/8.....22/64" & 8/64" (8.7 & 3.2 mm)
 Small: 12/8.....12/64" & 8/64" (4.8 & 3.2 mm)
 Fine: 8/0.....8/64" (3.2 mm)

TYPICAL APPLICATIONS

- Topping for dairy items, baked goods
- Coating for ice cream bars
- Filling for bakery or confectionery
- Crust for meats, seafood



SLICED, NATURAL OR BLANCHED

COMMON SPECIFICATIONS

THICKNESS

Thick: 1.5–1.8 mm
 Thin: 0.7–1.0 mm
 Regular: 1.1–1.4 mm
 Extra Thin: 0.5–0.7 mm

TYPICAL APPLICATIONS

- Topping for salads
- Ingredient for cereal and snack bars
- Coating for savory dishes
- Garnishing for baked goods, desserts



MEAL OR FLOUR, NATURAL OR BLANCHED

COMMON SPECIFICATIONS

Coarse ground
 Fine ground
 (Grinders and screens determine particle size)

TYPICAL APPLICATIONS

- Important in European-style bakery
- Gluten-free bakery
- Coating for fried foods
- Sauce thickener



SLIVERED, BLANCHED

COMMON SPECIFICATIONS

THICKNESS

Regular: 3.0–5.0 mm
 Medium: 4.0–6.0 mm

TYPICAL APPLICATIONS

- Roasted or flavored snacks
- Ingredient for baked goods, cereal
- Texture for confectionery
- Topping for prepared foods, salads



PASTE & ALMOND BUTTER, NATURAL OR BLANCHED

TYPICAL APPLICATIONS

- Alternative to other nut butters
- Filling for chocolate, cereal bars, confectionery, bakery



OIL

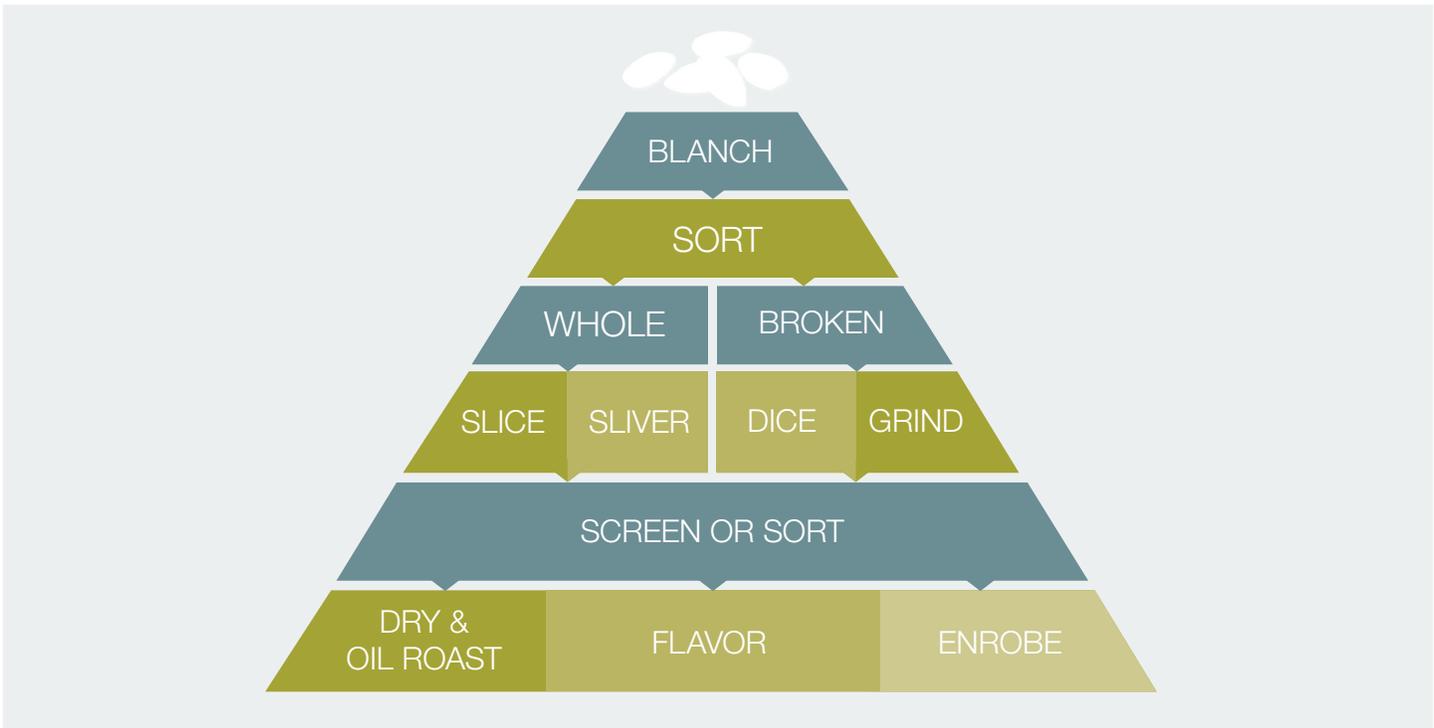
COMMON SPECIFICATIONS

Cold pressed, light and pale amber color

TYPICAL APPLICATIONS

- Salad dressings and cold dishes
- Non-food (e.g., cosmetics, moisturizer)





ALMOND PROCESSING OPTIONS

PROCESS	PRIMARY STEPS	GENERAL DESCRIPTIONS
BLANCH	Scalding, skin removal, drying, cooling, sorting	Almond skins are peeled off after the kernels are scalded in 90°C–100°C water for 2–5 minutes. Kernels are dried by hot air and then cooled to ambient temperature.
SLICE/SLIVER	Plasticizing (heat to soften kernels), cutting, drying, cooling, screening	Almond kernels are made pliable by dry or steam heat prior to being cut by blades into different forms. The cut product is dried and cooled to ambient temperature and then screened for sizing.
DICE/GRIND	Cutting, screening	Almond kernels are diced or ground, then screened for particle sizes.
ROAST	Dry heat or oil roasting, cooling	Almond kernels are roasted by either hot air at a temperature of 130°C–145°C or oil at a temperature of 130°C–170°C for varying times, depending on application needs.
SORT/SCREEN	Electronic or manual sorting; round-hole screens with different diameters	Defects and foreign material are removed prior to further processing. Screens in varying sizes are used throughout processing for uniformity and sizing of the product.

