FPMS PISTACHIO NEWSLETTER
UCB-1 Hybrid Pistachio Rootstock

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Number 1 **December 2000** **Cheryl L. Covert, Editor**

No UCB-1 Seed Available in 2000

Following the record UCB-1 seed crop in 1999, UC Kearney Agricultural Center (KAC) staff decided the time was right for some much-needed rejuvenation of its two unmanageably large UCB-1 parent trees. Since 2000 was anticipated to be a lower-bearing year, they took the opportunity to prune both parent trees down to a size that will help maintain maximum seed production in years to come. Though necessary, the pruning done at KAC meant there was no UCB-1 seed production this year and, therefore, no UCB-1 seed available for allocation this season (Fall 2000). Seed is expected to be available for distribution again in the 2001 season.

Off-types in UCB-1 Seedlings

Louise Ferguson, UC Kearney Agricultural Center

UCB-1 pistachio rootstock seed is produced by a closed pollination between two parents of different species, a selected *Pistacia atlantica* female and a selected *Pistacia integerrima* male. A closed pollination is accomplished by enclosing the female tree to prevent chance pollination and applying only pollen collected from the selected male. Since the male normally blooms in late February and the female in early to mid March, male pollen is collected and

UCB-1 Seed

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Investigations Underway to Determine Cause of Stunting of Orchard Trees on UCB-1 Rootstock

Louise Ferguson, UC Kearney Agricultural Center

In July of 1999, in an orchard on the west side of Kern County, approximately 30% of the three- and four-year-old Kerman pistachio trees budded on UCB-1 rootstocks displayed the stunted-looking growth seen in the picture below. The trees were produced in the first year of an on-ranch nursery.

Trees with this problem have been observed previously, but never in such high numbers. For example, in the pistachio rootstock *Verticillium* trial planted in 1992 at University of California's West Side Field Station in Fresno County, this type of stunting was observed as early as 1996, but at an incidence of less than 1%. We are calling this problem UCB-1 pistachio stunt.

There is concern that this stunting may be a significant problem with adverse economic consequences, primarily due to decreased nut yield

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FPMS "Test-Harvests" First UCB-1 Seed From Parent Tree Orchard at UC Davis

Mike Cunningham

The UCB-1 parent tree orchard established at FPMS in 1996 has produced its first crop of UCB-1 seed. The new orchard of 13 *P. atlantica* (female parent) and 5 *P. integerrima* (male parent) trees was planted at FPMS in response to requests from FPMS pistachio industry advisors for an increased supply of UCB-1 seed. With the planting of the new orchard, the goal of centralizing production and distribution functions at UC Davis is progressing according to plan. Before the new orchard was planted, only one male and one female parent tree existed at KAC from which to produce seed. Budwood for the FPMS orchard was collected from the KAC parent trees in 1995, budded onto UCB-1 rootstock seedlings, and planted in the FPMS collection in the Spring of 1996.

Some of the UCB-1 parent trees at FPMS flowered for the first time in March, 2000. Although there were insufficient flowers to produce enough seed for sale, it provided FPMS production staff with the opportunity for hands-on experience in producing UCB-1 seed. Flowers and seed produced this year were used for various experiments in pollination, bagging and harvesting techniques, to be followed by germination and isozyme testing to verify how the best quality seed is produced.

During the flowering period, the timing of pollen collection, methods of protecting the flower clusters before and after pollination, and various methods of pollen transfer were investigated. Careful notes were kept identifying the treatment(s) each lot of seed received. Pollination techniques are being compared with seed set, and harvest times compared with germination rates. These experiments have resulted in a small amount of seed being harvested, cleaned, and stored, with special care in labeling to retain the integrity of the pollination trials.

The various lots of seed will be germinated according to standard germination instructions provided by Dr. Louise Ferguson. Leaf samples will be taken from the seedlings for isozyme analysis to test for trueness-to-type, the results of which will indicate the extent to which any contamination from foreign pollen may have occurred.

If the results of this year's seed quality testing are as expected, the 2001 season should result in the first saleable seed harvest for FPMS from Davis trees, and the experience gained this season will translate into the same high-quality UCB-1 seed the nursery industry has come to expect from the University.

UCB-1 Parent Tree Budwood Availability

Over the years, the demand for UCB-1 hybrid seed has consistently exceeded the available supply. In 1995, FPMS held meetings with its industry,

academic and administrative advisors to explore ways of increasing the amount of seed available to industry. Two solutions were approved and implemented as a result of these meetings: (1) the planting of a larger parent tree orchard in the FPMS collection at UC Davis; (see article in this newsletter), and; (2) providing an avenue through which growers and nurserypeople can produce their own UCB-1 seed by propagating their own parent trees using budwood from the University. With the agreement of all of the parties, a plan was developed that allows nurseries to purchase budwood while providing ongoing revenue back to the University to support FPMS program costs and continuing pistachio research.

In 1996, FPMS began offering budwood of UCB-1's male (*Pistacia integerrima*) and female (*Pistacia atlantica*) parents for sale to industry under the terms of a Grower Agreement requiring the buyer: (1) not to sell or otherwise transfer budwood to another party, and; (2) to pay a user fee of $0.25 per propagative unit on trees, seed and any asexually propagated unit produced using the budwood. The exact language of the Grower Agreement appears on the back of the FPMS pistachio order form and can also be viewed on the FPMS Web site at http://fpms.ucdavis.edu/Pistachio/PISTOrder.html#PistachioUserFees (copies can also be obtained from the FPMS office). FPMS plans to begin collecting pistachio user fees beginning in the Spring of 2001 (see article in this newsletter).

Budwood is normally available beginning in early July and continuing through the Fall. An announcement regarding availability of parent tree budwood, along with ordering materials, is sent to those on the FPMS pistachio mailing list each year in early June. Available material is generally allocated among all who request it by July 1st each year, and on a first-come, first-served basis after that. If you would like to be included on the FPMS pistachio mailing list, please contact the FPMS office.

FPMS Pistachio User Fee Collection To Begin in Spring 2001

In the Spring of 2001, FPMS will begin the annual collection of pistachio user fees. Each year in early February, custo- mers who have purchased UCB-1 parent tree budwood from FPMS will receive a report form and be asked to report the number of propagative units they have sold, exchanged or retained for their own use during the previous calendar year (January 1st-December 31st), and to pay the user fee of $0.25 per propagative unit to FPMS if applicable. A propagative unit is defined for purposes of the agreement as any viable tree, seed or asexually propagated unit from a seedling produced from the budwood purchased from FPMS.

25¢ per propagative unit

Collection of pistachio user fees will occur for the first time in February of 2001, and for the initial collection only, purchasers will be asked to report and pay for all propagative units made from FPMS budwood from the time they received their budwood through the end of calendar year 2000. In 2002, and every year thereafter, customers will report and pay for propagative units only for the preceding calendar year. User fees that are owed will be due no later than March 1st each year.

After production expenses are deducted, net revenue raised through collection of pistachio user fees will be used to support FPMS programs and pistachio research at the University of California. 1/3 of the after-expense revenue will go to FPMS and 2/3 to the UCD Pomology Department endowment to fund graduate research on pistachios.

FPMS Web Site Now Online!

FPMS is pleased to announce that customers can now access FPMS program information, collection lists and ordering materials via its new site on the World Wide Web at **http://fpms.ucdavis.edu**. FPMS also has an Email address, **fpms@ucdavis.edu**, to which customers can direct inquiries by Email about FPMS programs, materials and services. Email inquiries will be directed to the staff member(s) best able to answer your questions. We hope these new resources will help to make our program information and staff more readily accessible and will encourage you to learn even more about FPMS!

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Off-types in UCB-1 Seedlings *(continued)*
stored until the female rachii bloom. When pollen is applied to the female flower, the UCB-1 seed is created. In the early years of seed production, paper bags were used to protect the female flowers from unintended pollination. In 1977, in an effort to increase the UCB-1 seed supply, a large, ventilated cage structure enclosing the entire mature female *P. atlantica* parent tree was built.

An ongoing concern in the production of this F-1 hybrid seed has been the possibility of rogue pollen from neighboring male trees successfully fertilizing the female *P. atlantica* parent. To monitor for this possible event, an isoenzyme test was developed in the Department of Pomology. This is a chemical method of determining the genetic components of the rootstock seedling which can determine whether non-*P. integerrima* pollen has entered into the cross. Each year, the crop of UCB-1 seed is sub-sampled for possible rogue pollination: 100 seeds are germinated and individually tested for aberrant isoenzyme patterns in the Pomology Department's lab. In addition, both Dr. Louise Ferguson, Pomology Extension Specialist, and FPMS production staff perform germination tests for viability. Commercial nurseries also share their germination percentages with FPMS. The seedlings produced to determine germination rate are also examined for off-types.

FPMS UCB-1 customers all receive an automatic 10% augmentation of their seed allocation to compensate for losses due both to off-types which must be rogued from the seedling beds and a normal range of germination percentages. Nurseries are encouraged to carefully examine all UCB-1 seedlings and eliminate any which exhibit abnormal growth.

Some of the off-types are not easily distinguishable until the trees are 4-6 months old and transplanted into 22-inch nursery sleeves. These rootstocks look like the smaller seedlings in the picture at the top of the next column.

At this stage, these seedlings resemble an *atlantica* more than a UCB-1 rootstock. It is possible that these seedlings are the result of rogue pollination, but it is

also possible that a certain percentage of UCB-1 seedlings will normally display this phenotype. Over the past ten years, since the beginning of commercial UCB-1 rootstock production, seedlings with this appearance have been noted, and generally rogued, or removed, while in the nursery.

Because of questions about the cause of UCB-1 pistachio stunt (see article entitled "Investigations Underway..." beginning on p. 1 of this newsletter) and the possibility that the problem might be related in some way to off-types in UCB-1 seedlings, more information is needed about the frequency of off-types in UCB-1 rootstock populations. In the Spring of 2000, three nurseries provided off-type seedling counts. The first nursery, with a seeding population in the tens of thousands, reported 95% germination with 2.4% of the germinated seedlings resembling *atlantica* seedlings. The second nursery reported 93% germination of 5,000 seeds with 16, or 0.03%, of the seedlings resembling *atlanticas*. Nursery three reported 99.3 % germination with 8.0% of the seedlings resembling *atlanticas*. Foundation Plant Materials Service (FPMS) also sent seed samples to the Pomology lab for isozyme analysis to determine whether *atlantica* types were present. Of 100

randomly-selected seeds in the 1999 seed lot, only one produced an isozyme analysis profile characteristic of an *atlantica,* rather than a UCB-1, rootstock. Summarizing, in three large seed lots, the incidence of *atlantica*-like seedlings ranged from 0.03 to 8.0 %. And in a seed lot of 100, only 1% tested by isozyme analysis as an *atlantica*. Since no reported seed lot was compromised by more than a total of 10% by the combination of germination failures and identified off-types, the 10% seed augmentation given by FPMS would have compensated nurseryman for these losses. Futhermore, thus far, the *atlantica*-like UCB-1 seedlings in the nursery have not been proven to be the cause of the UCB-1 pistachio stunt seen on the Kerman scions in young orchards in 1999. It is clear, however, that more information is needed to help nurseries eliminate any possible off-type seedlings from UCB-1 rootstock populations to ensure the best possible success for future plantings.

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Investigations Underway to Determine Cause of Stunting of Orchard Trees on UCB-1 Rootstock *(Continued)*

or quality. A team has been assembled at the University in an effort to determine the extent of this problem, and to begin the difficult task of establishing the cause of the stunting phenomenon. Cooperators will include: (1) two major California pistachio nurseries; (2) a pistachio nursery in Arizona; (3) Foundation Plant Materials Service (FPMS), and; (4) three scientists from the UCD Pomology Department--UCCE Pistachio Specialist Dr. Louise Ferguson, Dr. Steven Southwick and Dr. Darush Struss. Many questions need to be answered. Is this a genetic problem associated with UCB-1? If so, why isn't the stunting found in more orchards? Is the problem severe enough to outweigh the benefits of the higher yields of trees on UCB-1? Can it be eliminated by roguing out certain genotypes of UCB-1 seedlings? Is the problem
associated with the off-type UCB-1 seedlings that are referred to as "*atlantica* type", which are routinely eliminated by experienced nurseries? Does this problem ever occur when other rootstocks are used?

Louise Ferguson

Two methods of determining the effect these stunted individual rootstocks might have on the yield or quality of the Kerman scion will be used. The first will be to obtain mature yields and nut grades from trees grown on rootstocks identified as stunted in the nursery, and on trees with normal UCB-1 rootstocks as controls, and then observe and record data on both through bearing. This approach will require at least eight years to complete, but will provide the most reliable information. The second strategy, which may result in quicker, but less reliable results, will be to examine yield records of the pistachio rootstock trials currently in progress at the Kearney Agricultural Center and West Side Field Station in Fresno County, and in Kern County. The objective will be to identify individual trees on UCB-1 rootstocks with yields significantly lower than other trees on UCB-1 rootstocks. If individual, poor-yielding trees on UCB-1 rootstocks identified through yield records also have visibly compromised growth, this could be an indication, but not definitive proof that the "*atlantica*-like" rootstocks seen in the nursery and the pistachio stunting observed in the field are the same, and an economic problem. Though findings from the second method will not be as conclusive as findings from the first, they may give us some useful preliminary information in a relatively short time.

Determining the cause of the problem may be more difficult. It is unlikely that UCB-1 pistachio stunt is the result of pests, disease, or horticultural practices, as the incidence and symptoms are not consistent with any of the above. Further, preliminary nutritional sampling by one nursery revealed no differences between stunted and visually "normal" trees on UCB-1 rootstocks. It is possible that what we are observing is the result of genetic variation among UCB-1 seedlings. If that is the case, it would be difficult to understand the uneven distribution of this problem given the uniform source of UCB-1 seed in commerce at this time (see article on p. 2 of this newsletter

entitled "UCB-1 Parent Tree Budwood Availability"). Another possibility is that a genetic problem exists which requires an environmental or pathological stimulus before it manifests.

UCB-1 seed is a variable F-1 product of a closed crossing of two parents of different species, a *Pistacia atlantica* female and a *Pistacia integerrima* male. A closed pollination is accomplished by caging the female tree to prevent chance pollination and applying pollen from the male artificially. Just as individual children of the same two parents can be genetically different due to the recombination and segregation of the parents' genes, individual pistachio seeds can be genetically different. Thus, it is entirely possible a percentage of seeds have horticulturally undesirable genetic combinations. Another possible source of undesirable genes is contamination by foreign pollen, not the applied *integerrima* pollen, when the *atlantica* seed tree is pollinated. For years, it has been known that UCB-1 seedling populations have a certain percentage of obvious off-types with a markedly different growth habit or phenotype (see the article beginning on p. 1 entitled "Off-Types in UCB-1 Seedlings"). Normally these off-types are rogued in the nursery, however it is possible that some off-types exist which manifest at a later age, after normal nursery roguing.

A sufficiently discriminatory genetic tool might be able to determine whether the UCB-1 pistachio stunt phenomenon is associated with a particular genotype of UCB-1 seedling and exists due to natural variability in the F-1 generation, or is the result of pollen contamination. The DNA fingerprinting technique called DNA microsatellite analysis, the most discriminatory molecular technique currently available, could help us understand this phenomenon. An intensive program to develop pistachio microsatellite analysis was initiated this year at UC Davis in the Department of Pomology. Drs. Darush Struss, Steve Southwick and Louise Ferguson are cooperating on the project with support from California and Arizona pistachio nurserymen and FPMS. Allied work on pistachio cultivars supported by the California Pistachio Commission will accelerate progress on the project, as both projects are working with the genus *Pistacia*. Initial results are expected by the summer of 2001.

In summary, both the effects and possible causes of UCB-1 pistachio stunt will be investigated. First, nurserymen producing UCB-1 rootstocks have agreed to share their data on the incidence of off-type or abnormal seedlings in their plantings, which usually resemble *P. atlantica*. These percentages are reported in the companion article in this newsletter on UCB-1 off-types. Second, UCB-1 rootstock seedlings resembling *atlantica*s will be planted in the Spring of 2001 to observe their growth and yield relative to normal-looking controls. Third, individual young orchards in Kern and Madera Counties with trees on stunted UCB-1 rootstocks are soon to enter bearing. The yield of these trees will be monitored. Finally, efforts are currently underway to identify the microsatellite DNA fingerprints of the current pistachio rootstocks. If successful, this type of analysis could be used to establish the genetic profiles of the UCB-1 rootstock in affected orchards and unaffected orchards, thus determining whether or not genotype plays a role in the problem.

Last, but not least, with a problem like this, the more information available to researchers, the sooner the cause of the problem can be established. If you suspect your orchard trees on UCB-1, or on any other rootstock, have a problem similar to the pistachio stunting described in this article, contact your University of California Farm Advisor and your nurseryman for confirmation.

Useful Pistachio Industry Web Sites

California Pistachio Commission
http://www.pistachios.org/

UCD Department of Pomology
http://pom.ucdavis.edu/

UC Fruit & Nut Research and Information Center
http://fruitsandnuts.ucdavis.edu/

UC-IPM Pistachio Pest Management Guidelines
http://www.ipm.ucdavis.edu/PMG/selectnewpest.pistachios.html

UC Extension Pistachio Specialist Dr. Louise Ferguson's Web Site
http://fruitsandnuts.ucdavis.edu/louise2.html

Pistachio Rootstock Update

Louise Ferguson, UC Kearney Agricultural Center

The California pistachio rootstock trials are now a decade old. This decade of data collection has produced a good picture of the relative merits of the four rootstocks now used in California. The rootstocks consist of two separate species, *Pistacia integerrima* 'Pioneer Gold I' (PGI), *Pistacia atlantica,* and two hybrids of these two, one produced by Pioneer Nursery, 'Pioneer Gold II' (PGII), and one produced by the University of California, UCB-1. The following tables provide an update on the trial and the capabilities of these rootstocks.

Table 1 gives the planting dates and locations of the rootstock trials. The objective of the Madera, Kern and Fresno trials is to demonstrate relative yield performance among the four rootstocks in the three major pistachio production areas. The West Side Field Station Trial, (WSFS) was planted to determine relative *Verticillium* tolerance among the four rootstocks.

Table 1.

Location	Planted	Budded
Madera County	5/28/88 +	+
Fresno	2/22/89	7/10/89
Kern County	3/4/89	8/14/89
WSFS	4/8/92*	*

+This demonstration plot was established independently a year before this trial using budded trees, and a different field design.
*These were planted as budded trees

Table 2, shown on page 8, reports on the effects of rootstock on yield and quality. Trees on UCB-1, in all locations, produced significantly better yields than trees on all the other rootstocks, followed by trees on PGI and PGII. All three produce better than trees on *atlantica* in all locations. There are no consistent significant differences in the percentage of blanks or splits produced among the rootstocks. An analysis of the components of yield, clusters per tree, nuts per cluster and nut size demonstrates UCB-1 yields better because it produces more clusters per tree than trees on the other rootstocks, not more or bigger nuts per cluster.
Tables 3 and 4, shown on page 9, demonstrate the

relative *Verticillium* tolerance among the four rootstocks. PGI and UCB-1 are statistically equal in *Verticillium* tolerance, and both are clearly better than Atlantica or PGII. However, this trial is now only beginning to bear, and only yield data through 2002 will give the final answer on *Verticillium* tolerance between PGI and UCB-1.

Table 5 on page 10 shows the results of a field trial designed to demonstrate the relative differences in salinity tolerance among the four rootstocks.

Decrease in yield as a function of irrigation water salinity level was the indicator of salinity tolerance. Trees on all four rootstocks tolerated 6 sequential seasons of irrigation with water adjusted to 8 dS/m, equivalent to 6720 ppm TDS. Above this, at 12 dS/m or 11040 ppm TDS, trees on all four rootstocks had yield decreases, but UCB-1 appeared the most sensitive. However, in a tank trial, done to confirm the field trial results, PGI demonstrated the most sensitivity to salinity. In this latter trial, sensitivity was measured by decreases in growth.

Table 2. Effect of rootstock on yield and grade out. *

	County	UCB-1	PGII	PGI	Atlantica
1999 yield/tree **1999 yield/acre @ 112/acre** (kg dry in-shell splits)	Fresno	3.7 414	3.0 336	3.5 392	2.3 258
	Kern	1.7 190	1.3 146	1.8 202	.8 89
	Madera	0.8 90	0.5 56	0.7 78	0.9 101
% Filled Splits	Fresno	61	57	61	61
	Kern	68	62	62	64
	Madera	76	56	59	67
% Filled Non-Splits	Fresno	20	20	17	14
	Kern	15	15	17	14
	Madera	12	14	16	11
% Blanks	Fresno	13	15	12	12
	Kern	12	15	14	14
	Madera	5	13	13	8
% Damage	Fresno	6	9	8	13
	Kern	5	7	6	7
	Madera	7	17	12	14
Cumulative Yield to 1999	Fresno	21.1a	17.5c	20.0b	14.9d
(kg/tree)	Kern	32.0a	21.1c	28.4b	23.7d
	Madera	16.9a	15.2b	12.5c	7.9d
Cumulative Yield to 1999	Fresno	5222a	4332c	4950b	3689d
(lbs/acre @ 112 trees/acre)	Kern	7920a	6708c	7030b	5864d
	Madera	4184a	3761b	3093c	2402d

*Values within a row followed by different letters are significantly different. Lack of letters indicates no significant differences within a row

Table 3. General health of pistachio trees in September, 2000 in a trial in *Verticillium*-infested soil at the West Side Field Station.

	General Tree Vigor					
Rootstock	Excellent	Good	Fair	Poor	Died in 2000[b]	Died before 2000 [b]
	Percentage of trees					
P. integerrima	73	27	0	0	0	0
P. atlantica	30	28	11	16	3	11
PGII	11	27	31	20	0	11
UCB-1	66	31	3	0	0	0

[a] Sixty four trees per rootstock were planted in 1992.

[b] All appear to have died from *Verticillium* wilt.

Table 4. Symptoms of *Verticillium* wilt in pistachio trees in September, 2000 in a trial in *Verticillium*-infested soil at the West Side Field Station. [a]

Rootstock	Strike symptom	Died before 1999[b]	Free of strike symptoms in 2000
	Percentage of trees		
P. integerrima	0	0	100
P. atlantica	9	11	80
PGII	8	11	81
UCB-1	2	0	98

[a] Sixty four trees per rootstock were planted in 1992.

[b] All appear to have died from *Verticillium* wilt.

[c] Two *P. atlantica* trees with severe *Verticillium* strike symptoms died in 2000

Table 5. Effect of saline irrigation water on yield.

YIELD (kg/ tree)	IRRIGATION WATER SALINITY in EC (dS/m)* and PPM TDS 1997-1999											
	0.5 370			4.0 2960			8.0 6720			12.0+ 11040		
ROOT-STOCK	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999
Atlan-tica	6.0a	8.4a	0.2a	6.1a	7.6ab	0.5a	6.5a	8.3a	0.7a	5.2b	6.9b	0.7a
PGI	7.6a	11.9a	1.7a	8.6a	9.0b	3.4a	8.1a	10.8b	2.3a	7.7a	10.3 b	0.7a
PGII	6.5b	10.8a	0.3a	7.8a	10.9a	0.4a	8.1a	10.8a	1.2a	6.7b	9.0b	1.2a
UCB-1	6.3b	11.9a	0.5a	8.2a	12.3a	0.8a	8.8a	10.9a	0.4a	5.1c	6.1b	0.3a

* Values within a rootstock row for a given year followed by the same letter are not significantly different.
+ 12 dS/m irrigation was only applied for 1997 through 1999 seasons.

There is a possible explanation for these differences in tolerance between the tank and field trials. In the field trial, the salt content of the irrigation water decreased water uptake by the tree, producing a soil consistently at field capacity. Such waterlogging of the soil did not occur in tank trials. This suggests the field trial results may be confounded by unavoidable waterlogging of the soil. Other salinity researchers have reported similar differences between tank and field trials in salinity experiments with other permanent crops.

In summary, the rootstock trials investigating yield and *Verticillium* and salinity tolerance have produced the following results. UCB-1 produces the best yields among all the rootstocks, followed by PGI and PGII. All three produce better yields than trees on *atlantica* rootstocks. PGI and UCB-1 are equivalent in their tolerance of *Verticillium*. Both are significantly more tolerant of *Verticillium* than *atlantica* or PGII. All four rootstocks tolerate irrigation water containing up to 6720 ppm TDS. This last value makes pistachios, among tree fruit crops, second only to date palms in their salinity tolerance.

2000 Pistachio Production Short Course Held November 6-9, 2000

The 2000 Pistachio Production Short Course, sponsored by the UCD Pomology Department and UC Cooperative Extension, was held on November 6-9, 2000 in Visalia, CA. The course was designed to deliver the latest research-based production practices in a format that enables prospective or current pistachio growers, production managers and pest control consultants to better achieve their pistachio growing goals. The course covered the economics of establishment and production, orchard site selection and development, an assessment of the current

cultivars and rootstocks, irrigation, fertilization, training and pruning, weed, pest and disease diagnosis and control, and postharvest handling. Also featured was a one-day field demonstration. Participants received a manual written specifically for the course,

quick guides for year round production practices, and information about nutrition, disease and pest diagnosis and control. Certificates were given to those who completed the course. This course is offered once every five years. The next course will be held in 2005. Questions regarding short course content should be directed to Louise Ferguson, Extension Specialist, Kearney Agricultural Center, (559) 646-6541.

Annual Pistachio Field Day

The annual pistachio field day will be held on Tuesday, January 16, 2001 in Visalia, California. Contact Dr. Louise Ferguson at the Kearney Agricultural Center for more information, by phone at (559) 646-6541, or by email at louise@uckac.edu.

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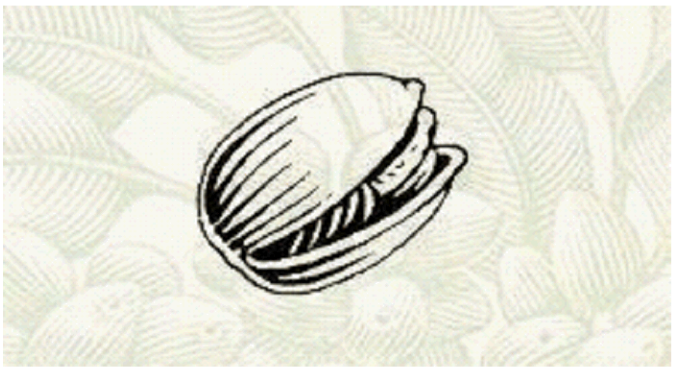
For questions regarding distribution, allocations, user fees, mailings and business operations

Production Manager.....Mike Cunningham
macunningham@ucdavis.edu, (530) 752-3888

For technical questions regarding production and growing of seed and parent tree budwood

Order Processor.....Ginnie Dixon
vndixon@ucdavis.edu, (530) 754-9294

To place orders, make changes to orders, get current status of orders, ask questions about requirements for placing orders



Questions About the FPMS Pistachio Program? Who To Contact.....