Almond Board of California

Annual Report- 2005-06

Project Title: **Almond Variety Development**

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Objectives:

Develop (1) improved pollinizers for *Nonpareil*, and ultimately, (2) replacement varieties that possess self-fertility and improved disease and insect resistance. Specific objectives for 2005 include:

1. Expand field trials of new UCD selections. Continue to monitor performance of *Winters*, UCD selections '36-52', '2-19E', low-BF *Carmel* sources, and UCD36-52.
2. Continue to develop rapid selection/breeding techniques for Noninfectious Bud-failure, self-compatibility, disease resistance, and pest (especially NOW) resistance.
3. Generate the next generation of almonds from controlled crosses and screen progeny trees for self-compatibility, tree productivity, kernel quality and resistance to key pests/diseases.
4. Begin the patenting and release procedure for UCD36-52 including making virus-tested foundation propagation stock available to California nurseries.

Results

Current breeding objectives include a series of almond varieties having production quality and yield consistency comparable to Nonpareil but with self-compatibility to improve insect pollination efficiency and reduce orchard management needs. Ideally, nuts should also have good shell-seal to restrict worm, ant, fungal (Aspergillus) and bacterial (Salmonella) entry, while retaining high crack-out percentages. Varieties should be free from Non-infectious Bud-Failure and have improved disease and pest resistance. While genetic solutions have been available to these problems in related almond varieties and species, we have only recently been successful in transferring these traits to breeding lines adapted to California environments and processor requirements. This work has greatly increased the genetic options available to the breeding program for solving current and future industry needs. Initial breeding priorities include the recovery of promising genes for self-compatibility as well as resistance to naval orangeworm and diseases caused by *Coletotricum* spp. (anthracnose), *Aspergillus* (aflatoxin) and Alternaria. Concurrent with this germplasm development, rapid evaluation assays to greatly improve breeding efficiency are being developed for self-compatibility (with Dr. Dandekar), anthracnose (with Dr. Adeskaveg), aflatoxin (with USDA scientists) and noninfectious Bud-failure (with California nursery industry). Breeding crosses in 2005 continue to reflect the transition of the breeding program from gene identification and incorporation to the final development of the commercial almond varieties containing introduced genes combined with high horticultural quality. This focusing has allowed a greater number of crosses using fewer parents than have been utilized in the past.

Over 42,000 crosses were made in 2005 among 22 different crossing combinations (parents). Over 5000 seed have been recovered from these crosses with field planting occurring in Spring, 2006. A total of over 32,000 seedling trees from controlled crosses are now being grown in breeding plots in Davis and Winters California. In addition to self-compatibility and disease/pest resistance, promising traits have been identified for tree architecture, bearing habit, productivity, and shell crack-out efficiency and adaptability to Central Valley conditions.

The most promising selections have been propagated and planted to grower plots in the Sacramento and San Joaquin valleys to assess the commercial productivity under standard orchard conditions. This report characterizes advanced breeding selections now in regional grower tests. Breeding strategies and goals have been detailed in previous reports.

97,1-227 Lineage: 25-75 [{Arbuckle X 4-26} X {SB4, 4-2E}] X Winters.

The seed parent 25-75 is highly self-fertile (derived from the peach species Prunus mira) and productive but suffers from poor tree structure. The Winters parent contributes a more upright-spreading tree structure as well as an improved kernel size and quality. Kernels are large and uniform with a desirable Nonpareil-type elliptical shape. Some kernel shriveling is apparent but this item and its sister line 97, 1-232 have been essentially dryland farmed for the last two years. Shells have a medium thickness and are well sealed with good resistance to NOW and and damage. Self-compatibility in this election is rated as good, meaning that 50% or more of viable flowers will set seed when selfed under artificial (mesh bag limbs, limited controlled pollinations, etc.) conditions. The tree is upright to spreading and productive. Potential deficiencies include a possible predisposition to shriveled kernels and kernel gumming.

97,1-232 Lineage: 25-75 [{Arbuckle X 4-26} X {SB4, 4-2E}] X Winters. A sister line to 97, 1-227, resulting in good levels of self-compatibility and tree productivity. Nuts are large and ovate, being similar to Monterrey. Kernel shells are less substantial than 97, 1-227 resulting in greater crack out but greater susceptibility to insect damage. The tree is productive and more spreading the 97, 1-227. Flower self-compatibility is rated as good, being slightly better than its sister line when compared over several years. Potential deficiencies include a possible predisposition to shriveled kernels and kernel gumming and a tree architecture that may develop to be overly spreading.

97,2-240 Lineage: D3-4 {(Mission X P.webbii) X (Mission X P.webbii)} X Ferragnes. The seed parent is a backcross from the cross between Mission and P. webbii, a wild bushy almond species with small but well sealed nuts. The French variety Ferragnes was used as the pollen parent to increase kernel size and quality and contribute a more upright architecture to the tree. Kernels are Carmel-type in size and appearance. [For reference, a Nonpareil kernel (left) and Carmel kernel (right) are placed within a black disk within the

sample tray]. The kernel shell has been reduced to a very thin but very durable inner shell resulting in crack outs of up to 70%, combined with very high shell seals and so low vulnerability to insect damage and aflatoxin contamination. Trees are medium in height and productive, though the spreading architecture results in a higher incidence of early limb splitting if early orchard trees are not managed properly. The possible excessive spreading nature of this tree remains its most serious potential deficiency. Flowers are self-incompatible but our cross-compatible with all major California cultivars.

97,3-40 Lineage: D4-18 [(Mission X {P.fenzliana X Alm})] X Winters. The seed parent is a backcross of Mission and the wild almond species P. fenzliana. P. fenzliana was selected to bring in early flowering, good shell seal, a more upright tree productivity, and disease resistance. Winters was selected as the pollen parent to contribute better kernel quality and to maximize tree productivity through its tendency to produce consistently productive lateral branching. This selection exhibits very large Sonora-type kernels in a Peerless-type well-sealed shell. Flowering time is very early, occurring with Sonora or before. Despite its early flowering, the selection has been very productive in our southern San Joaquin test site. Flowers are self-incompatible but compatible with all commercial California almonds because of its unique S-allele genotype. The large, high-quality kernel combined with its attractive, durable shell make this selection a possible replacement for Peerless. Potential deficiencies include its very early flowering and an uncertain production consistency.

97,4-333 Lineage: Nonpareil X F7,1-1 [(Sel5-15={Nonpareil X LukensHoney X Mission} X WSB3b25) X 25-26. The seed parent is Nonpareil crossed with the very productive, self-compatible and disease resistant selection F7,1-1. The self-compatibility from the pollen parent is derived from peach but was not transferred to this selection, which is self-incompatible. The kernel possesses good quality and is Carmel-like in appearance but typically not as thick. Nuts have a paper shell which is only moderately sealed. Seedling tree productivity was high though

productivity in propagated trees remains mediocre. Medium yields and the relative flatness of the kernels remain potential deficiencies of concern.

98,11-77 Lineage: Nonpareil (F5,3-12) X 90,13-59 (Jeffries X Nonpareil). The variety Nonpareil was essentially selfed in this cross since the pollen parent 90,13-59 resulted from the cross between Jeffries (a Nonpareil bud-sport) times Nonpareil. Seedlings from this cross showed a range of variation for many important commercial qualities, confirming the genetic diversity inherent to this important commercial variety. Many seedlings in this population also showed reduced vigor and increased disease susceptibility, particularly to certain stem cankers, demonstrating the detrimental affect of selfing in almond since it concentrates otherwise deleterious but recessive genes so that they are expressed to the detriment of the final selfed plant. This selection was chosen for its high-quality Nonpareil-type kernels combined with a good sealed shell and good tree productivity. The semi-hard shell confers greater insect resistance but results in lower crack out ratios. Besides potentially greater disease susceptibility (because of the selfed nature of this selection), other potential concerns with this selection include possible deterioration in tree architecture and reduced yields as trees age.

98,14-340 Lineage: Sonora X LeGrand-OP. LeGrand-OP is a selection from crossing the partially self-compatible variety LeGrand with Sonora. Flower self-compatibility is rated as good. Kernels are medium large and somewhat resemble the Sonora parent though slightly shorter. Shriveled and creased kernels were apparent in recent harvests but these were from essentially dry land farmed trees with better kernel quality observed in irrigated orchards. Kernel eating quality is very good. Trees are upright-spreading and productive. Early yields of test trees in the southern San Joaquin remain promising though deficiencies and kernel quality remain a concern.

98,15-109 Lineage: D2-4 SB20,1-19 (Missions X P.webbii) X Sonora) X D3-3 SB20,1-28 (Missions X P.argentia) X Sonora. The result of a complex interspecies cross involving cultivated almond (P. dulcis), and the wild almond species P. webbii and P. argentia, this selection combines good levels of self-

compatibility, disease resistance, and a more spreading tree architecture. Kernels are medium quality, with slightly beaked kernels and shells. Some kernel creasing and doubling were apparent in Winters, California seedling blocks, though this could have been the consequence of the dry land farming methods used for this and related selections. Kernel quality remains a concern in ongoing evaluations as is the possibility that the tree habit may be overly spreading.

98,2-305 Lineage: Nonpareil X F7,3-11/D3-3 (SB13,28-21 X P.webbii hybrid). The result of a cross between Nonpareil and F7, 3-11, a self-compatible and aflatoxin resistant selection. Tree is upright and appears to be only moderately productive. Both shell and kernel are of medium quality as they are somewhat flat and elongated. Kernels consistently express the distinct and desirable amaretto flavor which combined with their elongated and relatively flat structure may make this a useful variety for panning or sugar coating. Potential deficiencies being examined in regional testing include consistency of amaretto flavor, kernel shape, and productivity.

98,3-53 Lineage: D3-11 (=F8S,53-60) X F7,1-1 [(Sel5-15{Nonpareil X LukensHoney X Mission} X WSB3b25)]. The seed parent, D3-11, was selected for its very good kernel quality, good disease resistance and high tree productivity. Tree architecture, however, was excessively spreading, and in particular, the terminals and laterals bearing the crop were too weepy or feathery for consistent mechanical harvest. The pollen parent, F7, 1-1, was selected for its high disease resistance, high productivity, and good spur production. Kernels tend to be small and Ruby-like. The resultant

selection has combined the better attributes of both parents with good-quality Sonora-type kernels within an upright and productive tree. Very thin shells confer high crack out ratios but the poor seals result in increased vulnerability to insect damage.

99,1-121 Lineage: D3-26 (F5,4-6{{P.webbii X P.webbii} X {SolSel, 5-15 X 24-6}}) X LeGrand. A cross between D3-26 with its good tree, kernel and shelf characteristics (described below) and the variety LeGrand to incorporate improved bearing habit and self-compatibility. The tree is upright and productive. Flowers show good levels of self compatibility and kernels show consistent high-quality. Kernels and shells are somewhat similar to Monterey in appearance with he a slight but distinct beaking. Shells possess good seals with moderately good crack out. Bloom is just after Nonpareil and it is an effective cross- pollinizer for Nonpareil. Regional evaluation trees are being watched closely for final tree architecture and productivity.

99,4-8 Lineage: Ferragnes X LeGrand-OP. (Sometimes listed in regional trials as 99, 4-2). Combining the upright tree architecture and large kernel size of rightness with the productivity and self-compatibility of LeGrand OP, this selection has proven only partially self-compatible (i.e. between 25 to 50% of all viable flowers artificially selfed pollinated will set seed). Kernels are of good quality, think somewhat similar to Solano. Shells are hard, with good seal and insect resistance but moderate crack out ratios. The tree is upright-spreading a very productive. The show is durable, attractive, and bleachable. Because of its high productivity, and high-quality kernel and shell, the selection is being considered as replacement for the Peerless variety.

C,1-10 Lineage: Wood Colony X Fritz. The result of a cross between two traditional, commercial varieties, this selection combines a Nonpareil-type kernel and paper shell with a later flowering and later maturing tree. In early regional trials, tree productivity has been unexceptional. The selection

also seems more susceptible to foliar diseases than other advanced selections. Its similarity to Nonpareil, however, would make this a very useful variety if it performs well in regional trials. In addition to productivity and disease susceptibility, an overly spreading tree architecture may also be problematic with the selection.

C,1-16 Lineage: F10D,3-67 = Nonpareil X D3-19 {(Mission X P.fenzliana) X Solano}. This selection is derived from a cross to P. fenzliana with the goal of transferring improved disease resistance and cropping architecture. Tree is productive and consistently yields uniform and good-quality Price-like kernels. Shells are paper and relatively well sealed. Tree is upright to spreading and it appears to have improved levels of disease resistance. Mature tree productivity and architecture are among the potential deficiencies being monitored in this selection.

C2-4 Nonpareil-BF X Monterrey. [Tested as selection F10D, 5-39 in some locations]. Similar to selection C1-10 (above), this selection resulted from an early cross between a high bud-failure Nonpareil selection and a variety Monterey (to evaluate latent bud failure potential in the variety Monterey). Kernels show good-quality, and are somewhat between Carmel and Sonora in shape and size. Shells are paper in texture and moderately well sealed. Propagated trees have shown good productivity in regional testing although some non-bearing blind wood has also been observed in the southern San Joaquin Valley. Experience has shown that crosses to high bud-failure sources have in approximately 50% probability of inheriting the predisposition to noninfectious bud-failure. In addition to bud-failure potential, regionally planted trees will be closely monitored for tree bearing habit, particularly cropping wood regeneration.

D,1-25 Lineage: {(Mission X P.webbii) X Sonora. This selection represents a unique class of kernels being relatively long, wide and flat and thus well tailored for the sugar coating or panning market. In addition, kernels possess a unique

and desirable amaretto flavor. The combination of kernel architecture and kernel flavor quality have made it old interest to certain specialty markets processors. The tree is medium in size and spreading. While the selection appears highly productive, there is some evidence of bearing decline in older trees. The selection is being released for regional testing for growers and processors interested in this particular niche market. In addition to attention to those kernel characteristics required for this market, other characteristics to be watched in regional trials include consistency of productivity and a renewal of bearing wood.

D,1-6 Lineage: 90,14-124= (Jeffries X Nonpareil). Similar to 98, 11-77 (described above), the selection represents a self pollination of Nonpareil as part of a project to dissect the genetic components of this important variety. D,1-6 was selected for its very good Nonpareil-type kernel and thin paper shell conferring a high crack out what only a moderate barrier to insect pests. Trees appear productive in regional trials with no evidence of reduced vigor or increased susceptibility to disease as is often associated with selfed or inbred genotypes. The selection also shows partial self-compatibility which appears associated with the unilateral breakdown of the self-incompatibility mechanism in the Jeffries bud-sport. In addition to the general signs of inbreeding depression, other deficiencies to be watched for in this selection are an increase susceptibility to stem canker which is frequently seen in inbred lines of Nonpareil.

D3-25 Lineage: Nonpareil X F5,4-11 {P.webbii X P.webbii}{SEL5-15Selfed}). This complex interspecies cross, combines genes from P. mira (a wild peach), P. webbii (a wild almond) and P. dulcis (cultivated almond). The selection combines a good Nonpareil-type kernel quality with good upright tree architecture and good levels of self-compatibility. Both tree productivity and bearing wood renewal have declined with age in the initial tree though propagated trees in regional trials have shown good tree growth and scaffold architecture, but a tendency for weepy growth at branch terminals. This selection is also associated with greater susceptibility to twig blight. Initial crops in regional trials have been moderate. Cropping potential and levels of disease resistance are being watched closely in the selection as regional trial trees mature.

D3-26 Lineage: F5,4-6 {P.webbii X P.webbii} X Solano. [Labeled as F10D, 3 -216 in some plots]. Tree is large, upright-spreading, and productive. Nuts are ovate, somewhat similar to Peerless, and like Peerless have a semihard shell resulting in good resistance to insect damage but moderate crack out ratios. Some evidence for alternate bearing has been observed in the parent trees, but trees in initial regional trials continued to show good growth and productivity. In addition to alternate bearing, the selection is being watched for consistency of bearing wood regeneration and susceptibility to peach twig borer damage.

F7,1-1 Lineage: (Sel5-15{Nonpareil X LukensHoney X Mission} X WSB3b25). Breeding selection Sel5-15, has proven to be one of our most effective sources for both self-compatibility and improved disease resistance and has been derived from peach and almond germplasm, respectively. F7,1-1 combines a high levels of self-compatibility with high tree productivity and good disease resistance. The Butte-type kernel is a medium to small in size, and uniform in its good appearance and freedom from defects. It has a paper shell with moderately good seal. This selection has been a consistent and dependable performer in terms of both self-compatibility, foliar disease resistance, and tree productivity both in the initial evaluation in regional evaluation plots. The small kernel size is its most apparent handicap, though its consistent productivity and disease resistance may lead to commercial profitability.

F8,7-179 Lineage: D3-15 (Nonpareil X F5,4-43{P.webbii X P.webbii}{SEL5-15Selfed})) X D3-25 [(Nonpareil X F5,4-11{P.webbii X P.webbii}{SEL5-15Selfed})]. Combining multiple and distinct sources of self-compatibility (from both peach and P. webbii), this selection has shown consistently good levels of self compatibility even in seasons were spring storms have suppressed flower development. Improved levels of both foliar and blossom diseases have also been observed. Kernels show good Carmel-like quality and are of uniform size and shape. The shells are paper, though only poorly sealed. Regional trials at Winters, California

have shown the tree to be productive and a regular bearer though some evidence of hull rot disease has also been observed. Early productivity in regional trials has been only moderate. Regional trials are being watched closely for disease susceptibility and bearing wood renewal.

F8,7-180 Lineage: D3-15 (Nonpareil X F5,4-43{P.webbii X P.webbii}{SEL5-15Selfed})) X D3-25 [(Nonpareil X F5,4-11{P.webbii X P.webbii}{SEL5-15Selfed})]. Although a sister line to F8,7-179, the selection is self-incompatible, having inherited none of the self-compatibility factors from the parents. Kernels are of good quality being similar to Nonpareil though larger. Shells are thin, paper consistency and only moderately well sealed. This selection has shown only moderate productivity at Winters, California evaluation sites but has shown stronger productivity at southern San Joaquin test sites. Trees at the Winters, California evaluation site show problems in bearing wood renewal leading, eventually to lower yields. Trees flower just after Nonpareil and pollen is fully cross compatible with Nonpareil and Carmel.

F8,8-160 Lineage: D4-18 (Mission X {P.fenzliana X Alm}) X Sonora. This and the following selection have incorporated genes from the wild almond species P. fenzliana into a cultivated almond background. F8,8-160 was selected for its consistent level of self-compatibility and its high-quality Carmel-type kernel. Shells are paper, and poorly sealed. Trees have shown good productivity both at the Winters, California and southern San Joaquin evaluation plots. Improved levels of resistance to foliar diseases have also been observed. Kernels are uniformly elliptical and relatively thick resulting in good kernel weights and so improved yield potential. Trees are upright-spreading with good crop distribution primarily on spur bearing wood. Pollen is fully cross compatible with Nonpareil.

F8,8-161 Lineage: D4-18 (Mission X {P.fenzliana X Alm}) X Sonora.This and the previous selection have incorporated genes from the wild almond species P. fenzliana into a cultivated almond background. Like F8,8-160, F8,8-161 was selected for its consistent level of self-compatibility and its high-quality Carmel-type kernel. Shells are comparable to, to slightly thicker than Carmel,

having good seals. Trees have shown good productivity both at the Winters, California and southern San Joaquin evaluation plots. Improved levels of resistance to foliar diseases have also been observed. Trees are upright-spreading with good crop distribution, primarily on spur bearing wood. Doubled nuts (two nuts developing on a unique T-shape spur) are often observed and may contribute to the higher yield potential this selection. Pollen is fully cross compatible with Nonpareil and most major commercial almond varieties.

F8,8-4 Lineage: D3-15 (Nonpareil X F5,4-43{P.webbii X P.webbii}{SEL5-15Selfed})) X D3-25(Nonpareil X F5,4-11{P.webbii X P.webbii}{SEL5-15Selfed}). This complex interspecies cross, combines genes from P. mira (a wild peach), P. webbii (a wild almond) and P. dulcis (cultivated almond). Kernels are of good quality, ovate in shape, and with good thickness resulting in good individual kernel mass. Shells have a medium thickness and are generally well sealed. Doubled-nuts have been observed in this selection as have a relatively high number of shriveled nuts. The tree is upright to upright-spreading and consistently productive. Nuts are borne primarily in spurs but also at current shoot terminals, particularly in younger trees. Kernel quality problems, particularly double kernels, need to be watched with this selection.

LeGrand-OP Lineage: LeGrand-Open-Pollinated. Resulting from a large-scale screening of LeGrand seedlings, this selection shows moderate levels of self-compatibility (better than the LeGrand parent), combined with good tree productivity and without the stick-tight problem of LeGrand. Kernels have a good quality, Padre-type shape though are somewhat larger. Shells are soft, moderate in thickness with good seals. The tree is more compact, like Carmel, but allowing good productivity because of a shorter internode distance between leaves and spurs. Most production in the mature trees is on spurs which are well distributed throughout the canopy. The level of self-compatibility appears inconsistent from year to year, much like the LeGrand parent.

Trees have shown good productivity both at the Winters, California and southern San Joaquin evaluation plots. As these trees mature, particular attention will be given to the evaluation of the stability of self-compatibility, the level of stick-tights, in the incidence of foliar diseases.

2000,2-3 Lineage: D3-15 (Nonpareil X F5,4-43{P.webbii X P.webbii}{SEL5-15Selfed})) X D3-25 [(Nonpareil X F5,4-11{P.webbii X P.webbii}[{SEL5-15Selfed})]. A relatively recent selection, 2000,2-3 represents an advancement of the previously described D3-25 selection incorporating improved tree structure and productivity. Self-compatibility and a Nonpareil-type kernel were derived from the D3-25 parent. The D3-15 parent contributed a more upright-spreading tree structure, a more uniform, spur based productivity, and a more durable and well-sealed shell. Tree structure is upright to upright-spreading with a very high productivity resulting from a uniform and high nut distribution. The original tree also shows evidence of improved foliar disease resistance.

2000,8-27 Lineage: Nonpareil X F8,7-179. As with selection 2000,2-3, (above), this selection represents the next breeding generation derived from selection F8,7-179 (described above). The backcross to Nonpareil has resulted in an improved Nonpareil-type kernel quality and improved shell seal. High levels of self-compatibility have also been recovered as have good tree architecture and uniform crop distribution, primarily on spur bearing wood. The tree also exhibits improved levels of foliar disease resistance when compared to both parents. Kernel uniformity is very high with low levels of doubled or damaged kernels.

UCD2-19E. Lineage: Tardy Nonpareil X Arbuckle. This selection is one of the highest producing varieties at the Kern RVT plot with an accumulated (1996-2005) yield of 26,112 pounds per acre following an exceptionally high crop of 4890 pounds per acre in 2003. As can be seen in the attached figure, however, UCD2-19E shows a strong alternate bearing habit where years of high crop yield are followed by low crops. It is believed that on years of very high crop, insufficient nutrients are available to the overloaded fruiting spurs to initiate

the number of flowers needed to maintain the crop, and in some cases to maintain the very viability of the spur into the next season. An alternate bearing habit is undesirable for California production, and usually breeding selections showing this behavior would be discarded. However, many Kern County growers have been successful in maximizing year-to-year production in other strongly alternate bearing varieties such as Price, by closely monitoring current season crop yield and providing increases in both irrigation water and fertilizer nutrients as needed. To evaluate this opportunity to capitalize on its very high crop in potential and because of its good kernel quality and bloom overlap with Nonpareil (as detailed in the 2003 annual report) additional grower plantings have been made in Kern County in 2004. Virus-free, nursery foundation plant material has also been provided to interested nurseries to facilitate greater grower experimentation with the selection.

UCD36-52. [Also referred to as Marconita due to it's resemblance to Marcona]. Lineage: F7,1-1 [(Sel5-15{Nonpareil X LukensHoney X Mission} X WSB3b25)] X 25-26 almond selection. This is a premium quality Spanish Marcona type almond combining very high quality and NOW resistance.Our efforts to develop a California-adapted Marcona-type variety have intensified because of the increasing plantings of the Marcona variety in California [due to the high quality of its heart-shaped kernel and the associated higher market price(from $15-$20 a pound)]. Despite its high market price,

Marcona does not appear to be ideally adapted to California conditions owing to a generally greater disease susceptibility, vulnerabilities to noninfectious Bud-failure, and poor kernel/shell crack-out proportions of approximately 30%. In its principal areas of production in Spain, the Marcona flowers approximately 1 week before Nonpareil and so would not be suitable for cross pollination. UCD selection 36-52 combines the desired heart-shaped kernel of Marcona with its high kernel quality (resulting in part from a higher oleic acid content which confers both an agreeable buttery flavor and improved resistance to kernel rancidity). In addition, selection UCD 36-52 has a moderately well sealed paper shell with crack-out proportions of approximately 60%. Because it flowers approximately 3-6 days after Nonpareil it would be a suitable pollinizer for the late Nonpareil bloom and since it possesses moderate levels of self-compatibility, it will allow some self seed set if cross-pollination does not occur. Selection UCD 36-52 also

demonstrates improved levels of resistance to navel orangeworm and Indian meal moth which results in greater yield recovery and, equally important, reduced incidence of aflatoxin contamination which is highly correlated with insect damage to the kernel. [The selection has also been a favorite of Almond Board evaluators since its superior flavor, heart shape and high proportion of monounsaturated fatty acids make it the poster-child (poster-nut?) for almonds' excellent eating qualities and health benefits].

Navel orange worm resistance in UCD 36-52 results in part from a good shell seal but also appears to involve various biochemical components of the kernel. The multiple resistance mechanisms provide a more stable, broad-level resistance but is difficult to transfer to new varieties because of the complexity of the genetics involved. Yield, which is the single most important determinant of variety success, will vary by site in almond production areas of the Sacramento and San Joaquin valleys. A small-scale (12 trees in a solid 4x4 block), 12-year old test plot at Arbuckle, California has shown UCD 36-52 to be similar to slightly lower in production when compared with nearby Nonpareil trees. Additional grower blocks planted in the Sacramento and San Joaquin valleys which have now come into production. Because to initial good performance, the very high market value of this Marcona-type nut and the consequent high interest by growers familiar with this marketing niche, this selection is scheduled for patenting and release in 2006.